THREE ESSAYS ON EARNINGS INEQUALITY IN CANADA DURING THE 1980s:

by

Fiona MacPhail

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ABSTRACT

This thesis, comprised of three essays, focuses upon changes in individual employment earnings inequality in Canada during the 1980s. The empirical analysis uses data from the Survey of Work History (1981), the comparable Labour Market Activity Survey (1986 and 1989), and the Survey of Consumer Finances (1981 and 1989).

The first essay addresses the question: "Do researchers' measurement choices influence our understanding of earnings inequality?" Changes in earnings inequality are assessed in terms of statistical significance and the magnitudes are compared to those observed in other countries and in the previous decade. A central issue examined is whether, for a given definition of the population (for example, all male workers or full-time/full-year female workers), the trends in earnings inequality are robust to measurement choices. Apart from practical implications, the results are used to make several observations about economic methodology.

The second essay empirically examines the relationship between macroeconomic conditions and earnings inequality, within a specific model of labour market adjustment which is a novel feature of this essay. The model shows the conditions under which changes in firms labour strategies influence the degree of earnings inequality. Regression analysis is used to test the hypothesis that the inverse relationship between macroeconomic conditions and earnings inequality weakened in the late 1980s, as has been reported for the U.S.; and we conclude that the hypothesis can be rejected.

In the third essay, the labour market model of essay two is extended to incorporate other dimensions of inequality which are the age and education premia and other determinants, namely, structural, institutional, and demographic factors. Macroeconomic and unionization variables are found to be consistent and significant determinants of the three inequality dimensions. Support also exists for other hypothesized relationships, such as the relationship between the relative supply of university-educated workers and education premium, and the relationship between technological change and earnings inequality.

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CHAPTER 1

INTRODUCTION

A generally accepted "stylized fact" about labour markets, in Canada, and in many other industrialized countries, is that individual employment earnings became more unequally distributed and real mean earnings were quite stable, during the 1980s. Increased earnings inequality has been experienced in a variety of industrialized countries such as the U.S., U.K. and France and in comparison, increased earnings inequality in Canada has been less severe. This phenomenon of increased earnings inequality and stable mean earnings during the 1980s is striking because it marks a sharp departure from the relative stability of earnings inequality and substantial increases in mean earnings of the earlier decade. It represents more generally, the end to growing prosperity and equality experienced previously.[1]

Interestingly, this stylized fact of the 1980s, contrasts sharply with a comment by Blinder, referring to the United States, not so long ago:

> Where the average level of economic well-being is concerned, the record is one of steady improvement.... However, when we turn to consider the distribution of economic welfare-economic equality, as it is commonly called-the central stylized fact is one of constancy.
> [Blinder (1980), p. 416, quoted in Beach (1989), p. 162]

The trend toward greater earnings inequality is taken as indicative of fundamental structural changes in the labour markets of industrialized countries. Such structural

[1]. For Canada, see ECC (1991) and Morissette et al. (1993). For a variety of industrialized countries, see for example, Smeeding (1995).

changes are evidenced by the disappearance of "middle-class" jobs and a growing share of "bad-jobs" characterized by part-time work, casual work, and higher rates of unemployment, among other factors.[2] Rising inequality (around a stagnant mean) in the labour market implies increasing working poverty and has implications for social welfare. Furthermore, it is particularly troubling because it coincides with a period of slow economic growth and large government deficits and debts which limit the maneuverability of governments to counteract these labour market phenomena.

The large number of documents which explore the causes of these labour market changes including newspapers articles, government-sponsored policy papers, and journal articles, attest to the widespread acceptance of this new "fact" about labour markets of the 1980s.[3] The recent survey article by Levy and Murnane (1992) reviews primarily U.S. studies and reports that while certain clues concerning the causes of this phenomena have emerged, many puzzles remain. A variety of papers have analyzed determinants of increased earnings inequality in a cross-country, comparative manner using the Luxembourg Income Study (LIS) data.[4] Multi-country studies are viewed as providing an opportunity to examine competing explanations of the rise in earnings inequality and particularly, to distinguish among the explanations of institutional changes, government

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[2]. See, for example, Noreau (1994), Logan (1994), Pold (1994), Myles et al. (1988), and Picot et al. (1990).

[3]. The ECC (1991) study examines trends in earnings inequality in a policy context. The Globe and Mail had a series of articles on this topic January 11-15, 1993.

[4]. For comparisons of earnings inequality in various industrialized countries using LIS data, see for example Fritzell (1992), Jantti (1993), Gottschalk (1992, 1993), and Smeeding and Coder (1993).

interventions, and trade-related phenomena.[5] Comparatively little empirical work, however, has been conducted for Canada.[6]

This thesis explores trends in individual earnings inequality in Canada during the 1980s and empirically distinguishes among competing explanations of increased earnings inequaliry within a segmented labour market model. The thesis uses three Statistics Canada data sets which are fiequently used by labour economists. These data sets are the Survey of Work History (1981) and comparable Labour Market Activity Survey (1986 and 1989), and the Survey of Consumer Finances (1981 and 1989). Following this introductory chapter, the thesis is comprised of three essays which are described below.

Chapter 2 is a case study of trends in individuai earnings inequality in Canada during the 1980s. This chapter addresses the question: do researchers' measurement choices influence our understanding of earnings inequality? Researchers often explicitly choose certain inequality indicators given their known theoretical properties and consequently, their expected impact on estimates of earnings inequality. Researchers rarely, however, acknowledge how their other measurement choices influence their empirical estimates of earnings inequality. The impact on inequality of typical choices made by researchers are examined in this chapter. These measurement choices include

5. Katz and Revenga 1989) compare Japan and the United States, Gottschalk and Joyce (1992), Freeman and Needels (1993) compare earnings in Canada and United States.

6. Canadian studies of individual employment earnings inequality may be limited to: ECC (1991), Freeman and Needels (1993), Patrinos (1993a, 1993b), Morissette et al. (1993), Doiron and Barrett (1994), Richardson (1994), Burbidge et al. (1994), Kuhn and Robb (1996), and Storer and Audenrode (1996).

the income concept, population selection, data set, treatment of outliers, and inequality indicators, as well as those choices made by statistical agencies regarding top-coding during the data compilation process.

Chapter 2 serves a variety of practical and methodological objectives. At a practical level, it documents trends in earnings inequality. Firstly, it indicates that earnings inequality increased during the 1980s for all male workers and for full-time/full-year workers. Further, it shows that certain groups of workers, such as young workers and the poorest 20 per cent of women working full-time/full-year, were made worse off during the 1980s, both in relative and absolute terms. The empirical analysis demonstrates that measurement choices, relating to the definition of the reference population, critically affect estimates of earnings inequality. However, for a given population definition (defined in terms of age, gender, and work status), trends in earnings inequality are quite robust to other measurement choices, such as income concept, data set, and treatment of outliers. In contrast, estimates of earnings inequality at a point in time are extremely sensitive to measurement choices, making comparisons between studies questionable.

Secondly, at a practical level, this chapter provides the foundation for subsequent essays which focus upon explaining changes in earnings inequality. It imparts a rationale for measuring earnings inequality in certain ways and describes the method used for correcting a bias in the Survey of Work History 1981 data which is used in this and subsequent essays. Finally, the rationale for examining the robustness of the trend of increasing earnings inequality extends beyond documenting trends and setting the stage for the subsequent analysis, to issues of how to interpret and compare results of other studies on earnings inequality.

At a more abstract level, the analysis in chapter 2 affords the opportunity to reflect upon the practice of economics with respect to a particular issue, that of the measurement of earnings inequality. Thus, this chapter approaches the terrain of economic methodology in that it uses conclusions from the concrete analysis of how economists practice economics, in this case, measure the phenomena of earnings inequality, to make a number of observations about the state of economic methodology and epistemology.

This chapter argues that facts, or descriptions of phenomena, are social constructions of researchers, rather than independent and exogenous entities. This position is argued in two ways. First, a context is set, drawing upon the economic methodology literature, which critiques and rejects the positivist, neoclassical economics view that data are independent and exogenous. While rejecting positivism does not necessitate a rejection of an empiricist epistemology, it does call for a more complex and reasoned empiricist approach, referred to here as "realist".

Second, the literature review and empirical analysis are conducted to demonstrate, respectively, the potential and empirical variation in inequality estimates arising from specific measurement choices. The combined analysis illustrates that facts are created by researchers through a process involving a lengthy list of choices which depend upon the research question, personal preferences of researchers, norms of acceptability internal to the discipline, and societal values. Consequently, the literature review calls into question the uncritical notion of objectivity in the official epistemological position of neoclassical economics.

In summary, the first essay, presented in chapter 2, describes the phenomenon of interest, justifies the measurement choices, and identifies the methodological position. The following two essays, presented in chapters 3 and 4, precede to examine explanations of increased earnings inequality during the 1980s.

Chapter 3 distinguishes between cyclical and secular determinants of increased earnings inequality during the 1980s. The debate over the causes of increased earnings inequality in the United States has centred upon distinguishing among various microeconomic explanations such as changes in the relative demand and supply of skilled labour (skill "mismatch"), deindustrialization, increased import-competition, deunionization, and technological change, particularly that of computer-based automation. The focus on microeconomic explanations of increased earnings inequality has overshadowed a conventional explanation, that of a slowdown in economic activity which had received considerable attention in previous decades [see for example, Blinder and Eskai (1978), Blank and Blinder (1986), and more recently, Richardson (1994)]. In contrast to the U.S., where cyclical explanations of increased earnings inequality have been rejected [Levy and Murnane (1992), p. 1351], this chapter finds evidence, particularly for men, to support the hypothesis that the inverse relationship between macroeconomic conditions and earnings inequality did not weaken in the late 1980s.

This chapter situates the empirical analysis of the relationship between macroeconomic conditions and earnings inequality within the context of a particular theoretical view of how labour markets adjust to cyclical fluctuations. The model shares features with efficiency wage models and segmented labour market theory. This chapter contrasts, therefore, with the majority of empirical studies which are conducted without reference to an explicit labour market model [for example, Blinder and Eskai (1978) and Blank and Blinder (1986)].

A model is developed of how firms, responding to changes in the unemployment rate, alter their job structures which gives rise to changes in the distribution of earnings. The model is comprised of two components. The first component adapts Osberg's (1995) model and outlines the relationship between changes in economic incentives faced by firms and changes in their job structures. Specifically, an increase in the unemployment rate induces some firms to switch from offering only permanent jobs, to offering a combination of permanent and casual jobs, referred to as a "just-in-time" labour strategy. The conditions under which an increase in the proportion of firms adopting a just-in-time labour strategy results in an increase the proportion of casual jobs offered in the economy are demonstrated. This model is similar in nature to micro-optimizing efficiency wage models [Shapiro and Stiglitz (1984) and Rebitzer and Taylor (1991)] and exhibits segmented labour market features. The second component of the model demonstrates the conditions under which an increase in the proportion of casual jobs results in an increase in earnings inequality, measured by the Variance of Logarithm inequality indicator. This component uses Robinson's (1976) arguments developed in the context of a dual sector economy and the Kuznets' hypothesis between the level of development and earnings inequality.

The topic and theoretical perspective give rise to the following questions which are addressed. First, did earnings inequality increase and then decrease over the business cycle of the 1980s? (Note that the unemployment rate was 7.5 per cent in 1981, rose to almost 12 per cent in 1983, and fell to 7.5 per cent in 1989.) Second, were these cyclical labour market adjustments experienced equally by all population groups, with particular attention paid to young workers and women? Third, did hourly wage rates and annual hours worked (the components of annual earnings), follow the same pattern of inequality as annual earnings over the business cycle?; and what were the relative contributions of increases in hourly wage rate inequality and annual hours worked inequality to overall increases in annual earnings inequality? On this last question, from a segmented labour market and efficiency wage perspective, we expect changes in hours inequality to be a relatively more important determinant. Evidence for the U.S., however, suggests that annual earnings inequality is due to increased wage inequality [Karoly (1993), Juhn et al. (1993)].

Chapter 4 expands the analysis of determinants of increased earnings inequality in Canada during the 1980s by considering a variety of secular, as well as cyclical determinants, and by examining other dimensions of inequality. This chapter discriminates among various explanations of increased earnings inequality during the 1980s, such as technological change, deindustrialization, increased import competition, skill "mismatch", deunionization, and the decline in real minimum wages, as well as the deterioration in macroeconomic conditions examined in the previous chapter. While chapters 2 and 3 focused upon earnings inequality among workers, this chapter considers two other dimensions of inequality, namely, the age premium and education premium. The deterioration in the position of young workers during the 1980s observed in chapter 3 is associated with a rise in the age premium. Chapter 4 also documents the decline in the position of less-educated workers which is reflected in a slight rise in the education premium. These three dimensions of inequality have received particular attention in the literature. While the evidence indicates that the age premium has risen [Morissette et al. (1993), Picot et al. (1993)], the evidence that the education premium has increased has been mixed [see for example, Freeman and Needels (1993) compared to Bar-Or et al. (1995)].

The theoretical framework for analyzing how firms alter the job structure offered in response to economic incentives, developed in chapter 3, is extended to incorporate the additional explanations of increased earnings inequality and other dimensions of inequality. Thus, the relative empirical contributions of these factors to increased earnings inequality are examined within a comprehensive theoretical framework. Previous studies have tended to focus upon analyzing the contribution of a single factor to increased earnings inequality - to locate the "smoking gun" to use a metaphor common in the literature.

The empirical analysis is conducted with a unique data set created explicitly for this purpose. The data set is created from the Survey of Work History (1981) and the Labour Market Activity Survey (1986 and 1989) and each observation represents a region in Canada. There are 64 regions, for 3 years, generating a data set of 192 observations.

The data set is richer in detail and larger than other data sets commonly used in this type of work.

Macroeconomic conditions and unionization are found to be the most consistent, significant determinants for each of three dimensions of earnings inequality. Demand side determinants such as technological change and supply side factors such the relative supply of university-educated workers are significant for certain inequality dimensions. While these determinants are less robust to measurement choices, in comparison to macroeconomic conditions and unionization, they warrant further consideration in understanding why the poor, the young, and less-educated fared so badly in the labour market.

The final chapter discusses general themes and results.

CHAPTER 2

INCREASED EARNINGS INEQUALITY DURING THE 1980s: DO RESEARCHERS' CHOICES MATTER ?

1.0 INCREASED EARNINGS INEQUALITY: A STYLIZED FACT?

Increased earnings inequality during the 1980s has become a "stylized fact" within the discipline of economics and society more generally. A fact is taken here to mean, following Machlup (1978), "data of direct observation ... which are so firmly established that they cannot reasonably be questioned" [Machlup (1978), p. 450]. While facts exist at different levels, including quantitative descriptions of phenomena and hypothesized relationships, what is fundamental to the creation of a fact is that it is generally accepted within the discipline or society as a correct representation of reality.

The methodology of neoclassical economics, that of positivism, takes a simple view of facts as exogenous and independent of researchers. This view continues to be held despite the methodological positions to the contrary and illustrations of how measurement choices may influence the nature of facts. In terms of illustrations, the profession (or self-selected groups of the profession) is occasionally made aware, through careful evaluation of data, that what has generally been perceived as a fact is merely a statistical artifact. For example, in the poverty literature, it is now clear that our understanding of "facts" about poverty depend upon a variety of measurement choices including the poverty line, the poverty measures, and whether the extent of poverty is considered, equivalence scales, and treatment of outliers.[7] To take another example, Atkinson et al. (1984) show that the generally held view, or "fact", of a direct relationship between unemployment insurance benefits and the unemployment rate is quite dependent upon the measures employed.[8]

The purpose of chapter 2 is to examine whether the stylized fact of increased earnings inequality during the 1980s in Canada depends upon measurement choices. In the inequality literature, it is now generally recognized that trends in inequality, or rankings at a point in time, depend upon the inequality indicators selected. There has been, however, little discussion of how other measurement choices made by researchers affect the conclusions. In this chapter, I consider the impact of measurement choices typically made by researchers conducting inequality studies such as the income concept, population selection, data set, treatment of outliers, and inequality indicators, as well as those choices made by statistical agencies regarding top-coding during the data compilation process.

Evaluating the impact of measurement choices on estimates of earnings inequality serves a variety of objectives ranging from the abstract to the more practical. At an abstract level, this chapter is a case study of how measurement choices potentially and empirically affect estimates of earnings inequality which affords the opportunity to reflect upon the practice of economics with respect to a particular issue, that of the measurement

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[7]. See for example Sen (1976), Phipps (1993).

[8]. See also Setterfield et al. (1992) where the robustness of another fact, the NAIRU, is questioned.

of earnings inequality. Exploring the way in which facts about earnings inequality are socially constructed arising from researchers' decisions within the context of a discipline is used to illustrate the limitation of the official epistemological position of neoclassical economics of positivism and, specifically, its uncritical notion of objectivity of facts.

At a more practical level, the chapter documents trends in earnings inequality in Canada during the 1980s and demonstrates how our understanding of these trends relates to measurement choices. Documenting the trend in earnings inequality alone is important given reports on the dramatic changes in earnings inequality and controversy surrounding the magnitude of the Canadian estimates.[9] However, understanding the empirical impact of measurement choices on estimates of earnings inequality is useful for other reasons.

This work provides the basis for explanations of changes in earnings inequality found in chapters 3 and 4 by establishing "appropriate" ways to measure earnings inequality. If the "fact" of increased earnings inequality is indeed robust, then the search for causes of these trends takes on central importance. Alternatively, if estimates of earnings inequality are not robust, then it is necessary to identify the measurement issues which determine facts about trends in earnings inequality, and to recommend suitable measurement criteria before proceeding to analyze determinants of changes in earnings inequality.

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[9]. For example, Morissette et al. (1993) document a rise in earnings inequality using data from the Survey of Consumer Finances and Survey of Work History 1981/Labour Market Activity Survey 1988 and note the potential bias in trends arising from the latter data set. Doiron and Barrett (1994) report a decline in earnings inequality for the period 1981 to 1988.

The rationale for examining the robustness of the trend of increasing earnings inequality extends beyond documenting trends and setting the stage for the subsequent analysis, to issues of how to interpret results of other studies on earnings inequality. As noted previously, a number of studies using the Luxembourg Income Study (LIS) data provide estimates of earnings inequality across countries and over time and quantitatively distinguish among competing explanations of earnings inequality. However, interpreting these comparative results is plagued by difficulties given differences among researchers' measurement choices and data sources. To take a simple example, if top-coding[10] significantly affects estimates of inequality, then how does one interpret the inequality estimates in two countries derived from data sets which differ in their implementation of top-coding? More generally, the robustness of the "fact" of increased earnings inequality to various measures has implications for other studies which use wage and earnings data, such as those concerned with gender wage differentials, poverty, and so on.

In the following section, the nature of facts within the neoclassical economics paradigm is briefly reviewed and the notion that facts exist independently of researchers' choices and the discipline's conceptual framework is critically examined. The notion of objective facts is rejected by general methodological arguments and illustrations from the income inequality literature to show the potential of researchers' choices to affect estimates of earnings inequality. Emphasis is placed upon explaining why researchers make certain choices, such as the selection of individual employment earnings rather than

[10]. Top-coding of income refers to the procedure of reducing all income observations above a certain income level, to that level.

family total income, as well as their potential impact on estimates of inequality. The data used in this chapter, namely the comparable Survey of Work History 1981 and Labour Market Activity Survey 1989, and the Survey of Consumer Finances 1981 and 1989, is described in section 3. A method for correcting a potential bias in the SWH 1981 data is aiso offered. The empirical impact of measurement choices on trends in earnings inequality is examined in section 4. A conclusion relating to the above objectives is offered in the final section.

2.0 A CRITICAL APPRAISAL OF THE METHODOLOGY AND PRACTICE OF ESTIMATING EARNINGS INEQUALITY

2.1 INTRODUCTION

Two leading researchers in the income inequality field make an interesting observation in a recent paper that trends in income inequality depend upon researchers' approaches to inequality measurement. Cowell and Jenkins (1994, p.1) state:

> [e]xplaining the level of and trends in inequality is an intriguing topic but one that is often dependent on a researcher's particular approach to inequality measurement. Sometimes the approach is simply one that accords with intuition; sometimes principles of applied welfare economics or statistical analysis are invoked.

Approaches to the measurement of income inequality and other economic phenomena, as well as approaches to data more generally, are typically not explicitly discussed.

The primary purpose of this section is to highlight the nature of choices made by researchers in the measurement of earnings inequality, reasons why certain choices are made, and the potential impact of these choices on estimates of earnings inequality. This section provides a review of the literature on the measurement of earnings inequality and focuses upon selected measurement issues, the empirical impact of which will then be assessed in the remainder of this chapter. Before undertaking this practical analysis, the question of researchers' approaches to data is placed within a broader context of examining whether neoclassical economics, in general, offers any principles to guide empirical work.

2.2 QUESTIONING THE POSITIVIST/MODERNIST CONCEPTION OF FACTS IN NEOCLASSICAL ECONOMICS

2.2.1 Neoclassical Economics - a Positivist, Modernist Paradigm of Science

Before considering the principles for guiding the use of data offered by neoclassical economics, the methodology and epistemology of the paradigm of neoclassical economics are discussed.

Neoclassical economics is a paradigm in the sense described by Kuhn (1970). It is a paradigm because there exists agreement among neoclassical economists on rules for undertaking economic research, the appropriate concepts and tools, and problems or questions warranting study [Kuhn (1970), pp. 43-46]. With respect to the choice of problems within a scientific paradigm, Kuhn (1970, p. 37) states:

> To a great extent these are the only problems that the community will admit as scientific or encourage its members to undertake. Other problems, including many that had previously been standard, are rejected as metaphysical, as the concern of another discipline, or sometimes as just too problematic to be worth the time. A paradigm can, for that matter, even insulate the community from those socially important problems that are not reducible to the puzzle form, because they cannot be stated in terms of the conceptual and instrumental tools the paradigm supplies.

The foundation of neoclassical economics, or at least the foundation which is typically espoused - the official doctrine - is that of logical positivism (or logical empiricism).[11] Logical positivism involves a Popperian methodology and positivist, modernist epistemology. Methodology refers to the study of the reasons behind the principles of undertaking scientific inquiry, rather than the study of aspects of the research process such as methods of data collection and hypotheses testing; as such, methodology is often considered a branch of philosophy. According to Machlup (1978, p. 55) a methodology "...provides arguments, perhaps rationalizations, which support various preferences entertained by the scientific community for certain rules of intellectual procedure, including those for forming concepts, building models, formulating hypotheses, and testing theories." Epistemology refers to the study of the nature and method of knowledge.[12]

Logical positivism in economics emerged with the transition from classical to neoclassical economics and has persisted within the economics discipline, despite its decline in the eyes of philosophers of science since the 1960s [see Walsh (1991), p. 862]. From the time of Hutchinson's (1938) call for economists to apply logical positivism in the 1930s, through to the late 1970s, variants of logical positivism have been proposed.

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[11]. For example, see Boland (1991a) and Walsh (1991) for descriptions of logical positivism. Most introductory economics textbooks very simply illustrate some of the main tenets of logical positivism.

[12]. Austrian, Institutional, and Marxist paradigms incorporate alternative methodologies and epistemologies.

While various strands continue to co-exist today,[13] several writers have argued that there is general acceptance of a positivist view which is basically a version of Friedman's and Lipsey's positivism, both of which involve modernist conceptions of knowledge.[14]

Friedman's version of positivism (sometimes referred to as instrumentalism or predictionism) provides a useful starting point for examining positivism since it involves an assessment of the ideas of the early logical positivists In addition, Friedman's 1953 essay "The Methodology of Positive Economics" is considered by many economists to be the landmark in economic methodology for the period 1950 to late 1970s.[15] For Friedman (1953), a positive methodology is comprised of a set of tautologies and set of substantive hypotheses. A set of tautologies, or language, is "designed to promote systematic and organized methods of reasoning" The validity of the language is to be assessed by the criteria of formal logic, such as completeness and consistency, and by

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[13]. Boland (1991a) identifies four co-existing strands of positivism which appear to differ mainly in the role assigned to the testing of economic theory These approaches are Harvard - Chamberlin, followed by Vernon Smith (experimental approaches), MIT - Samuelson (the need only for potentially refutable hypotheses); Chicago - Friedman, followed by Becker and Stigler (empirical testing only of hypotheses and not assumptions); and LSE - Lipsey (falsifiability of both assumptions and hypotheses) Koopmans (1947, 1957) also argues that both assumptions and hypotheses should be tested. He has a more sophisticated analysis of researchers' approaches to data which will be discussed

[14]. Stewart (1991), for example, argues that the period 1950 to the late 1970s is best characterized as a period of methodological stagnation in terms of this general acceptance of a Lipsey-Friedman positivism Boland (1991a, p. 95) states that the Lipsey's (1963) textbook the Introduction to Positive Economics ". .became the major platform for all modern economic positivism "

[15] Hausman (1989), for example, refers to Friedman's (1953) essay as the most influential piece of methodological writing in the twentieth century. See also Stewart (1991) who makes the same point

factual evidence to assess the meaningfulness of categories. The set of substantive hypotheses are "designed to abstract essential features of complex reality". Theories are to be accepted as valid if their hypotheses or predictions, and not necessarily assumptions, are consistent with the experience. [Friedman (1953), p. 7]

Friedman's distinction between language and substantive hypotheses follows from the logical positivist distinction between analytical and synthetic statements. Analytical statements are definitions and tautologies and synthetic statements are hypotheses which may be testable [Blaug (1992), pp. 83-84]. Where Friedman differs from the logical positivists is in his emphasis on testing hypotheses rather than assumptions in assessing the validity of theory. Instrumental hypotheses can only be assessed in terms of the accuracy of their predictions.[16]

Lipsey incorporates Friedman's ideas along with the some of Popper's criticisms of logical positivism, to develop a more critical approach to confronting hypotheses with data. Lipsey argues that hypotheses are to be tested using the Popperian criterion of falsification, rather than older notion of verification. Lipsey (1989, p. 24) states:

> ...the scientific approach to any phenomenon consists in setting up a theory that will explain it and then seeing if that theory can be refuted by evidence. The alternative to this approach is to set up a theory and then look for confirming evidence. Such an approach is hazardous because the world is sufficiently complex for some confirming evidence to be found for almost any theory, no matter how unlikely the theory may be.

While these two strands of positivism differ as to the prescribed rules for testing theory, they share a positivist (or empiricist) and modernist epistemology in which the

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[16]. In contrast to the Friedman emphasis on testing of predictions only, Koopmans (1957) methodological position is that both hypotheses and assumptions should be tested.

notion of a value-free inquiry is essential. Central to the modernist view of science is the idea that the natural world exists independently of our concepts, beliefs, and hypotheses concerning this world and critically, that truth or true theories are obtainable.[17]

Truth, or "objective knowledge", as Popper states is "independent of anybody's claim to know", that is, independent of belief [Popper (1972) quoted by Pera (1989), p. 176 and de Marchi (1992), p.3]. For Popper, the end product of "objective knowledge" is not in any way dependent upon the beliefs of the scientist doing the producing [de Marchi (1992), p. 6].

This view is based upon the belief that it is possible to separate: analytical and synthetic statements; fact from value; and objective from subjective. Science advances by confronting hypotheses with facts, in this case by correctly applying Popperian falsification rules, in order to understand truth.

From this positivist, modernist epistemological stance, facts, or alternatively data, or evidence, are used to evaluate hypotheses. Facts are assumed to exist independently from the researcher and are objective. The emphasis of neoclassical economics is on formal testing of synthetic statements or hypotheses where the data, or construction of data, is exogeneous and unimportant.

Before examining alternative views within neoclassical economics about the nature of facts, for completeness of the argument we justify the view of noeclassical economics as a paradigm and the dominant paradigm within the discipline of economics. Boland

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[17]. Whether truth exists is the subject of ontology.

(1991b, p. 456), for example, argues that, by examining the output and practice of economists, it is clear that there is a generally accepted methodology, even if it has not been attained through explicit and conscious agreement. He states elsewhere that: "[p]ositive economics is now so pervasive that every competing view (except hard-core mathematical economics) has been virtually eclipsed." [Boland (1991a), p. 88] Further, Boland (1991b, p. 456) argues that, since the 1960s, there has been growth in the view of the "correct method or scientific investigation" as is evident in the commonality across economics curricula of universities and the growth in the usage of mathematical ideas and theorems in journals. Grubel and Boland (1986) report that the use of mathematics in key economics journals has grown substantially during the postwar years. They further suggest that the mathematical works and empirical/policy-oriented works do not interact (as judged by cross references of articles).[18]

Even if it is argued that the use of mathematical reasoning has not increased in the post-World War II period, Morgan's (1988) results demonstrate that pure theory

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[18]. There is some debate about whether or not there has been growth in the post-World War II period in the usage of mathematical reasoning without the evidence to support hypotheses. Morgan (1988) classifies papers from the American Economic Review for sub-periods between 1971 and 1986, extending the work of Leontif, and for the Economic Journal into categories where the two main categories are theory papers and empirical analysis papers. He finds that the percentage of theory papers decreased in the American Economic Review and remained about stable in the Economic Journal. However, the use of mathematical reasoning does appear to have increased over the longer period of the late 1800s to the 1980s. This conclusion is based upon a comparison of the results of Mirowski (1991) and Morgan (1988) although their results are not strictly comparable since the two studies use different methods of measuring trends. Mirowski (1991) estimates the percentage of pages with mathematical content in four selected economics journals, for the period between 1887 and about 1955. Based upon Mirowski's (1991) data, the use of mathematical reasoning increased over the period 1887 to 1955.

papers dominant the discipline of economics to a greater extent than in other social science and physical science disciplines such as political science, sociology, chemistry and even physics. For example, in chemistry, 100 per cent of papers examined in the The Journal of the American Chemical Society involved empirical analysis [Morgan (1988)].

Just as the view that neoclassical economics is a paradigm may need no justification, the view that neoclassical economics claims to be a positivist science likewise is hardly under dispute. Positivism however is controversial, at least outside of economics. The positivist/modernist foundation of neoclassical economics is advanced year after year in the numerous standard introductory economics textbooks. Lipsey, for example, indicates that positive economics is captured by a circular flow involving the development of theory (definitions, assumptions, hypotheses from which predictions/implications are deduced using theoretical analysis), and the testing of predictions (using empirical observations and statistical analysis). If the prediction is in conflict with the evidence, then the theory is either rejected in favour of a superior competing theory, or the existing theory is revised thereby, completing the circular flow of theory and empirical testing [Lipsey (1989), p. 26]. Subsequently, the distinction between fact and value, along with the positive-normative distinction, are emphasized.[19]

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[19]. Samuelson and Nordhaus (1993, p. 5) refer to the scientific approach of economics and state: "[e]very day a new puzzle arises. In response, economists test new ideas and reject old ones, and economics evolves and changes. Textbooks embody both the established wisdom and the hot controversies of today. But in a decade or two, new facts will have toppled old theories, and the subject will evolve anew."

McConnell and Brue (1993, p. 3) state that using a deductive approach, "economists can begin with theory and proceed to the verification or rejection of this

Despite the critiques of logical positivism and the demise of positivism in philosophy departments as discussed below, McCloskey (1989, p. 226) concludes that "[s]entences from Milton's pen still provide the philosophical stage directions for the field". McCloskey (1989, p.226), expanding upon this point of the importance of logical positivism in neoclassical economics, states:

> [e]conomists young and old still use the positivist way of arguing. They talk a lot about verifiability, observable implications, meaningful statements, science vs. pseudo-science, the love of physics, the unity of sciences, the fact/value split, prediction and control, hypothetico-deductive systems, and the formalization of languages....

Having argued that neoclassical economics is a paradigm with logical positivist foundations and having described some its tenets, we turn now to criticisms of the practice and foundations of neoclassical economics.

2.2.3 Criticisms of the Methodology and Practice of Economics

Logical positivism has been generally accepted for the past 50 years and continues to be espoused as the official doctrine of neoclassical economics. However, the relatively few voices expressing dissatisfaction with the epistemological underpinnings

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theory by an appeal to the facts". They also acknowledge a role for the inductive method in deriving principles from facts.

Stager (1985) explicitly states that economics, along with other social science disciplines, shares the same scientific method as the physical and natural sciences. In connection to epistemology (although he does not use this term), Stager (1985, p. 17) stated "the scientifc method requires examining questions by referring to actual evidence rather than to intuition, judgment, or personal experience..." Continuing, he stated that "[t]he validity of a theory is tested by comparing its predictions with evidence drawn from actual experience; such evidence must of course be classified according to the definitions used in the theory" [p. 20].

of the paradigm in the earlier period (roughly 1930-1980) have been joined recently by many more critical voices. Individuals dissenting from the official doctrine can be divided into two groups, although the line between them is often blurred. In the first group are people who accept the doctrine of logical positivism and, by prescribing it to economists, seek to make economists practice it better. In the second, very diverse, group are people who argue that the doctrine is flawed and they raise a number of criticisms, each of which has implications for alternative conceptions of science and approaches to data.

In the first category, writers note that there is a divergence between the official doctrine of logical positivism and what economists actually do. Issues of how approaches to data may influence our understanding of reality and the objectivity of data are neglected. Even 20 years ago, it was recognized that empirical analysis was not as highly valued as perhaps the methodology of positivism would suggest. Leontief (1971, p. 3), for example, stated that, in the academic community, empirical analysis... "gets a lower rating than formal mathematical reasoning". Further, he states that the academic community "discourages venturesome attempts to widen and to deepen the empirical foundations of economic analysis" [Leontief (1971), p. 5]. Leontief (1971, p. 2) also bemoans the lack of testing of theoretical assumptions:

> In the presentation of a new model, attention nowadays is usually centered on a step-by-step derivation of its formal properties....By the time it comes to interpretation of the substantive conclusions (in italics in the original), the assumptions on which the model has been based are easily forgotten. But it is precisely the empirical validity of these assumptions on which the usefulness of the entire exercise depends....What is really needed in most cases, is a very difficult and seldom very neat assessment and verification of these assumptions in terms of observed facts.

Not only does empirical work get a lower rating than theoretical work, but there has been a shift away from empirical testing to formal mathematical modelling (from synthetic to analytic statements) and the discipline of economics is more likely to have pure theory papers than disciplines in the physical sciences, as noted previously.[20]

Writers in this first group argue that economists have not been adequately practicing the logical positivist methodology. They extol the virtues of the doctrine, and prescribe it as necessary for conducting good economics. While writers in this group may suggest modifications to the basic Popperian methodological principles, they accept the modernist view of knowledge. Of particular importance in the context of this chapter, is that the fact-value and objective-subjective distinctions remain intact. As a result, the issue of researchers' approaches to data and the influence on facts remains unexplored.

Blaug, who has been one of the most vociferous and influential writers on economic methodology, has called for economists to practice a Popperian methodology, albeit in a more sophisticated form. Blaug (1979) is critical of neoclassical economists' practice of testing theory. He argues that modern economics is characterized by a preoccupation with theories without testable implications which can shed light upon economic phenomena. Further, even when hypotheses are tested, economists have

[20]. The reasons for the shift, while worthy of discussion, are not elaborated upon here. Popper's criticism of logical empiricism and the theory-dependent nature of facts may have contributed to the shift away from testing. As Boland (1991b, p. 457) notes: Popper's challenge contributed toward the movement from the view that we can collect "indisputable observational facts, to the new view that we collect or create indisputable logically valid theorems which may or may not be about observable data." See also the Duhem-Quine thesis discussed below.

tended to follow the rules of confirmation, rather than the more difficult approach of falsification [Blaug (1979), pp. 254-256]. Blaug (1979, p. 257) states: "empirical work that fails utterly to discriminate between competing explanations quickly degenerates into a sort of mindless instrumentalism and it is not too much to say that the bulk of empirical work in modern economics is guilty on that score."

Others have called for a more sophisticated form of hypothesis testing, building upon the Duhem-Quine thesis. The Duhem-Quine thesis states that it is impossible to falsify a single hypothesis because it cannot be separated from a set of auxiliary hypotheses. Thus, if the evidence suggests the single hypothesis should be rejected, we may attribute the inconsistency to one of the auxiliary hypotheses rather than the main hypothesis. Cross (1982), for example, illustrates the inappropriateness of testing single hypotheses drawing upon the literature concerned with the hypothesis of the stability of the money demand function. As an alternative, he suggests a Lakatosian appraisal of a scientific research programme, in which the hard core is separated from a set of hypotheses in the "protective belt" and it is these latter hypotheses which can be tested. However, the same Popperian rules of theory assessment still apply to the protective belt and, consequently, the Lakatosian research programme is still subject to the same limitations which are considered below.

Writers in the second group, rather than prescribing a more sophisticated logical positivist methodology, draw attention to fundamental problems with logical positivism, and in particular, point to the problem of viewing facts as objective. A wide range of economists have been critical of the notion of independent objective facts. Economists writing in the 1980s are not the first to make this point. It has been recognized, at least since the time of David Hume, that data/facts are not objective, nor necessarily true representations of the independent reality but are theory dependent and influenced by the choices made by, and the perspective of, researchers. For example, Knight (1956) responding to Hutchinson in the 1930s, challenged the use of logical positivist methodology precisely on this ground.

To take another example, Hayek (1943, p. 10) notes:

> ...if our historical fact is such a complex as a language or a market, a social system or a method of land cultivation, what we call a fact is either a recurrent process or a complex pattern of persistent relationship which is not 'given' to our observation but which we can only laboriously reconstruct - and which we can reconstruct only because the parts (the relations from which we build up the structure) are familiar and intelligible to us. To put it paradoxically: what we call historical facts are really theories which, in a methodological sense, are of precisely the same character as the more abstract or general models which the theoretical sciences of society construct.

Koopmans (1947) is also critical of the idea that facts are objective, exogeneous entities. He recognizes not only that facts are theory-dependent like Hayek, but he strongly advocates the use of theory in measuring and selecting variables in order to improve our measurement and understanding of economic phenomena. In a review of a book concerning the measurement of business cycles, Koopmans (1947), p. 163) states:

> ...even for the purpose of systematic and large scale observation of such a many-sided phenomenon, theoretical preconceptions about its nature cannot be dispensed with, and the authors do so only to the detriment of the analysis.

Koopmans (1947) further noted that some aspects of "measurement without theory" results in the lack of discussion of how concepts are operationalized, how choices are related to notions of causal effects (in this case fluctuations in economic activity), choice of measures, and deciding which concepts are to receive more attention (for example, cycles or trends). Koopmans (1947, p. 165) argued that the "gap left by the barring of explicit formal theory is thus filled with methodological quasi-theory concerned with delineating the object of study."

More broadly, Schumpeter concluded that facts can not be objective and that the biases introduced are related to the observer's social position. He stated:

> The analyzing observer himself is the product of a given social environment-and of his particular location in this environment-that conditions him to see certain things rather than others, and to see them in a certain light. And even this is not all; environmental factors may even endow the observer with a subconscious craving to see things in a certain light. [Schumpeter (1954), quoted in Seiz (1994), p. 168]

More recently, Coddington (1972) has argued the positivist methodology does not identify the criteria for establishing what is to be considered a fact. Since variables will never perfectly match concepts, data are never perfectly accurate, and researchers' choices in measurement of facts will vary, facts are not objective. In addition, the relative merits of facts and tests require making judgements rather than taking any empirical evidence at its face value - as an indisputable fact.

While the most common use of data has been in theory evaluation, Kaldor has been a strong proponent of using data in the generation of hypotheses in addition to evaluation, as advanced in his concept of "stylized facts".[21] Kaldor (1978, p.2) stated:

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[21]. A quick review of the literature suggests that stylized facts have been used quite widely, although not always in the manner suggested by Kaldor. For examples, see Ahluwalia (1976), Shafer et al. (1992), Fethke (1985), and Reagan and Sheehan (1985).

> Any theory must necessarily be based on abstractions; but the type of abstraction chosen cannot be decided in a vacuum; it must be appropriate to the characteristic features of the economic process as recorded by experience. Hence the theorist, in choosing a particular theoretical approach, ought to start off with a summary of the facts which he regards as relevant to his problem. Since facts, as recorded by statisticians, are always subject to numerous snags and qualifications, and for that reason are incapable of being accurately summarized, the theorist, in my view, should be free to start off with a 'stylised' view of the facts - i.e. concentrate on broad tendencies, ignoring individual detail, and proceed on the 'as if' method.

Lawson (1989), in an attempt to clarify some of Kaldor's concepts, argues that stylised facts provide an entry point for theory formulation and evaluation - i.e. "provide a starting point for the analysis of enduring structure and mechanisms". Thus, Lawson, following Kaldor, emphasizes the role of data in attaining agreement about an economic phenomena which "we" wish to explain, and thereby, provide impetus to the formulation of theory.[22]

It is important to note that Kaldor was not advocating an ultra-empiricist approach, in that he recognized that the usefulness of stylised facts does not rest upon the belief that one can obtain some "absolute and immutable foundations for knowledge through something like perception, intuition or direct experience alone" [Lawson (1989),

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[22]. For example, Lawson (1989, p. 65) states:

> ...to the extent that any manifest phenomenon appears to reveal some degree of uniformity, generality, or persistency, albeit by no means complete in such respects, it would seem to provide a prima facie case for supposing that some enduring generative mechanisms are at work. Consequently, such partial regularities - with completely irregular details ignored - are often essential for initiating searches for operative causal mechanisms. And conceptualisations of such partial regularities, of course, are the obvious candidates for representation as 'stylised facts'.

p. 67]. Identifying a stylized fact does not make it immune from criticism, redevelopment, and reconceptualisation.

In the 1980s, there was a surge in methodological writing critical of the official doctrine of neoclassical economics, and particularly, its positivist epistemological stance. Specifically under attack was the modernist view of knowledge as objective, known with certainty, and independent from a social context comprised of values, personal convictions and experience and societal power relations. The criticisms of the 1980s are distinguished from those of the earlier period (1930-1970) by not just the greater number of dissenting voices, but the greater seriousness attached to the issue of non-objectivity and bias, and their explicit links to the general philosophy of science literature where many developments had taken place since the declaration of the death of positivism in the 1960s.[23]

While writings in this second group are very diverse, they are united by an explicit rejection of the positivist epistemological stance, thereby distinguishing these writings from those in the first group. For the purpose of this chapter, it is possible, by taking considerable liberty, to break the second group down further into two positions (2a and 2b).[24] It should be noted, however, that there is not a distinct line between the

[23]. McCloskey (1989, p. 225) quotes Passmore (1967, p. 56) "'[l]ogical positivism, then, is dead, or as dead as a philosophical movement ever becomes.'"

[24]. The distinction made here between the two positions is broadly similar to distinctions found in the literature, see, for example, Seiz (1993) and Maki (1993).

two positions. Basically, both positions in the second group view knowledge as a social process[25], but where the two positions differ is on the role assigned to theory appraisal.

The first position (2a) - the realist position - recognizes some role for empiricism and is willing to entertain the notion of the greater validity of some theories or arguments. This position, as stated here, is very broad and incorporates both sociological Kuhnian views of science and Marxist views which pay attention to ideology. The position involves the notion that while objective facts and knowledge are unattainable, empirical evidence still plays a role in helping us to reject certain hypotheses and understand the world around us. Consequently, there is a need for theory appraisal. Here, the Popperian falsification methodology, as the only set of rules for how to conduct scientific inquiry is rejected. Caldwell (1982), with his methodological pluralism, could be classified as subscribing to this position since he appears to argue that different methodologies must be assessed in their own terms and each may be valid for different problems. Folbre (1993) could also be regarded as holding this position, as she holds out hope for fostering a "reasonable processes of arbitration between contending theories and between opposing visions of economic reform"; and she does so, even while

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[25]. Seiz (1993) notes that some economists recognize the influence of social context. Seiz refers to a quote by Patinkin who stated:

> What generates in me a great deal of scepticism about the state of our discipline is the high positive correlation between the policy views of a researcher (or, what is worse, of his thesis director), and his empirical findings. I will begin to believe in economics as a science when out of Yale there comes an empirical Ph.D. thesis demonstrating the supremacy of monetary policy in some historical episode - and out of Chicago, one demonstrating the supremacy of fiscal policy. [quoted in Hutchinson (1977), p. 61, as in Seiz (1993), p. 190]

recognizing that "our tools for understanding social reality are distorted by social reality" [Folbre (1993), p. 177 and 179].[26]

The second position (2b) - non-realist or relativist position - corresponds to the Post-structuralist/Post-modernist stance. Like the realist position above, the relativist position rejects positivist epistemology. It goes much further, however, by dismissing any form of empiricism and appraisal. Deconstruction and post-structuralism examine pieces of research - texts - to highlight critical concepts, the hierarchies among concepts, and assumptions on which they are based, in order to demonstrate the set of values underlying the work. The deconstruction of arguments is deemed to be the valid limit of evaluation or assessment of research [Rossetti (1992)]. The key argument is that writers are influenced by their respective contexts, as in realist position 2a above, but furthermore, it is impossible for anyone to step outside of these structures in order to evaluate theories and arguments. As Rosetti (1992, pp. 216-217) stated, the content of structures:

> ...defines us, is us; we cannot leave it behind to judge objectively or comprehend Truth. ... There may be Truth or God existing outside of and prior to the system of language and thought, absolute, complete in itself, free of the need for context. However, if this Truth does exist, it is not accessible by any of us via rational inquiry. We are barred from approaching or attaining this objective, unbiased, encompassing Truth precisely because we are unable to be objective.

Thus, from the relativist position 2b, it is not only that knowledge is non-objective and unattainable (as in position 2a), due to researchers being caught within their own social

[26]. Seiz (1995) also advocates the realist position which she refers to as the "middle ground" between the positivist and post-modernist epistemological positions.

contexts but that researchers cannot escape their contexts. Therefore, there cannot be any standards for appraisal and for distinguishing between alternative views. To the extent that a theory or economic statement is evaluated, it is assessed only in terms of the degree to which it corresponds to a particular system of beliefs, and not in terms of correspondence to reality (hence the term, non-realist or relativist).

While post-structuralism is well-established in other disciplines outside of literary criticism from which it originates, it is relatively new in economics. McCloskey is probably the best-known proponent of the relativist position, although he takes a weak form of post-structuralism, as noted below.[27] McCloskey (1985, 1989) rejects positivism and focuses upon discourse rather than epistemology; he is interested in how economists persuade and explain, how economists try to convince each other that their ideas are valid. McCloskey avoids the critical issue of whether or not Truth exists and does not take an epistemological stance, but rather focuses more narrowly upon techniques of persuasion. A stronger form of post-structuralism, of which Mirowski (1989) would be an example, would take the arguments further to examine why certain techniques are more persuasive than others. Strassman perhaps could be classified as taking a post-structuralist position[28]. Strassman (1993), according to Seiz "characterizes economics as 'an interpretive activity' rather than 'a seeking after Truth', and calls upon all inquirers to acknowledge that their accounts of reality are not merely uncertain, but

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[27]. For other post-structuralist writings, see Klamer (1988) and Resnick and Wolff (1988).

[28]. Seiz (1993) makes this point.

necessarily inadequate, because they are 'situated', partial and incomplete" [Seiz (1993), p. 198].

2.2.4 Implications of the Criticisms for the Practice of Estimating Earnings Inequality

Economics and economic methodology continue mainly to be two non-interacting areas of economics, respectively doing and reflecting upon economics. This thesis, like most theses, practices economics, apart from this brief foray into economic methodology. However, this exploration sets a framework for the subsequent conclusions drawn about trends in, and explanations of, changes in the degree of earnings inequality.

As described above, there are a variety of epistemological positions taken by economists, and the one taken here is broadly consistent with the realist position (2a) outlined above. While the criticisms levied at logical positivism, the official doctrine of neoclassical economics, have implications for all steps of the conventional research process[29], we focus here upon their implications, given the purpose of this chapter, on the more narrow issue of researchers' approaches to data and the generation of facts. In logical positivism, the conception of objective, independent, and exogeneously given facts is flawed. In contrast, research outcomes are viewed as a product of one's social context and the state of the discipline. However, recognition of the value-ladenness of research and inherent subjectivity of research outcomes does not lead me to embrace the

[29]. These steps including the formulation of theoretical framework and hypotheses, testing of hypotheses, and broadly, the reception by the academic community of the research results.

relativism of the post-structuralist position (position 2b). In the post-structuralist position all data are subjective and socially constructed and cannot be used to arbitrate methodological disputes and "world-views".

The realist position (2a) is that data are important (unlike in 2b) but require justification and explanation given that data are not independently given (as advanced by writers in group 1) but are socially constructed. Recognizing that a piece of research is only a partial reflection of reality means, in contrast to post-structuralism, that some measurement choices may be preferred representations of reality in the context of a given research question. It is acknowledged that arguments about what is a reasonable and preferred measurement choice are subject to personal biases, the influence of the internal dynamics of the discipline, as well as external influences.

Establishing criteria for assessing "reasonableness" is beyond the scope of this chapter. Even without such criteria, however, given the arguments about non-objectivity of facts, at minimum, researchers should be responsible for explaining their measurement choices and outline how measurement choices may influence the facts generated.

In the remainder of this section, we consider researchers' approaches to data and assess whether common choices potentially matter, or influence, our understanding of trends about a particular economic phenomenon, that of income inequality.

2.3 CONCEPTUAL ISSUES RELATING TO THE MEASUREMENT OF EARNINGS INEQUALITY: QUESTIONING THE OBJECTIVITY OF "FACTS"

2.3.1 Introduction

In the methodological literature it is widely accepted that facts are not objective and independent entitities, whereas in the area of applied economics, even if it is recognized that facts depend upon choices made by researchers (and this often appears not to be the case), the impact of these choices on facts tends to remain invisible. Thus, the recent literature on earnings inequality is reviewed in order, firstly, to highlight why researchers make certain choices and, secondly, to identify the potential impact of choices made by researchers and data-gathering agencies on facts about earnings inequality. The choices that are examined include: the unit of analysis and income concept; the treatment of outliers; the population selected; the data set; and the inequality indicators and statistical significance. The empirical and statistical significance of these measurement issues are then explored in detail using Canadian data in the remainder of this chapter.

2.3.2 Unit of Analysis, Income Concept, and Time Period

(a) Introduction: Three Categories of Studies

Two of the more obvious choices which a researcher studying income inequality must make concern the unit of analysis and the income concept, thereby answering the familiar questions of the distribution of "what" and "among whom". More recently, studies of income inequality have added another dimension to the analyses, that of time; for example, studies have examined patterns of income inequality over individuals' life cycles, rather than inequality at a point, or a series of points, in time.

Studies which examine income inequality at a series of points in time can be categorized into three types of studies representing combinations of different units of analysis and income concepts. While there are basically three units of analysis (the family, the individual and the job) and two common income concepts (total income and employment earnings), researchers' choices basically give rise to three categories of studies which are: families and total income; jobs and associated earnings; and individuals and employment earnings. It is in this last category that the time element noted above has been introduced.

Notice that the term economic family takes a precise definition required for statistical purposes and consistency over time and builds in certain assumptions and values about the nature of living arrangements and shared resources. In the Survey of Consumer Finances (SCF), for example, the census definition of the economic family is used which basically refers to parents and never married children. Once a child marries even if s/he continues to live in the same dwelling with the parents s/he is excluded from the orginal economic family. This practice perhaps reflects the assumption, that once the children marry, there is insufficient sharing of resources between the generations to warrant inclusion in the original economic family. Further, in the case of married couples, in the SCF, the head is always coded as the male, although this is not the case in the Labour Force Survey. When the practice was initiated, the dominate value system accorded the status of household head to men. Even though it may be now recognized that this is no longer appropriate, the practice is continued in order to maintain consistency.

The choices made by researchers about the income concept and unit of analysis, which give rise to these three categories of studies, reflect explicit or implicit decisions about, firstly, the concept of well-being to be examined and, secondly, the specific types of questions to be pursued. The decisions about the underlying concepts and questions are briefly highlighted below for each of the three categories of study before elaborating upon the category of individual employment earnings which is the one emphasized in this thesis.

(b) Differences among Categories in Questions Pursued and Underlying Concepts

Key concepts and questions fundamental to each of the three categories of studies on income inequality are highlighted. The category of studies of **family total income** are frequently motivated by researchers' interests in changes in the distribution of economic well-being among families. Family economic well-being is typically proxied by the sum of the monetary contributions from each family member from various sources such as: factor incomes (for example, wages and salaries, self-employment earnings, and property income); pensions; public transfers; and other cash income (for example, dividends, interest, and profits). Some studies focus upon total income net of taxes such as personal income taxes, employee social security contributions, municipal taxes, and indirect taxes.

To better reflect family economic well-being, recently some researchers have moved beyond proxying family well-being by the sum of income from various sources to include non-cash benefits. The non-cash benefits include benefits from the government (such as health, education, subsidized housing, transportation, child care, and cultural facilities) plus any other non-cash benefits such as the imputed value of owner-occupied housing, plus unpaid labour providing goods and services and leisure time.

An even broader definition of family economic well-being would add wealth, a stock concept, to income, a flow concept. Wealth reflects an individual's potential command over society's resources. The inequality in family economic well-being is greater when wealth is included since wealth tends to be concentrated in the top five per cent of households [see for example, Erksoy (1994)].[30]

Conceptually economic well-being is a very broad concept that has typically been proxied by income since income is assumed to reflect the ability to buy goods and services which contribute to welfare. Income goes beyond capturing the economic benefits relating strictly to paid work effort. Another approach is to use data on consumption expenditure as a measure of well-being [see for example, Johnson et al. (1994)].

There are a set of problems associated with making inferences about the distribution of family well-being or welfare from the distribution of family income and these problems are only briefly noted.[31] The first problem is that most studies of the distribution of family economic well-being choose to proxy well-being by monetary

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[30]. Wolff (1994) shows for the U.S. that wealth inequality has risen during the 1980s, and that for the U.S., about one-half of the increase in inequality of wealth arises from the increase in income inequality.

[31]. These issues are in addition to the fundamental point raised in the theoretical literature on income inequality pertaining to the impossibility of making judgements of inter-personal welfare or utility from income.

income rather than the broader proxies for well-being which include non-cash benefits and services because of conceptual problems associated with the broader definitions and the lack of data. The distribution of monetary income may give a biased picture of the distribution of well-being because many of the non-monetary factors contributing towards well-being are correlated with the level of earnings. For example, the inclusion of government non-cash benefits and unpaid time available for the home production of goods and services, which is sometimes referred to as extended income, may lower the estimates of income inequality.[32] The reason behind this result is that the estimated value of family production is constant across families of different money incomes given that the amount of time spent on household production is similar and each of hour spent in household production is valued equally. Thus, household production comprises a larger share of total income of poorer households and, consequently, relative shares of extended income of poorer households are raised. The addition of the imputed value of education and health care to family disposable income has been shown by Smeeding et al. (1993) to reduce family income inequality. For example, for Canada, the inclusion of education and health care services is estimated to raise the percentages of total income accruing to the lowest quintile of households by 0.8 per cent and to the second lowest quintile by 0.4 per cent.[33] Thus, the inclusion of non-cash government benefits is of

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[32]. A study by Jenkins and O'Leary (1994) provides estimates of the distribution of extended income. They indicate for non-elderly, one-family households in the U.K. that the distribution of extended income is substantially more equal than the distribution of money income (inequality indices are about one-half).

[33]. Smeeding et al. (1993), Table 6, p. 248.

particular interest in making cross-national comparisons of family total income inequality where countries differ in the degree of social policy intervention.

While the focus upon income to the exclusion of non-cash benefits is likely to overestimate the degree of inequality among families, the failure to include wealth in the proxy for family well-being will result in an underestimation of the degree of inequality. Wealth is particularly concentrated in the upper decile or even centile.[34]

A third problem in making inferences about economic welfare from total family income arises because of different family sizes and needs. One can start by making adjustments with equivalence scales using data from conventional data sets, such as size and composition of the family. Radner (1994) discusses conceptual issues relating to the use of equivalence scales and measurement of income inequality when non-cash income arising from public provided goods are included in income. His argument is that there must be consistency between the income concept and equivalence scale used, to reduce the bias in estimates of income inequality. If the income definition includes non-cash income then the equivalence scale must reflect the relative needs for that non-cash income of different sub-groups of the population.

A final, and fundamental, problem arises because per capita income within the family is not a good proxy for the actual distribution of goods and services within the family. There is now an extensive literature that indicates that family resources are unequally allocated in a manner which systematically discriminates against women and girls. Thus, the choice of family total income rather than individual total income misses

[34]. See Osberg (1981), Erksoy (1994).

this important gendered dimension of inequality. To take a simple example, women have substantially less leisure time than men. Despite women's increased labour force participation in the past twenty years, women still perform the majority of household labour. Households comprised of a male-female couple with children (18 years of age or younger), and with both adults working outside home, represented 30 per cent of all households in 1970 and 71 per cent in 1990. Yet, in these households where both the woman and man worked full-time, only 10 per cent of households reported that housework was shared equally [Marshall (1993)].

The unequal burden of work is only one example of the more general phenomenon of unequal sharing of resources within the family which on a world scale results in the extreme form of discrimination against female household members, such as female infanticide [Kynch and Sen (1983)]. The problem of unequal sharing of all types of resources within the family is now extensively documented and one paragraph cannot begin to outline the literature.[35] Whether one views the unequal sharing of resources within the household as a problem depends upon one's theoretical perspective as a comparison of the Becker joint utility models, neoclassical bargaining models and more radical models indicates.[36]

Studies of family total income inequality typically seek to answer two types of questions, which also relate to the income and unit of analysis dimensions defining the

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[35]. See Agarwal (1986) for an introduction to the empirical literature.

[36]. See for example, Becker (1981), Folbre (1986), McElroy and Horney (1981), Manser and Brown (1980) Rosenzweig (1986), and Rosenzweig and Schultz (1982).

category. The studies have focused upon answering the questions to what extent are changes in the distribution of family total income due to: firstly, changes in the various components of family total income (the different sources of income); and secondly, due to changes in various family members' contributions to family total income.

In this first group are, for example, studies which focus upon questions such as whether government transfers have offset increases in earnings inequality. Several studies indicate that government tax and transfer policies have played a substantial role in influencing the changes in inequality in total family income and they demonstrate how these roles have differed among industrialized countries.[37] While the focus has been on the impact of government cash transfers on the distribution of family total income, governments can also affect the distribution of well-being through the provision of non-cash benefits, such as education, health care, child care, and transportation, as discussed above.

In the second group, the question addressed is how the economic contribution of various population groups has affected inequality, such as the rise in female labour force participation. Studies have also focused upon the impact of changes in the nature of labour force participation and work status, such as the rise in self-employment and part-time work.[38]

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[37]. Despite similar increases in inequality of male employment earnings, the U.S. had increases in inequality of total household income whereas Canada did not due to the increase in public transfers [see Jantii (1993), Gottschalk (1993), Hanratty and Blank (1992), and Fritzell (1992)].

[38]. For various examples see Harding (1994), Goodman et al. (1994), Machin and Waldfogel (1994).

Moving now from the category of studies focusing upon family total income, studies in the second and third categories choose the job or the individual as the unit of analysis, and most frequently choose employment earnings as the income concept. Studies in the second and third categories are concerned with only one component of total income, that which stems from the labour market. Despite the use of the same income concept, studies in these two categories ask different research questions and use quite different measurement approaches.

Studies that select **jobs as the unit of analysis** are typically interested in the question of whether the structure of job quality has changed. A specific research question of the 1980s has been whether the structure of jobs has become more polarized.[39] Rather than examining the distribution of earnings, these studies examine the distribution of jobs. Various classes of jobs are defined in terms of earnings categories (where categories are defined in an absolute or a relative manner), and the proportion of individuals or full-time equivalent jobs in each of the earnings categories are determined. The choice of the middle earnings range is somewhat arbitrary and the results depend upon this choice.[40]

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[39]. See Wolfson (1994) who demonstrates how measures of inequality and polarization may move in opposite directions.

[40]. In general, there is evidence of increased polarization of jobs into "good" jobs and "bad" jobs. For the U.S., Bluestone and Harrison (1988) employ a relative approach and find evidence of an increase in polarization of jobs among full-time/full-year workers between 1963 and 1986. For Canada, an ECC (1991) study devised three relative earnings categories (0 to 75 per cent, 75 to 150 per cent, and greater than 150 per cent of the median earnings) and documented a drop in the percentage of the labour force in the middle earnings group between 1981 and 1986. Updating this work, Morissette et al. (1993) find a drop of about 10 per cent in middle level jobs for a variety of

The third category of studies focus upon **individual employment earnings** and these studies tend to be interested in research questions relating to changes in economic well-being derived from work. Similar to studies which use jobs as the unit of analysis, studies of individual employment earnings may be motivated by a concern for changes in the quality of jobs. Studies of individual employment earnings are concerned with the returns to work accruing specifically to individuals, rather than as in the previous category, with compensation associated with jobs.

All studies of the distribution of the returns to work among individuals focus upon the returns to work for which there is direct payment in cash or in-kind. Such studies are completely separate from those analyzing the distribution of total work effort of which only part is compensated. The focus upon work which is related to the production of goods and services for the market is a conceptual bias within economics, despite the more comprehensive definition of economics[41] which does not preclude the analysis of unpaid work and despite the magnitude of the amount of unpaid work performed.[42]

Studies in this third category raise several arguments for focusing upon market-driven earnings. Since employment earnings constitute the major source of total income

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definitions of the middle. Based upon the absolute approach of 10 wage categories, Morissette et al. (1993) also show that the movement away from the middle has been to the tails of the distribution of jobs during the 1980s. See also Beach and Slotsve (1994).

[41]. Standard definitions of economics include references to the study of the allocation of scarce resources to meet human needs.

[42]. A recent Statistics Canada study places an estimate of the value of unpaid housework at between 30 and 46 per cent of Canada's gross domestic product. [Chandler (1993), National Income and Expenditure Accounts, reported in the Globe and Mail, April 7, 1994]

for most individuals, employment earnings deserve to be studied in detail. It is further argued that it has been changes in the distribution of individual employment earnings that has been particularly dramatic during the 1980s.[43]

Many studies in this last category have focused upon the correlates of changes in earnings inequality such as age and education. Davis (1992) finds that during the 1980s for a group of advanced industrialized countries including Canada: male earnings inequality increased in nearly all countries studied; the experience (age) premium increased in all countries studied; the skill (education) premium increased or remained stable; and there was a rise in earnings inequality among observationally equivalent workers.[44] While there have been increases in earnings inequality in many industrialized countries, the extent to which inequality has risen and the structure of inequality differs among countries which indicates that increased inequality is neither inevitable nor outside the scope of government policies.

Income inequality is important for many different reasons and arises in the context of different research questions as the above categorization of studies illustrate. An estimate of income inequality does not exist as an independent entity but is generated in the context of an explict or implicit choice about the research question and these questions are themselves products of societal and discipline values and individuals' world

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[43]. As noted previously, in Canada, the distribution of household income has remained relatively stable over the past two decades due to automatic stabilizing tax/transfer programs and because of the tremendous changes in the labour force participation of women. See Wolfson (1986) for Canada up until 1983.

[44]. For a review of the American literature, see Levy and Murnane (1992).

views. In the context of a particular research question, there are a variety of more technical conceptual choices which researchers actively or passively make and it is to these choices that we now turn. While there are a variety of conceptual issues associated with measuring earnings or income in each of the three categories of studies, the remainder of this section focuses upon the conceptual issues and related measurement choices related to the third category (studies of changes in the distribution of individual employment earnings), given the goal of this chapter.[45]

(c) Conceptual Issues Specific to the Measurement or Definition of Employment Earnings

Researchers make active choices about how to measure earnings as well as passively make choices due to constraints in using data which have been constructed by statistical agencies. The potential impact on earnings inequality of three specific issues relating to the definition of earnings are discussed, namely: the focus on gross wages and salaries without inclusion of the value of other forms of compensation and supplementary income; whether to include self-employment earnings along with wages and salaries; and the choice of the time period. The emphasis is on how choices potentially influence inequality estimates and the discussion is not intended to be an exhaustive survey of every possible measurement choice.

Studies in this category of the distribution of individual employment earnings are typically interested in the distribution of the returns to work. Conceptually, therefore,

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[45]. For further details on conceptual issues related to measurement of family or household income, see Karoly (1993).

the returns to work is best captured by **all monetary and non-monetary compensation** paid by employers to workers plus earnings from self-employment. Such a comprehensive measure of employment earnings would include, in addition to gross wages and salaries and self-employment earnings, other monetary factors such as tips and commissions, fringe benefits, stock options, and bonus plans, as well as payments in-kind such as free or subsidized rent and the use of an automobile.[46] While such an inclusive definition of employment earnings is desirable, most frequently, researchers passively choose to define employment earnings as gross wages and salaries because these are data that are most readily available.

It is interesting that data on the value of fringe benefits is not widely collected by statistical agencies, although there may be exceptions. The argument that it is not collected simply because it would be too difficult is unconvincing given the variety of complex phenomena on which data are collected through the use of special surveys.[47]

Although the focus is on monetary compensation for work is by default, it is still useful to recognize the degree to which the inequality in full compensation from work might differ from that of gross income. Each non-wage and non-salary forms of

[46]. Fringe benefits or supplementary labour income refer to the value of employers' contributions to employee benefit plans, such as private pension and insurance plans and public plans including unemployment insurance, workers' compensation and the Canada/Quebec Pension Plans. Gross earnings include deferred earnings although deferred earnings are not included on tax returns. Payments in-kind are reported on tax returns but are not typically captured by definitions of employment earnings on surveys.

[47]. See, for example the surveys described in Statistics Canada, Labour Market and Income Data Guide (1992).

compensation is likely to affect earnings in the tails of the distribution. Consequently, the focus upon wages and salaries to the exclusion of these factors results in biased estimates of earnings inequality as shown in the following examples. Assuming that tips and commissions are relatively more important to workers with low incomes, the exclusion of tips and commissions from the definition of earnings results in higher estimates of earnings inequality (and lower estimates of mean earnings). Tips and commissions, are however, included in the earnings data and definition of earnings used in this study.[48]

Similarly, non-monetary compensation, such as free or subsidized rent, is likely to affect workers in the lower tail of the distribution. Thus, the exclusion of such factors, as for tips and commissions, will likely result in higher estimates of earnings inequality than would otherwise be the case. Note, however, that Coder (1993) reports that for a sub-set of the population in the U.S., the number of households reporting payments in-kind is quite small, particularly relative to the number of individuals with deferred earnings plans.

Deferred earnings, stock options and bonus plans are more likely to affect workers in the top tail of the distribution and the exclusion of the value of these forms of compensation will reduce estimates of earnings inequality (and mean earnings). The

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[48]. The LMAS provides data on the value of tips and commissions and so it is potentially possible to generate earnings distributions with and without tips and commissions. In this study, we cannot actually do this for 1989 since we have only a subset of variables from the LMAS 1989 public use data file which precludes performing this calculation or even an estimate of the percentage of individuals with tips and commissions.

data sets used in this thesis, as is generally the case, do not provide information on stock options and bonus plans and, thus, from this data source there is a tencdency for estimates of earnings inequality to be underestimated.

While tips and commissions, stock options and bonus plans, and non-monetary compensation might be important components of an individual's earnings, it is fringe benefits or supplementary income that likely represent the single largest exclusion from definitions of employment earnings. The failure to capture the value of fringe benefits probably results in the inequality in the distribution of the total value of employee compensation being underestimated, along with the underestimation of the mean value, as in the above case of the exclusion of deferred payments, stock payment plans, and bonuses. The greater inequality of total compensation for work (wage income plus fringe benefits), compared to the inequality in gross earnings arises because the value of fringe benefits and levels of wages and salaries are directly correlated. Industries showing the highest hourly wages and salaries also have the highest levels of employer-provided fringe benefits. For example, employer-provided benefit levels are higher in the relatively high-wage industries, such as public administration, and transportation and communication, compared to industries such as retail trade and construction [see Leckie and Caron (1991) and ECC (1991), Table 8-1, p. 139].

A second piece of evidence that indicates that the exclusion of fringe benefits results in the underestimation of inequality in employment earnings is that pension plan coverage and wages are correlated. Employer-assisted pension plans are a particularly important component of the supplementary labour income as employer contributions to pensions account for about one-half of total employer contributions to private benefit plans (which include not only pensions, but dental and health insurance benefits, among others) [Leckie and Carron (1991)]. For example, in 1989, the percentage of the labour force with annual earnings less that $19,999 with private sector pension plans was about 22 per cent; in contrast, the percentage of the labour force with annual earnings between $40,000 and $59,999 (and with a private sector pensions) was about 73 per cent [Frenken and Maser (1992), Table 1].[49]

While estimates of employment earnings inequality at a point in time are probably under-estimated due to the exclusion of fringe benefits, it is unclear how this affects trends in earnings inequality. Supplementary income or fringe benefits accounted for 7.8 per cent of the total wage bill in 1981 compared to 10.6 per cent in 1989[50]. We cannot simply conclude, however, that this means that the degree of underestimation of employment earnings inequality has increased. Between 1980 and 1989, the share of private benefit plans in total supplementary labour income declined and the share of public benefit plans increased, which included an increased share of unemployment insurance, workers' compensation and Canada/Quebec pension plans. This was opposite to the trends between 1967 and 1980 [Leckie and Caron (1991), Table 1]. The value of

[49]. Neither the SCF nor SWH/LMAS provide data on the value of fringe benefits. The LMAS 1989 indicates whether the individual is covered by a pension plan in each job, but the SWH 1981 does not. Consequently, we cannot determine whether pension plan coverage occurs at higher wage levels, and thereby support this ECC (1991) point.

[50]. Calculated from Statistics Canada. Estimates of Labour Income. Catalogue 72-005 Quarterly. By 1993, supplementary income was over 13 per cent of the total value of wages and salaries.

private benefit plans worked out on the basis of each hour worked (to control for increases in the size of labour force) show that private contributions remained stable during the 1980s [Leckie and Caron (1991), Table 2]. During the same time, the proportion of workers covered by employer-assisted pension plans, the most important component of private benefit plans, declined from 48 to 45 per cent [Frenken and Maser (1991)]. Thus, focusing upon private benefit plans alone, the degree of underestimation in earnings inequality would have increased during the 1980s only if it was the case that the decrease in pension coverage occurred at lower annual earnings levels.

While we cannot conclude that the degree of underestimation in inequality of work compensation has increased during the 1980s from the evidence that supplementary labour income has increased, the rise in part-time work does support this contention. For example, Morissette et al. (1993) show that, between 1981 and 1989, the percentage of all earners working less than 35 hours per week rose by 1.5 per cent for men and 3.4 per cent for women.[51] Since part-time workers tend not to be covered by benefit packages, this suggests that the positive correlation between the level of earnings and fringe benefits has actually increased. Thus, estimates of earnings inequality including fringe benefits would probably be higher in 1989 compared to 1981.

Overall, it is likely that estimates of the degree of earnings inequality are underestimated given the relative importance of these excluded non-wage compensatory factors. This conclusion is reasonable since the amount of overestimation of earnings inequality due to the exclusion of value of payments-in-kind and tips and commissions

[51]. Morissette et al. (1993), Table 12, p. 36.

at the bottom tail of the distribution is likely to be smaller than the underestimation of earnings inequality due to the exclusion of fringe benefits and deferred payments from earnings at the top end.

Finally, most studies focus upon gross wages and salaries rather than wages and salaries net of taxes. Given a progressive income tax system, the inequality in the distribution of gross wages and salaries will be greater than that of wages and salaries net of taxes.[52] If the data provide gross and net employment earnings, then the latter provides a better measure of economic welfare derived from work. However, if the interest is in establishing the market-oriented causes of changes in the return to work, then the focus on gross wages and salaries is appropriate. The choice of gross or net earnings brings us back to the research question which is selected.

The issue of defining employment income in terms of both **wages and salaries and self-employment earnings** has grown in importance during the 1980s because the size of the self-employed workforce has increased.[53] Causes of the rise in self-employed workers may indeed be the same ones evoking the rise in earnings inequality. Thus, one can argue that to analyze the effects of changes in the labour market and, more generally, changes in the distribution of the returns to work, it is necessary to define employment income as including self-employment earnings.

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[52]. The SWH/LMAS provides data on gross wages and salaries. While the SCF provides data on total income tax paid, this pertains not only to employment earnings but to all forms of income.

[53]. Self-employed workers in Canada as a percentage of total number of employed individuals increased from roughly 13 per cent in 1979 to 16 per cent in 1989 [Zhengxi Lin (1993), pg. 2 and footnote 9].

Most studies, however, define employment earnings in terms of wages and salaries only, excluding self-employed workers who do not have any waged work[54]. See, for example the studies reviewed by Levy and Murnane (1992). If the measurement choice is made explicit, it is more likely to be justified in terms of technical arguments, as opposed to being justified in terms of the research question and theoretical perspective. Researchers do not state that, given the emphasis in neoclassical economics on wage labour and, specifically, the monetary relationship between individual firms and individual workers, the inclusion of self-employment earnings is inappropriate. It is more likely that the decision to exclude self-employment earnings might be justified for the following reasons. First, wage and salary workers comprise a larger share of the labour force. Second, data on self-employment earnings are less readily available[55]. Third, data on self-employment earnings may be more unreliable than data on wages and salaries because the non-response rate is higher: the group is more heterogeneous, making weighting for non-response more inaccurate; and the information is more difficult for respondents to provide [see Eardley and Corden (1994) on this point]. Fourth, inequality cannot estimated with summary indicators involving a logarithmic calculation when a percentage of self-employed workers have negative self-employment earnings. Finally, factors causing the rise in wage and salary inequality may differ from the factors causing a rise in inequality in self-employment earnings.

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[54]. Zhengxi Lin (1993, p. 6) estimates that 11 per cent of self-employed workers also had paid jobs.

[55]. The SWH 1981 and LMAS 1989 do not provide data on self-employment earnings although the SCF does.

Defining employment earnings as wages and salaries plus self-employment earnings is expected, firstly, to generate larger estimates of inequality at a point in time because the self-employed workforce exhibits considerable heterogeneity and, secondly, to generate larger increases in inequality because the percentage of all workers who are self-employed has been growing during the 1980s.[56]

Several restrictions may be placed upon the definition of earnings. Firstly, some studies focus upon workers who have exclusively wage employment: that is, they exclude any workers who combine wage and self-employment.[57] The effect of such restrictions is potentially to lower estimates of earnings inequality.

Secondly, most researchers include only individuals with strictly positive earnings, thus generating measures of inequality much lower than those if individuals with zero

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[56]. Empirical work in the U.S. supports this contention. For example, both Blackburn and Bloom (1987) and Karoly (1988) measure earnings inequality for all workers aged 16 years and over with positive earnings using Gini Coefficients; the only difference between the two sets of results appears to be that Blackburn and Bloom (1987) include self-employment earnings and Karoly (1988) does not. The Blackburn and Bloom (1987) Gini Coefficients are greater in each year than those reported by Karoly (1988), indicating the greater inequality of self-employment earnings. Of all the studies reviewed by Levy and Murnane (1992), trends in earnings inequality including self-employment earnings during the 1980s are only reported by Blackburn and Bloom (1987) using Gini Coefficients for the population. However, for the population as a whole, there is no strong evidence of increased inequality (in terms of changes in the Gini Coefficient) for wages and salaries and self-employment earnings combined [Blackburn and Bloom (1987)], or for wages and salaries alone [(Karoly (1988)]. It has been noted that trends in the inequality of wages and salaries become more pronounced when disaggregated by sex, and likewise the same point is expected to apply to total earnings including self-employment earnings. Jenkins (1994) for the U.K. also shows that the rise in self-employment during the 1980s contributed to the overall increase in inequality.

[57]. See for example, Doiron and Barrett (1992) and Morissette et al. (1993).

earnings or negative self-employment earnings are included. The group of individuals with zero labour earnings however, is comprised of a variety of different types of individuals. These include people who have never entered the labour force, have retired, who are not participating that year because of a perceived or actual lack of jobs, or who are unemployed for the full-year. It may be the case that, during a recession, it is low wage workers who are disproportionately represented in each of the above categories. To assess this issue would require information on labour force participation rates for different age and sex groups, their wages, and whether these rates have changed over time, along with general economic conditions. In general, then, any changes over time in the distribution of employment earnings due to changes in labour force participation are not captured. Specifically, if the above assumption is correct then the failure to account for changes in labour force participation results in an underestimation of earning inequality. Clearly, excluding negative self-employment earnings will reduce estimates of earnings inequality.

The third and final issue to be discussed relating to the definition of employment earnings concerns the time period over which earnings are defined: that is, whether to focus upon annual earnings, weekly wages, or hourly wage rates. The rationale for focusing upon annual earnings is that it provides a proxy for the total economic benefits gained from work (during the year). Many studies, however, focus upon hourly wage rates. The typical justification is that the focus on hourly wage rates is better because it takes account of differences among individuals in total annual hours worked. Such an argument, of course, assumes that people can choose their number of hours of work, a fundamental assumption of the neoclassical perspective.

In terms of the impact of this choice, the inequality of hourly wage rates at a point in time is expected to be less than the inequality of annual earnings, given the vast variation in the time worked in the latter category, particularly for women. Over time, the relative changes in inequality of hourly wage rates and annual earnings cannot be predicted.

The degree of earnings inequality in society is likely to change over the business cycle and, thus, the trend will depend upon the end points selected. As discussed in chapter 3, earnings inequality is expected to rise during a recession and diminish with economic growth. Thus, it is important to compare inequality at similar points in the business cycle.

Most of the literature to date has examined the changing distribution of earnings by estimating earnings inequality at a series of different points in time. Some recent studies, however, have examined changes in the distribution of life-time income in a society where individuals are upwardly and/or downwardly mobile between income levels.[58]

(d) Summary of Conceptual Issues Related to the Definition of Employment Earnings

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[58]. See, for example, Osberg et al. (1994) and Gittleman and Joyce (1994).

The focus of this chapter upon the distribution of individual employment earnings is justified given an underlying interest in the changes in the economic returns to work effort and a desire to understand how labour market changes influence changes in the distribution of these returns. Apart from the theoretical justification, much of the evidence indicates that the rise in inequality of individual employment earnings is the main contributor to changes in inequality of family total income.[59] As such, this thesis differs from studies of the distribution of total family income which are motivated by a concern for a broader notion of welfare.

Having justified the focus on individual employment earnings, Figure 1 summarizes the conceptual issues relating to the definition of employment earnings and the potential impacts of these issues on inequality estimates.

First, estimates of inequality in the return to work typically focus upon monetary return or employment earnings and exclude a variety of non-monetary forms of compensation for work performed. The overall impact of excluding non-monetary forms of compensation tends to result in the underestimation of earnings inequality. While these non-wage compensation factors, particularly fringe benefits, are a substantial, the data used in this thesis, as in most studies, does not include the necessary information to develop more comprehensive measures of work compensation nor to assess the degree of underestimation of inequality. The focus on monetary compensation rather than full

[59]. See Fritzell (1992) for U.S., U.K, Sweden, Germany, and Canada, and see Jenkins (1992) for the U.K.

compensation is a passive choice determined by the data but it impacts our understanding of inequality in labour market returns.

A second issue considered in defining employment earnings is whether to include self-employment earnings. It is expected that the exclusion of self-employment earnings results in the underestimation of inequality at a point in time, and likely the underestimation of trends. Often, researchers choose not to include self-employed workers for technical reasons or passively because the data are unavailable. Analysis of the impact of the inclusion of self-employment earnings on estimates of earnings inequality is undertaken here, since self-employed workers represent a large and growing proportion of employed workers and because the cause of this growth is likely related to factors underlying the growth of earnings inequality among wage and salary workers. The empirical impact of excluding self-employment earnings from estimates of earnings inequality will be examined in this study using the SCF data; and the impact of excluding negative self-employment earnings on estimates of wages/salaries plus self-employment earnings inequality is also assessed.

Third, there are several issues relating to the time period over which earnings are defined. A distinction is made between studies which focus upon changes in the distribution of earnings by examining individuals' earnings over a short period such as a year compared to other studies which define individuals' earnings over longer period, to assess the impact of mobility on inequality of life cycle earnings. This chapter takes the former "snap-shot" approach and defines earnings over a calendar year. Given constraints of individual workers "choosing" the optimal number of hours worked and the lack of perfect liquidity, neither the hourly wage rate nor life cycle measures of inequality can be justified in this context.

Chapter 2 focuses upon the trends between 1981 and 1989 which are comparable points in the business cycle, with the unemployment rate being 7.5 per cent in both years. The patterns of annual earnings and hourly wage rate inequality during the decade are examined in chapter 3 using data for 1986 in conjunction with 1981 and 1989.

Having discussed in general the potential impact of various definitions of employment earnings on estimates of earnings inequality and having justified the choice of individual employment earnings, we turn now to a discussion of more technical measurement issues.

2.3.3 Treatment of Outliers

Choices made by statistical agencies and researchers concerning the treatment of outlying observations of individual earnings generally result in a sample which is truncated at either or both ends of the distribution. The treatment of outliers by each of these two groups is discussed below along with an assessment of the potential implications of the various choices for estimates of earnings inequality.

Statistical agencies frequently choose to impose a high income cutoff which truncates the sample at the upper end. A high income cutoff refers to the procedure of reducing the earnings of individuals with very high reported earnings to some agreed-upon level. This procedure is adopted in order to protect the confidentiality of respondents who might be identified using the earnings value in combination with other data such as job and personal characteristics. Typically, the high income cutoff is defined in terms of annual earnings (as opposed to an hourly wage rate) and this earnings value is used to identify the individuals for whom annual earnings will be revised downwards. In data sets where earnings are also reported or calculated for other time periods (monthly, weekly, and/or hourly earnings data), it is necessary to make adjustments to these data. Given the revised estimate of annual earnings and the reported (or calculated) data on hours worked for each of these time periods, the monthly, weekly, and hourly earnings data are revised downwards to attain consistency with the cutoff defined in annual terms.

Estimates of earnings inequality based upon data where a top-income code has been implemented will underestimate the degree of inequality. The degree of underestimation of inequality varies directly with the level of the top-code; the lower the top-code, the greater percentage of total observations affected. Further, the degree of underestimation in earnings inequality will depend upon the inequality indicator used. Specifically, the degree of underestimation will be higher for those indicators which are sensitive to the upper tail of the distribution.

The problem of underestimating inequality at a point in time is compounded firstly, when considering trends in inequality and, secondly, when making cross-national comparisons (or comparisons between data sets within a country). With respect to the former problem, from year to year, a different percentage of observations will be affected by the top-code regardless of whether it is implemented in constant or nominal terms[60]; consequently, the degree to which the top-code results in an underestimation of inequality will vary from year to year. For example, in the U.S. Current Population Survey, the data set used frequently in studies of earnings inequality, the top-code is fixed in nominal terms for a few years and is moved upwards in a step-like fashion. Karoly (1993) reports that, for the U.S. Current Population Survey, the top-code in nominal terms was $50,000 from 1968 to 1981, $75,000 for 1982 to 1984, and $99,999 from 1985 to 1988. Using data on mean total money earnings, the ratios of income code to mean earnings were approximately 3 and 6 for men and women, respectively, in 1981; and 4 and 7.5 for men and women, respectively, in 1988.[61] The substantial increase in the top-income code in 1985 may serve to over-estimate the rise in earnings inequality in the U.S.[62]

Karoly states that top income coding is unlikely to have an impact on earnings inequality in 1989, since the top-code was increased substantially between 1988 and 1989; and top-coding did not appear to be implemented between 1964 and 1967. Although only 1 per cent of the observations is affected in any given year according to

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[60]. Karoly (1993) notes that some researchers, such as Blackburn and Bloom (1987), use a constant dollar top-code. This does not, however, circumvent the problem of variation in the percentage of observations affected from year to year.

[61]. Mean total money earnings for men and women were: $16,907 and $8,299 in 1981; and $24,578 and $13,407 in 1988. Thus, the ratio of top income code and mean earnings for men and women were: $50,000/$16,907=3 and $50,000/$8,299=6 in 1981; and $99,999/$24,578=4 and $99,999/$13,407=7.5 in 1988. Source for the data on mean total money earnings is American Statistical Index 1993, Annual, 254-6:80 and source for the data on top income codes is Karoly (1993).

[62]. Note that in constant 1983 dollars, that the top-income code in 1981 was about $55,000 and in 1988, was $92,000.

Karoly (1993, p. 80 and fn. 2), this 1 per cent (or less) of the top earners will account for a substantial share of total earnings.

Related to the second problem of how to interpret cross-national estimates of earnings inequality, the level at which the top-code is implemented varies among countries and thus, the degree of underestimation will vary among countries. For example, while top income coding was implemented in the U.S., in Canada, top income coding has not been implemented for two frequently used data sets.

The issue of top-coding and interpreting measures of inequality is particularly stark in the papers which compare earnings inequality across a number of countries using the LIS data. A number of studies make comparisons of inequality over time and across countries on the basis of summary indicators such as the Gini Coefficient or Coefficient of Variation without noting differences among data sets in the treatment of top-coding, even in the description of the data sets. For example, Fritzell (1992) studies changes in inequality of family disposable income, adjusted for family size, in five countries, in terms of various summary inequality indicators without mentioning top-coding. Likewise ignoring the top-coding issue, Jantii (1993) examines changes in disposable income in five countries by decomposing the Coefficient of Variation. Other comparative studies use percentile measures rather than summary indicators, for the explicitly stated reason that such measures are less susceptible to data comparability problems including top and bottom coding issues. Smeeding and Coder (1993), for example, make this argument for the use of various percentile measures in their examination of the contribution of government tax and transfer policies in moderating earnings inequality in six countries.

However, a degree of bias (even if small) exists even with the percentile measures, given that the share of total income accruing to the top 1 per cent of the population will be smaller if top-coding has occurred compared to the situation in which top-coding has not been applied.

The issue of how researchers treat outliers in their samples of individual employment earnings is related to the issue of top-coding since both issues concern truncation of the sampled distribution. Just as researchers vary in whether they recognize top-coding as a potential bias in inequality measures, researchers also vary in their treatment of outliers. To give some indication of the variation and arbitrariness in the treatment of outliers some examples from recent studies are cited. Fritzell (1992), in a study of family income inequality in five countries, recodes negative incomes to 0.1 and recodes income figures higher than 1500 percent of the median income to this same value, in order to prevent outliers from affecting measures. Jantii (1993), also in a study of family income inequality, drops the top 5 per cent of observations in one table but does not provide a rationale for so doing. The ECC (1991) excludes observations in the bottom tail of the distribution on the grounds that they want to exclude individuals with "trivial attachment" to the labour force. The criterion used for inclusion is that an individual must earn at least 5 per cent of the average industrial wage.[63] Morissette et al. (1993) adopt a similar convention of dropping individuals from the bottom tail of the

[63]. The ECC (1991, Chapter 8) study does provide a check on the sensitivity of the Gini Coefficient to differences in the treatment of the "outlying" bottom observations. While changes in the Gini Coefficients over time are of similar magnitudes regardless of the definition, the degree of inequality reflected by the Gini Coefficient in any given year does vary with the definition.

distribution by excluding individuals who earn less than 2.5 per cent of the sex-specific mean earnings.

A reason is sometimes given for excluding outlying observations but the reason is not based upon an assessment of whether the outliers are biased. If these outlying observations reflect the situation of people regardless of whether it is considered by the researcher to be a "trivial attachment" to the labour force or a particularly high level of earnings, it is unclear why such observations should be excluded. In contrast, Burtless (1990) explicitly drops a percentage of observations from the upper tail in order to address changes in the value of the top-income cut-off over time, which seems reasonable given the quite large "steps" in the top-income noted for the U.S. (for example, the top income code did not change between 1968 and 1981).

As summarized in Figure 1, the implementation of top-coding and exclusion of a certain percentage of outlying observations are expected to result in the underestimation of inequality at a given point in time, where the bias is directly related to the level of the top-code or percentage of observations excluded, and to the distribution of those affected observations. This measurement issue is of particular importance in interpreting estimates of inequality among countries. Trends in earnings inequality will also be affected by these measurement issues because the percentage of observations affected by the implementation of top-coding or minimum earnings levels varies from year to year. Even if the same percentage of observations are excluded from year-to-year, if differences exist in the distribution of these observations then bias will still be introduced. The empirical impact of dealing with outlying observations is examined in the empirical section with particular attention paid to top income codes, and the exclusion of a certain percentage of top and bottom observations.

Having discussed some of the choices made by statistical agencies and researchers which result in the truncation of the sample, we turn now to the issue of measurement error at the data collection stage and how such error may affect estimates of inequality.

2.3.4 Population Selection

Even if employment earnings are defined in a comparable manner across studies, there is considerable variation in the definition of the population for which earnings inequality is estimated. Comparing estimates of earnings inequality across studies may be potentially misleading because the reference population differs, as does the nature of inequality.

The type of population selected in terms of demographic characteristics (for example, age and sex) and labour force attachment (for example, hours per week and weeks per year) is related to current conventions within economics and the type of question being pursued. While particular research questions can be better analyzed with certain population groups, the choices are not always explicitly recognized by researchers and justified. Justification in terms of attaining replicability, a norm of the discipline, may serve to perpetuate biases.

While the choice of inequality indicator is now recognized as influencing the observed trends in income inequality (as discussed in section 2.3.5), less attention has been paid to how the choice of the reference population group in terms of demographic characteristics (age, sex) and hours of work may also affect the manner in which the tails of the earnings distribution are captured and, hence, estimates of income inequality. The relationship between population selection and research question, and potential biases in earnings inequality estimates are explored below.

As a generalization, two broad categories of studies can be identified, namely, studies of the population of all workers and, secondly, studies of full-time/full-year workers. First, studies that are interested in research questions of changes in the distribution of welfare arising from labour market participation tend to focus upon the population of all workers. The emphasis of such studies is on documenting trends in earnings inequality for the broadest population: all workers with any labour force participation as indicated by positive earnings. For example, most U.S. studies in this category focus upon on all workers, 16 years of age and older [Levy and Murnane (1992)]. In Canada, the ECC (1991) study focuses upon all individuals with earnings who earn at least 5 per cent of the average industrial wage.[64] A study by Doiron and Barrett (1994) using the SWH 1981 and LMAS 1988 refers to a sample of all individuals included in the survey with positive labour income from waged work. Morissette et al. (1993) include all individuals, aged 17 to 64 years of age, with positive earnings. Both of these latter studies focus upon individuals engaged exclusively in waged work. Morissette et al. (1993) impose a further restriction that individuals must earn greater than 2.5 per cent of the sex-specific mean annual earnings.

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[64]. Since this study uses the Survey of Consumer Finances data, it appears that the population is comprised of all individuals (who meet the above-noted labour force attachment criteria) who are 15 years of age and older.

Studies of trends in earnings inequality in recent years tend to present estimates of earnings inequality for men and women separately since it is now recognized that there are differences between men and women in earnings inequality at a point in time and that the patterns over time differ. At a given point in time, the degree of earnings inequality in the female population is greater than that exhibited in the male population. As will be shown in chapter 3, this is due primarily to the greater variation in annual hours of work for women compared to men, rather than in substantial differences in the variation in hourly wage rates.[65] With respect to patterns over time, evidence from the U.S. and Canada indicates that different patterns of earnings inequality exist for the three population groups, where the groups are men and women combined, men separately, and women separately, as is discussed subsequently. As a preview to these results, male earnings inequality increased during the 1980s, whereas female earnings inequality remained quite stable. Thus, focusing upon trends in earnings inequality for the entire population masks the quite different trends for men and women.[66]

Disaggregating trends by gender is now commonly accepted within the economics discipline and perhaps the reason given above, the difference in observed trends, would also be generally accepted as sufficient justification. However, disaggregating by gender by no means implies that the discipline views these trends through a theoretical lens which can explain the difference.

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[65]. See also Doiron and Barrett (1994) and Morissette et al. (1993).

[66]. For U.S. trends, see Karoly (1993), Bluestone and Harrison (1987), Blackburn and Bloom (1987). For Canada, see Morissette et al. (1993) and Doiron and Barrett (1994).

What is particularly interesting in this context is that the choice of which population groups to select for comparison, such as men and women, may be independent of the magnitude of the difference in the trends. The choice of groups for comparison depends upon conventions internal to the discipline about appropriate comparative population groups and these conventions change over time, lagging societal values and changes in other disciplines. In the U.S. it is convention to compare the nature of economic phenomena between different racial groups as well as gender. Less than 50 years ago, the dominant convention within economics (and other disciplines) was to use religion as a category for analysis and to distinguish between Protestants and Catholics.

While the first group of studies just reviewed examine questions related to distribution of the returns to labour market work among all workers, a second group of studies focus upon how changes in the structure of labour markets may have caused changes in the earnings distribution. Interest in the underlying causes of the changed earnings distribution has led researchers to select a population more narrowly defined than in the first group of studies, in order to increase the likelihood of being able to isolate causes. More specifically, studies have tended to focus upon men, or full-time/full-year male and female workers, and more recently, upon young workers.

The justification typically given, if at all, for focusing upon males is that it avoids sample selection bias associated with the increase in female labour force entry during the 1970s and 1980s. This argument, however, has some weaknesses. First, supply side issues theoretically can influence trends in earnings inequality, although the evidence to date points to demand side factors. Secondly, the rapid increase in female participation in the labour market, in Canada at least, occurred before the 1980s. In addition, selection bias issues are also present in an entirely male population since decisions to delay entry into the labour force (and prolong schooling), or decisions to retire early are also related to market conditions and these different participation rates will affect measured earnings inequality. Despite these issues, many researchers choose to focus upon "prime-age" males (typically defined as workers aged 25 to 54 years).

The choice of researchers to focus upon male populations tends to get perpetuated because other studies will also select a male population in order to replicate results of earlier studies. For example, Gottschalk and Joyce (1992) focus only upon male family heads and distinguish between prime age males 25-54 years and all male heads. They specifically justify their exclusion of women in terms of their aim of replicating other studies, primarily U.S. studies which focus on males. They further argue that the focus upon male heads of households and not all males is necessary to attain comparability among LIS data sets. Many studies which explore causes of increased earnings inequality are based upon an examination of only the male earnings distribution. The specificity of their results, however, is not typically reflected in the titles of papers.

Many studies in this second category define the population even more narrowly and select only full-time/full-year male or female workers. The rationale for this particular definition is that it enables the researcher to focus upon trends in annual earnings inequality without interference from variation in annual hours of work.[67] The

[67]. For example Bluestone and Harrison (1990, p. 356) note that their use of full-time/full-year workers is because the Current Population Survey does not provide hourly wage data.

main problem with focusing upon full-time/full-year workers is that it ignores a sizeable and growing proportion of the labour force and fails to analyze the causes of growth in this segment of the labour force. Further, it implicitly assumes that each individual's annual hours worked are the preferred number of hours, rather than being caused by demand side factors.

Another group which has received particular attention in the literature has been young workers. Both in Canada and in the U.S., young workers have fared particularly badly in the labour market of the 1980s. Thus, attention has been paid to this group in subsequent empirical work.

The definition of the population is likely to affect the size of the earnings inequality estimate both at a point in time and trends over time. At a point in time, for both men and for women, it is expected that estimates of annual earnings inequality will decline successively for each of the following groups: all workers; workers aged 17 to 64 years; prime age workers; and full-time/full-year workers. One reason for the decline in estimates of earnings inequality is that each successive group is likely to exhibit less inequality in annual hours worked. The empirical work to date does indicate how trends in earnings inequality differ for some of these age/sex/work status sub-groups of the population. There are, however, no well-developed explanations of why trends might differ.

The potential impact of the various population definitions on earnings inequality are summarized in Figure 1. The issues which subsequently will be empirically examined are indicated. Research to date shows that trends for men and women differ;

hence, results will be disaggregated by sex. At a given point in time, we would expect earnings inequality to be greater for women than for men, given the greater variation among women in hours worked. Earnings inequality estimates for the prime age population are expected to be less than those for the whole population because the former group is more homogeneous, but there is no a priori reason for predicting relative magnitudes of trends by age group. Two age groups, prime age and young workers, are examined in the empirical section since both have received considerable attention in the literature. Finally, with respect to work status, it is expected that at a given point in time, earnings inequality of full-time/full-year workers will be less than that for all workers given that they are relatively more homogeneous; the trends, however, cannot be predicted a priori. The decision to compare trends of men and women workers is consistent with personal preferences and is consistent with the current norms of the discipline but does not imply that the differences between men and women are larger than differences between other population sub-groups such as racial groups (white-First Nations, for example).

2.3.5 Inequality Indicators

Considerable attention has been paid to alternative measures or indicators of inequality over the past 30 years. It is only more recently, however, that issues concerning the variance or standard errors of these indicators have been addressed in both the theoretical and empirical literature. This relative lack of attention to the variance of inequality indicators is somewhat surprising since most empirical studies of income inequality rely upon data drawn from sample surveys. In this section, firstly, frequently used inequality indicators are highlighted and several are selected for use in subsequent empirical work. The selection is justified in term of required uses and their theoretical properties.[68] Secondly, issues concerning the variance of these indicators and selected computational issues are discussed.

In defining their research question about earnings inequality, researchers make decisions about the distribution of "what" and "among whom", and, additionally, researchers choose how best to measure inequality. There are basically two classes of inequality measures, those which do not make explicit the weighting scheme for aggregating individual income and those measures which offer an explicit weighting scheme, as derived from a well-defined social welfare function. Interestingly, Kanbur (1984) refers to these two groups of measures, as positive and normative measures, respectively, despite the fact that the positive measures implicitly include a weighting scheme.

In the first group, there are a variety of summary inequality measures which aggregate individual incomes by applying a particular (implicit) weighting scheme to each income observation. Some of the more commonly used measures include the Coefficient of Variation (and CV^2), Gini Coefficient, Theil's Entropy Measure, Relative Mean Deviation, Variance of the Logarithm of Income, and the Mean Logarithmic Deviation. Given the different weighting schemes of these measures, they vary in sensitivity to

[68]. Given the purpose of this chapter, the discussion of indicators is brief and draws upon several useful reviews of the theoretical literature on inequality indicators which are Kanbur (1984), Jenkins (1991), and Sundrum (1990).

transfers between individuals at different points in the distribution. As a result, trends in earnings inequality over time as documented by different measures may not be identical, and rankings of different distributions at a point in time by the different measures likewise may be ambiguous.

Since the weighting schemes in the above group of indicators typically remain implicit, this has led some writers to use other indicators which explicitly embody a weighting scheme by reference to a particular social welfare function. Examples of indicators in the second category include the Dalton index, Atkinson index and the Generalized Entropy index. In the Atkinson index, for example, a greater weight can be attached to the transfer of income to individuals at the bottom of the distribution than at the top, by raising the power to which income values are raised. An increase in the power to which income are raised, the parameter ϵ, represents an increase in the degree of inequality aversion. Atkinson refers to the degree of inequality aversion as the price society is willing to pay in order to decrease income inequality [Jenkins (1984), p.411]. Alternatively, the parameter ϵ indicates that the social welfare derived from a distribution with incomes equally distributed is identical to the social welfare derived from the observed (unequal) distribution, even though average income is a proportion ϵ of the average income of the orginal distribution [Jenkins (1991), p. 28].

Many researchers are aware of potential biases involved in documenting trends on the basis of a particular indicator. A concrete example of the importance of one's choice of inequality indicator is made in the survey article by Levy and Murnane (1992). Here, they point out that Blackburn and Bloom (1987), using the Gini Coefficient, find no evidence of a trend towards increasing earnings inequality, whereas Bluestone (1990) on the basis of the Variance of Log (VLN) indicator report increasing inequality from about 1979. Levy and Murnane (1992) (summarizing Karoly's (1988) point) note that the different results arise in part because the VLN is sensitive to changes in the bottom tail of the distribution. Gustafsson (1993) demonstrates that the extent of the increase in inequality in Sweden (between 1975 and 1990) depends upon the inequality indicator used. The percentage increase in inequality was 38 according to the Theil, 15 according to the Mean Logarithmic Deviation, and 0 according to the Gini.

The inequality measures differ as to their theoretical properties.[69] Many of the indicators mentioned are scale independent, which means that the inequality measure depends only the shape of the distribution and not its mean. If all individuals' incomes increase by the same percentage then the value of the inequality indicator will be unaffected. Measures which are scale independent reflect the notion that inequality is purely a relative concept, unrelated to absolute levels of income. For example, the value of the indicator will be the same in two groups with the same distribution of income, regardless of differences in the absolute level of income of the two groups.

A second condition, and one which seems reasonable for an inequality indicator to satisfy, is the Pigou-Dalton Principle of Transfers. The idea of this condition is that if a unit of income is transferred from a rich person to a poor person and the transfer does not reverse their ranking, then the value of the inequality indicator should decline.

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[69]. For a review of theoretical properties of different measures, see Jenkins (1991), Nygard and Sandstrom (1981), and Kanbur (1984).

Knowing whether indicators satisfy this condition is important for interpreting results of empirical work, yet not all indicators satisfy this condition.[70] The Gini, CV, and Theil indices do meet this condition. However, the Variance of Log indicator does not always satisfy the Principle of Transfer because, at incomes considerably greater than the geometric mean, a transfer from a rich to relatively poor individual may cause an increase in inequality.[71] The Relative Mean Deviation is insensitive to transfers, unless the transfer occurs across the mean.

While Gini, CV, and Theil meet the Principle of Transfer they vary in sensitivity to transfers in the lower tail. The Theil is more sensitive to transfers in the lower end of the distribution, but this case holds only if, as Jenkins (1991, p. 18) noted, the poor person has an income less than e (e=2.718) times the mean. The Gini and the CV are not as sensitive to transfers within the lower tail. The Gini Coefficient is particularly sensitive to transfers of income in the middle of the distribution; and the CV and CV^2 are strongly affected by transfers at the high end of the distribution.[72]

Another condition of inequality indicators is decomposability. Some inequality indicators can be derived as the weighted sum of inequality values for certain population sub-groups and inequality arising between these population sub-groups. Such indicators can be used to analyze the structure of inequality in terms of a variety of "exogenous"

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[70]. See Kanbur (1984), pp. 415-418 for a useful discussion of the Principle of Transfer in relation to various inequality indicators.

[71]. This point was demonstrated by Creedy (1977), referred to in Kanbur (1984).

[72]. See also Love and Wolfson (1976), p. 60 for a comparison of the Variance of Logs, CV, Theil and Gini on the principle of sensitivity of transfer.

factors, such as age, race, and sex. Shorrocks (1980) examines a class of inequality indicators which are additively decomposable[73], of which the Theil Entropy and Mean Logarithm Deviation are shown as particular cases. The Variance of Logs can be decomposed, although not additively, and it uses the population shares as the weights, rather than income shares as weights. Doiron and Barrett (1994) provide an example of the decomposition of the Gini following Yitzhaki and Lerman (1991) and a decomposition of the Atkinson modifying an approach of Blackorby, Donaldson and Auersperg (1981). As for inequality indicators in general, decomposable indicators will not necessarily provide unambiguous answers to such questions as what is the contribution of between-group inequality to overall inequality.[74]

To complement these summary measures, a disaggregative view of the distribution of earnings is also undertaken. The commonly used approach is adopted here of calculating the percentages of total earnings accruing to various equally-sized groups of the population, where the population is ranked from the poorest to the richest.[75]

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[73]. Additively decomposable means that the two component sum to the overall level of inequality.

[74]. The different indicators will decompose differently and hence give different answers. Kanbur (1984) notes that some indicators assign the group mean to each individual in calculating between group inequality and others do not. In some indicators the weights sum to one and in others they do not [Kanbur (1984), p. 420].

[75]. Inequality measures differ from measures of polarization which are used in connection with the questions concerning changes in the distribution of jobs and whether the middle class is disappearing. The middle is defined in class terms as the percentage of the population with a "middle class" income, for example, the percentage of the population earning an income within a certain range, such as between 50 and 150 percent of the median income. The range selected varies among studies and is selected in an arbitrary manner. Wolfson (1994) demonstrates that polarization and inequality of income are different concepts and how increased earnings inequality may or may not be

Given the properties of these various inequality indicators, the few which will be used in subsequent empirical work are identified and justified. In making this choice, an attempt was made to attain a balance between choosing a variety of indicators which reveal different information about the underlying distribution and the cost of extracting more information from a data set.[76] The selected indicators are the:

- Atkinson index because it permits great flexibility in incorporating various degrees of aversion to inequality;
- Theil Entropy index because it is additively decomposable which is desirable given the interest in chapter 3 in examining the age structure of inequality;
- Gini Coefficient because it is a widely used indicator and thus will facilitate comparison with other studies;
- Coefficient of Variation since it reflects sensitivity to transfers in the upper tail of the distribution, and thus, complements the Theil and Gini which are sensitive to transfers in the lower and middle portions of the distribution, respectively[77]; and
- deciles shares to provide a disaggregative picture of trends in earnings inequality.

The number of empirical studies of income inequality has increased substantially since the mid-1980s, and various combinations of the above-noted inequality indicators have been used. What has received comparatively little attention, however, has been the

accompanied by increased polarization. For example, between 1973 and 1981, inequality measures declined, or remained constant, while measures of polarization increased.

[76]. This is consistent with Slottjie (1991) who makes this point in his editorial introduction to two special issues in the Journal of Econometrics on economic inequality.

[77]. The indicators are calculated using methods outlined in the literature: the Atkinson follows Thistle (1990); and the Theil, Coefficient of Variation, and Gini Coefficient follow Cowell (1989).

use of standard statistical inference procedures relating to these estimates of inequality.[78] After noting possible reasons for the relative neglect of this issue, the methods which will be used in latter empirical work, to estimate the variance of inequality indicators, are reviewed.

The relative neglect of the variance of inequality estimates is surprising for two reasons. Firstly, the majority of income inequality studies are based upon data drawn from sample surveys. Hence, estimates are subject to sampling error. Sampling error arises at the data collection stage because certain groups of individuals are excluded from the sample. More precisely, sampling error occurs when the population is not sampled representatively due to the over- and/or under-represntation of some groups and/or the exclusion of certain groups. An example of sampling error of particular interest in this context is the undersampling of both very rich and very poor people, such as the homeless, both of which result in the underestimation of earnings inequality.[79] Thus, calculating the variance of the inequality estimates is useful for assessing the reliability of the estimates.

A second, and related point, is that the focus of many studies has been on analyzing trends in income inequality, yet there are few criteria for assessing whether

[78]. Several notable exceptions include Doiron and Barrett (1994), Karoly (1992), and Richardson (1994).

[79]. For example, Evans (1995) estimates that the exclusion of individuals from the Family Expenditure Survey underestimates the proportion of the population living in poverty, for the U.K. Excluding the homeless in estimates of earnings inequality will bias the results less than in estimates of total income inequality since the homeless typically do not hold paid jobs.

differences in estimates of earnings inequality over time are of any importance. Thus, the lack of attention to the variance of estimates of earnings inequality is surprising since they provide one such measure, that of statistically significant differences. While statistical significance is a useful criterion for assessing trends over time, it still must be distinguished from empirically significant differences, an issue which has received even less attention in the literature.[80] The main approach taken has been to compare the size of the increase in income inequality during the 1980s to earlier periods [see, for example, ECC (1991)].

Sampling error and measurement error (sometimes referred to as non-sampling error)[81] both occur at the data collection stage and researchers do not typically make decisions which affect these types of errors. Although researchers do not actively make decisions about sampling or measurement errors that potentially affect their estimates of earnings inequality, it is still useful to be aware of the nature of the potential bias. The nature of measurement error, methods for addressing this error used by statistical agencies, and the potential impact on estimates of earnings inequality are examined in Appendix A. The under-sampling of the very rich or very poor, such as the homeless, potentially underestimates the degree of inequality.

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[80]. For an exception, see Blackburn (1989) who proposes a method for assessing empirical significance of difference in income inequality, in terms of the size of a hypothetical redistribution required to generate the same degree of income inequality in two particular time periods.

[81]. There are two types of measurement error common to all survey data sets: non-response and biased response.

There are two main approaches for estimating the variance of inequality estimates, namely the jackknife and asymptotic approaches.[82] Given the large sample sizes of the data sets used in this chapter, as in most studies of income inequality, the two approaches are expected to generate similar results; a point discussed further below. The approaches for calculating the variance of the inequality indices, noted here, are all independent of the underlying distribution function and, importantly, of the complex sampling designs used in generating most data sets on income. The methods for calculating the standard errors of each of the inequality indicators selected for the empirical work are noted below.[83]

The Atkinson indices and their variances are calculated following Thistle (1990). Thistle (1990) discusses the large-sample properties and inference procedures of the Atkinson index using the properties of sample moments. Application of Thistle (1990) to calculate the variances for different values of "inequality aversion" is relatively straightforward, since it involves the use of various sample moments. Hence, the Thistle (1990) approach is chosen over the jackknife method proposed by Karoly (1989), for computational reasons.

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[82]. For the more disaggregated measures of earnings inequality, statistical inference procedures of Lorenz-dominance are typically used. See for example, Shorrocks (1983) and Beach and Davidson (1983) and Bishop, Formby and Thistle (1991).

[83]. I have benefitted tremendously from conversations with Tomson Ogwang about the choice of appropriate estimators for standard errors for inequality indicators. He has also derived a computationally efficient algorithm for calculating the jackknife standard error of the Gini Coefficient, as indicated further below.

One interesting issue that arises in computing the Atkinson standard errors with weighted data is the choice of denominator in calculating the standard error from the variance.[84] In the empirical work which follows, sample moments used in deriving the variance of the Atkinson index are calculated with the weighted number of observations. The standard error is calculated as the square root of the variance divided by the unweighted, as opposed to weighted, number of observations, which is consistent with the literature. Beach and Kaliski (1986) derive asymptotic standard errors for estimated Lorenz decile shares with weighted data, but use the unweighted number of cases to calculate the standard error from the variance. Doiron and Barrett (1994) also follow Thistle's (1990) method of calculating the variance of the Atkinson estimates and then use the unweighted number of cases to divide into the variance.[85] The practice of using the unweighted number of cases in the denominator of the standard error calculation is one which appears to be a convention, which perhaps has not been discussed in the theoretical literature to the same extent as the issue of whether to use weights in regression analysis.[86]

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[84]. Thistle (1990) derives the variance of the Atkinson index only and not the standard error, so does not address the issue of the appropriate denominator.

[85]. I appreciate these authors providing me with a copy of the FORTRAN computer program they used to generate standard errors for their 1994 paper.

[86]. See for example, DuMouchel and Duncan (1983).

Asymptotic standard errors are also calculated for the Theil Entropy and Coefficient of Variation indicators following the approach of Cowell (1991).[87] As in Thistle (1990), Cowell (1991) provides formulae for the variance calculations in terms of sample moments, and these are quite straightforward to compute.

Finally, the standard error of the Gini Coefficient is calculated using a jackknife method presented by Karoly (1989).[88] The results generated by the jackknife method are of the same order of magnitude as those generated by Cowell's (1991) method of asymptotic standard errors, although the results are not shown here. Sandstrom, Wretman and Walden (1988) and Nygard and Sandstrom (1989) have also shown the similarity in performance of the asymptotic and jackknife standard errors of the Gini Coefficient. Karoly (1988, 1992) notes that the jackknife method of calculating standard errors for the Gini Coefficient is particularly costly since it involves the calculation of the sum of the absolute income differences. Consequently, she does not present the standard errors for the Gini Coefficient in either of the two articles cited above.

Jackknife standard errors of the Gini Coefficient are calculated in this thesis using a computationally efficient algorithm derived by Ogwang (1995a). He modified Karoly's (1989) jackknife formula for the Gini Coefficient using a technique from recursive

[87]. My thanks to McKinley Blackburn who brought the Cowell (1991) paper to my attention and who also sent me a copy of a SAS program he used for calculating these standard errors.

[88]. Karoly (1989) also presents jackknife estimates of standard errors for the Variance of the Logarithm of income, the Coefficient of Variation, Atkinson index, and Theil's two inequality measures.

regression estimation.[89] Ogwang (1995a) demonstrates that the jackknife standard error of the Gini Coefficient can be derived from the Gini Coefficient calculated over all observations and a vector of Gini Coefficients calculated with one observation excluded. For example, the first observation in this n x 1 vector is the Gini Coefficient calculated when the first observation is excluded, the second observation in the vector is the Gini Coefficient calculated when only the second observation is excluded and so on. Ogwang (1995a) proves how this vector can be easily computed using cumulative incomes. The standard error of the Gini Coefficient is then calculated from the difference between this vector and the mean of the Gini Coefficient calculated over all observations, weighted appropriately.

2.4 SUMMARY OF MEASUREMENT ISSUES AFFECTING FACTS ABOUT EARNINGS INEQUALITY

The above review of the literature demonstrates that facts about earnings inequality do not exist independently from researchers in some objective state. Rather, facts are created by researchers through a process involving a lengthy list of choices which will depend upon the research question and personal preferences of researchers, within an "acceptability" framework internal to the discipline. By concluding that facts are social constructions and allowing for the possibility of subjectivity, this implies that it is necessary to reject the espoused methodological doctrine of economics, that of

[89]. In recursive estimation the regression coefficients are estimated for a set of n observations and then adjusted regression coefficients are estimated when new data of n+1 observations become available.

logical positivism and its modernist conception of science. This departure from the standard official doctrine is by no means radical thinking, since philosophers of science recognized this point well over 50 years ago, as have more recent economic methodologists. Rejection of modernism and logical positivism does not necessitate acceptance of the post-modern conception of science. Although there is no agreed upon alternative, the position taken here is an empiricist one which, as argued, is not synonymous with logical positivism. For certain problems, without asserting objectivity, empiricism still has a role: evidence may contribute to the evaluation of hypotheses; ranking, albeit a conditional ranking, is possible; and facts can still be better or worse approximations of phenomena, concepts, and relationships.

The literature reviewed above indicates the wide variety of choices made by researchers in measuring earnings inequality. In some cases, the impact of these choices on the direction and magnitude of inequality estimates remains unknown. In other cases, the direction of impact is known but the magnitude remains unclear, as is summarized in Figure 1. In the remainder of this chapter, the extent to which selected measurement choices affect measured earnings inequality are empirically examined using Canadian data from the LMAS and SCF for 1981 and 1989.[90] The measurement choices described below.

(1) **Definition of Earnings:** wages and salary earnings (from all wage and salary workers and exclusively wage and salary workers); and wage and salary plus self-employment earnings;

[90]. Note that, in all cases, the focus is on individual employment earnings.

(2) **Treatment of Outliers:** impact of top-coding where the top codes implemented are 3, 5, and 7 times greater than the population median earnings in each year[91]; exclusion of 1, 2, and 5 per cent of top observations; exclusion of 1, 2, and 5 per cent of the bottom observations.

(3) **Population Selection:** women and men are examined separately; prime age (25-54 years) and young workers (17-24 years) are shown; and for work status, full-time/full-year workers (total hours > 1560 and total weeks > 48) are distinguished from all workers.

(4) **Indicators:** means and medians; disaggregative measures (decile shares) and summary measures: Gini, Theil, Coefficient of Variation, and Atkinson index (r=0.5, -0.25, -0.5, -2.0).

(5) **Data Set:** although the issue of measurement error, and specifically, non-response cannot be examined directly, to assess the reliability of the results a comparison of results from two commonly used data sets is undertaken, these being the SWH/LMAS and SCF.

Before examining the impact of these choices on measures of earnings inequality, the data are briefly described.

3.0 DESCRIPTION OF THE DATA: SWH 1981, LMAS 1989 AND SCF 1989

3.1 INTRODUCTION

The data sets used in this chapter are the Survey of Work History (SWH) 1981 and comparable Labour Market Activity Survey (LMAS) 1989 and the Survey of Consumer Finances (SCF) 1981 and 1989.[92] The data sets share a common survey

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[91]. In the U.S. in 1981, the top income code was $ 50,000 and median earnings was about $ 10,000, as discussed in Section 2.3.4, giving a ratio of top code to median income of 5. Thus, in assessing the impact of top income code on estimates of earnings inequality, three levels are taken, one approximately equal to the U.S. and a higher and lower one, which are 3, 5, and 7.

[92]. The SWH 1981 was conducted only once. The LMAS provides comparable data for the years 1986 through 1990 and the Survey of Labour and Income Dynamics (SLID)

methodology and have a similar degree of representativeness as noted in section 3.2. In section 3.3, the unique features of the SWH 1981 and LMAS 1986/1989 which pertain to inequality measurement are discussed, along with the potential problem of inconsistency between the SWH 1981 and LMAS 1989 and a method for estimating the extent of the potential bias in inequality estimates. The special features of the SCF 1981 and 1989 data are highlighted in section 3.4. Finally, an evaluation of the two data sets is undertaken in section 3.5.

3.2 SURVEY DESIGN FEATURES COMMON TO THE THREE DATA SETS

The three data sets, namely, the SWH 1981, LMAS 1989, and the SCF 1981 and 1989 share several important features of survey design which should make the data comparable. These features are only briefly outlined; the details of the survey design are contained in Appendix B.

Each of the surveys are implemented as supplements to the Labour Force Survey (LFS) and, consequently, they share the same sampling frame and degree of representativeness. Specifically, the data are representative of a population which is of working age, in the ten provinces but excludes residents in the Territories, institutions, military barracks, and Indian reserves. Thus, estimates of earnings inequality do not reflect the labour market outcomes of these groups and yet the derived estimates are typically taken as a reflection of Canada as a whole. The exclusion of such groups as

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will provide similar data in the 1990s. The SCF is conducted annually.

residents of the Territories and Indian reserves will likely generate estimates of inequality which underestimate the degree of inequality for Canada.

Each of the three surveys use approximately two-thirds of the total LFS sample, generating samples in each survey of about 80,000 individuals. The dates of collection were: January 1982 for the SWH 1981; January and February 1990 for the LMAS 1989[93]; April and May 1982 for the SCF 1981; and April and May 1990 for the SCF 1989.

The SWH 1981 and SCF 1981 and 1989 are cross-sectional surveys whereas the LMAS 1989 is a longitudinal survey. Although the LMAS is a longitudinal survey, the sampling frame in the first year of the panel (1988) is identical to that of the other surveys. A modification was made to the sampling frame in the subsequent years of the panel, to ensure that the data generate representative "cross-sectional" estimates. The modification is of interest to this study since the second year of the panel data (1989) are used; longitudinal and cross-sectional estimates are discussed below in section 3.3.2.

Individuals are included in the survey if their dwellings are selected as part of the sample. The data pertaining to each individual, however, may be provided by the individual him/herself or by proxy from a "knowledgeable" household member. For example, in the LMAS 1986, 61 per cent of the respondents were interviewed directly. This percentage of direct respondents in the LMAS is higher than in the LFS where about 51 per cent of the respondents are interviewed directly. In the SCF, even if a

[93]. The LMAS 1986 data, which are used in chapters 3 and 4, were collected in January and February 1987.

"knowledgeable" household member completes the survey questionnaire for each member, a form containing the income questions is left for each respondent to complete directly.

The three surveys not only share the same sampling frame with each other and with the LFS, but in addition, they use a similar weighting scheme to generate the population estimates and common methods for adjusting for item non-response and complete non-response, which follow the general principles outlined in Appendix A. If non-response is non-random in the manner speculated upon in Appendix A, then the samples will systematically underestimate the tails of the distribution. To the extent that the surveys encounter the same non-response rate and type of non-respondents, they will also exhibit the same degree of bias.

While the three surveys share these common design features, there are several features unique to a specific survey which may influence the earnings data and inequality estimates generated. These features are discussed in sections 3.3 and 3.4.

3.3 SPECIAL FEATURES OF THE SWH 1981 AND LMAS 1989

3.3.1 Introduction

Both the SWH and LMAS were designed specifically to generate data for analyzing labour market phenomena and their designs are very similar, although the LMAS is a longitudinal survey.[94] Both surveys require respondents to provide an

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[94]. For information on the SWH 1981, in addition to the micro documentation which accompanies the micro-use tape, see Statistics Canada. (Economic Characteristics Division, Labour Force Activity Section). Hourly Earnings Data from the Survey of

account of their labour market activities over the past 12 months with detailed information on the length and timing of jobs and changes in employers, characteristics of jobs including hourly wages and hours worked, and their own individual characteristics Thus, the surveys provide critical pieces of information for analyzing labour market phenomena in an era characterized by the greater prevalence of casual work and rise in the number of part-time jobs. Both surveys also contain a job file which is not used in this thesis given its focus on the distribution of individual earnings.

This section highlights features of the SWH and LMAS data which are germane to the estimation of income inequality and comparability with the estimates generated from the SCF (see sections 3.3.2 to 3.3.7). While the SWH and LMAS share a similar survey design, generate comparable data, and have been used in several other studies to generate estimates of trends in earnings inequality, they differ in one critical aspect which may bias estimates of the trend in earnings inequality. The problem occurs in the SWH 1981 due to a less accurate method of recording hours of work in the stop and/or start months. Thus, in addition to highlighting those aspects of the SWH/LMAS data which differ from the SCF, the problem of potential inconsistency between the SWH and LMAS is discussed in section 3.3.8.

3.3.2 Longitudinal Survey Design of the LMAS and Cross-Section Estimates

The LMAS is a longitudinal survey[95] and does suffer, as do all longitudinal

1981 Work History, February 1984.

[95]. In the LMAS 1986-1987, data is collected from the same individuals for the two years and in the LMAS 1988-1990, data is collected from a new set of individuals for

surveys, from the problem of sample attrition, as discussed in Appendix A. However, Statistics Canada also provides cross-sectional data files which include a larger number of individuals than the longitudinal files to reduce the sample attrition bias. Consequently, this chapter uses the LMAS 1989 cross-sectional data file.

In the second (and third) year of the LMAS, all individuals who originally responded were re-contacted. For the cross-sectional sample, all of the dwellings in the original sample were recontacted. If any of the originally selected individuals have moved (they are included only in the longitudinal file), the new inhabitants in the originally selected dwellings are included in the cross-sectional survey.

Sample attrition is a problem for longitudinal surveys if the non-response due to mobility and refusal is non-random. If, for example, certain groups of people exhibit greater residential mobility, they are less likely to be contacted in the second year of the survey and hence the sample attrition problem may introduce systematic bias into the longitudinal survey data. For a systematic bias to be introduced, these groups must differ from the general population not just in terms of age or sex, since these would be corrected for by the age-sex weighting factor, but in terms of specific labour market characteristics. If the sample attrition is non-random, then a sample selection bias is introduced of the type discussed by Heckman (1979).

A comparison of the 1989 LMAS Cross-sectional and Longitudinal Files suggests that the percentage of young, less-educated workers is substantially smaller in the Longitudinal File relative to the Cross-sectional File (see Appendix D, Table D1). The

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each of the three years.

Cross-sectional and Longitudinal LMAS 1989 Files are similar in terms of: the percentage of the population with paid work (defined as workers with positive earnings) which is about 68 per cent in both Files; and the percentage of the population with paid work (between the ages of 17 and 24 years) which is, respectively, 16 and 15 per cent in the Longitudinal and Cross-sectional Files. However, examination of the population of paid workers between the ages of 17-24 years by education level shows that the percentage of this group with low levels of education is much smaller in the Longitudinal File compared to the Cross-sectional File.[96] For example, of all paid workers aged 17-24 years, about 15 per cent had only some high school education in the Longitudinal File while 24 per cent were in this category in the Cross-sectional File.[97] Thus, to the extent that level of education is related to other labour market characteristics, such as type of job and hours of work, the degree of earnings inequality based upon the Longitudinal File is likely to be lower than that measured using the Cross-sectional File.

This chapter uses the Cross-sectional File from the LMAS 1989 which resolves the specific problem of systematic sample attrition, probably due to young, less educated workers as argued above. However, the impact of the bias arising from complete and

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[96]. R. Morissette suggests that the lower percentage of young, less-educated workers in the Longitudinal File is due to the greater residential mobility of this group [letter 1993].

[97]. There is the additional problem of using one year of the LMAS Longitudinal File for cross-sectional purposes and this relates to the age group variable. In the LMAS 1989 Longitudinal File, the age data is provided using 8 age categories reflecting individuals ages in 1988. However, in 1989 when everyone is one year older, it would be necessary to estimate what proportion of individuals in each age category should actually move into the next age category.

item non-responses remains unknown. It is likely however, that our understanding of the degree of inequality at a given point in time and the increases over time are underestimated. As discussed previously (Appendix A), it is plausible that the non-response is more likely to occur in the tails of the actual distribution of earnings.

3.3.3 Age Range Included

The two surveys do not cover the same working age population. In the SWH 1981 data, the first age category is 15-16 years and the last age category is 70 plus years. In the LMAS 1989, the first age category is 16 years and the last age category is 65-69 years. Thus, to achieve estimates of earnings inequality for a consistent population in the two data sets, this study selects a sample of individuals between the ages of 17 and 69 years.

3.3.4 High Income Cut-off

A high income cut-off was not imposed in either of the two data sets, although the highest earnings value observed does vary among the data sets. In the SWH 1981 data, annual earnings do not appear to have been subjected to top-income coding given that there are several earnings observations with extremely high values.[98] For example, there are two observations with annual earnings greater than $150,000 namely, $159,992 and $492,750. In the case of this latter earnings observation, one might suspect that a

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[98]. This conclusion is also supported in statement from S. Roller: "[t]here is no record of top income coding having been done in the 1981 SWH survey." [Personal Communication, fax dated March 30, 1994].

clerical error has occurred given the extremely high value of earnings in conjunction with other characteristics of the individual.[99] At the same time, however, the questionnaire indicates that when individuals are asked about their usual wage or salary, the limit given is $99,999.99 which suggests the intention to impose a top income code of $100,000 [question 27A]. However, it may be possible for individuals to exceed this annual earnings limit if they reported a hourly, weekly, or monthly wage (less than $100,000) and then a large number of hours. The one extremely high earnings observation which was calculated to be $492,750 is dropped from the sample used in this study because it appears to be an error, leaving the highest earnings observation to be $159,992.

In the LMAS 1989 about 15 earnings observations were reduced for release in the public use microdata files, not due to the application of a top-income code but because the high values were thought to arise from clerical errors. For each individual, if the hourly wage rate was greater than $110.00, then the value was set to 1/10th of the recorded value.[100] The highest value recorded in the LMAS 1989 is $228,442.[101]

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[99]. This is individual is very young (between 17 and 19 years) to be employed in a waged-job earning almost half a million dollars annually. Some of the other characteristics of this woman are as follows: residence in Quebec; some post-secondary education; and works in the accommodation and food industry.

[100]. S. Roller, personal communication, fax dated March 30, 1994.

[101]. Similarly, in the LMAS 1986 data file, top-income coding was not undertaken. For example, there is one earnings observation equal to $422,289 and this observation is dropped from the sample.

3.3.5 Definition of a Paid Job

Both the SWH and LMAS collect wage and salary information from people with paid work and the definition of paid work is the same in both surveys. Individuals are considered to be self-employed, and hence, excluded from the category of paid work, if they classify themselves as: unpaid family workers; having an incorporated or unincorporated business; or being self-employed without a business. In the two data sets, cases with positive earnings are considered to have paid jobs. As shown in Table 1, the percentage of the population aged 17 to 69 years with a paid job is 69.0 in 1981, and 68.3 in 1989.

3.3.6 Number of Jobs

The number of jobs captured differs between the two surveys, with four jobs accounted for in the SWH 1981, and five jobs in the LMAS 1989. However, the difference in the number of jobs accounted for by each survey is not expected to substantially affect the estimates, given that only a small percentage of individuals held four jobs in each of the survey years. As shown in Table 1, about 0.6 per cent of the population held four jobs in 1981 (SWH data) and about 1.2 per cent of the population held four jobs in 1989 (LMAS data). Only about 0.3 per cent of the population held five jobs in 1989 (LMAS data).

3.3.7 Measurement Error in the Earnings Variable Common to SWH 1981 and LMAS 1989

Both the SWH 1981 and LMAS 1986, 1989 are subject to two potential measurement errors in the recording of the amount of work which can lead to distortions in annual earnings. Since the same two sources of measurement error are present in both the SWH 1981 and the LMAS 1989, at least any potential bias is in the same direction. Consequently, for measuring trends over time, these measurement errors are not expected to bias the observed trends. However, estimates of inequality at a point in time would be affected.

The first source of measurement error is introduced because only whole numbers are permitted in recording individuals' responses to the usual amount of work performed for an employer, regardless of which time period (weeks/month, days/week, or hours/day) the individual chooses for his/her form of response. For example, if the individual reports working 7 hours and 30 minutes per day, s/he is recorded as working 8 hours per day. If the individual works 1.5 days per week, then s/he is recorded as working 2 days per week. The practice of "rounding-off" the amount of work to the nearest whole number given the relevant unit of measure (hours/day, days/week, or weeks/month) will under- or over-estimate annual hours worked. The measurement error in the amount of work performed will also distort annual earnings or hourly wage rates since these are variables derived from responses to the amounts earned for a given time period (the rate) and the amount worked (except in the case where wages/salaries are reported in terms of an amount from an employer or for the year). In the documentation for the SWH 1981, it is observed that "in absence of evidence to the contrary" the errors due to rounding fractions up and down may cancel each other out.

The second source of measurement error occurs because only the most recent work schedule for an employer is reported (although this problem is corrected in the SLID).[102] For example, if a person worked full-time over the summer and part-time in the fall, then the person would report the part-time schedule since this is the most recent one, given that the survey is conducted in January or February in the following year. This procedure in collecting data results in annual hours worked being either over- or under-estimated, which introduces a distortion into the earnings calculation, unless earnings are reported on an annual basis or in total for an employer. The bias introduced will likely vary by industry and occupation since some of these categories are more susceptible to work schedule changes and some groups of workers, such as students, are more likely to undergo work schedule changes.

Both of these problems give rise to measurement errors in the calculation of earnings. To the extent that these measurement errors do not balance each other out, biases will be introduced in estimates of earnings inequality. However, since the same methods are used in the two surveys, it is expected that the degree of bias introduced is approximately the same and hence, trends in earnings inequality are less biased than estimates of earnings inequality at a point in time. During the 1980s there has been an increase in the prevalence of multiple job-holding and a rise in part-time work, as well

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[102]. As discussed in microdocumentation for the SWH, neglecting to account for changes in work schedule for the same employer may partially explain differences in the employment estimates of the LFS and SWH.

as, changes in the incidence of involuntary part-time work over the business cycle. These structural and cyclical labour market features suggest that the degree of bias may change over time.

3.3.8 Potential Problem of Inconsistency between the SWH 1981 and the LMAS 1989 and Method for Reducing the Bias

The reliability of trends in earnings inequality derived from a comparison of the Survey of Work History 1981 and Labour Market Activity Surveys 1986 and 1989 has recently been called into question by Morissette et al. (1993). They noted that the procedure for collecting data on hours and earnings in the SWH 1981 is subject to greater measurement error than in the LMAS; specifically, that annual earnings and annual hours worked data are potentially overestimated. However, the impact of this specific measurement error for estimates of earnings inequality has not been empirically assessed so far in the literature.

Although this is a major issue, only the principles of the problem and method used in this thesis for addressing the problem are outlined here. Appendix C presents in considerable detail the procedures of data collection and reasons why bias occurs, along with the techniques used for modifying the 1981 data and the results concerning the degree of bias in the original data.

The SWH 1981 data is potentially biased because it fails to capture the exact work schedule in the months that an individual starts and/or stops a job. The SWH and LMAS capture the same population, that of paid workers, and collect data on hours and earnings using the same method. Individual earnings are calculated from information provided on the amount of work performed during the usual work schedule and the rates of pay. The difference is that the LMAS provides information on the exact dates that an individual starts and/or stops a job and the SWH uses the individual's usual work schedule in the start- and/or stop-months. As a result, annual hours worked and annual earnings are potentially overestimated.

A method has been developed (see Appendix C) for revising the estimates of annual hours worked, hourly wage rates and annual earnings of workers for whom bias potentially exists. Workers who hold one job for the full-year do not have biased estimates. For the remaining group of workers, they will only have biased estimates in those jobs which are part-year jobs. Further, estimates of annual earnings will be unbiased if earnings are reported per employer and hourly wage rates are unbiased if reported as this rate. These factors are taken into account in revising the estimates. The main principle underlying the simulation is that estimates of hours worked in the start- and/or stop-months of a given job are not necessarily the usual work schedule but can range between one and four weeks.

The results of the simulation demonstrate that using the SWH 1981 data in original form will overestimate the mean annual earnings and underestimate the degree of earnings inequality. Taking a cross-sectional view, the underestimation of inequality is substantial: 11 basis points for women and 9 basis points for men, in terms of the Gini Coefficient, both of which are statistically significant differences at the 5 per cent level. These are also empirically large differences given that the increase in earnings inequality for the population of all workers (men and women combined) is only 9 basis points over the 1980s [see Appendix D, Table D5]. Details of the range of the bias, percentage of cases affected, degree to which bias occurs in annual earnings or annual hours worked are presented in Appendix C.

Notice that the treatment of this problem of bias in the SWH 1981 data is also a researcher measurement choice. As a researcher, one could choose do nothing about the bias, in which case cross-sectional estimates are underestimated and trends overestimated. Morissette et al. (1993) and Doiron and Barrett (1994) choose to calculate hourly wage rates in the LMAS using the same method as in the SWH, thereby making the two surveys more consistent. However, this method introduces measurement error into the LMAS data, making the LMAS data less accurate. The method chosen in this thesis is to adjust the 1981 SWH data, making it both more accurate and comparable to the 1989 LMAS data. In the remainder of this thesis the revised 1981 data are used.

3.4 FEATURES OF THE SURVEY OF CONSUMER FINANCES DATA

3.4.1 Introduction

Despite the similarity in the survey designs of the SCF and SWH/LMAS, there are several features of the SCF which suggest that estimates of earnings inequality generated from these surveys may differ. A factor contributing to the similarity of estimates of earnings inequality is the comparable definitions of wages and salaries in the SCF and in the SWH/LMAS, as noted in section 3.4.2. Top-income coding is not employed in the SCF nor in the SWH/LMAS. The SCF does capture a number of very high income observations, however, which indicates the surveys have captured slightly different populations, as discussed in section 3.4.3. Finally, the definitions of paid work differ between the SCF and SWH/LMAS which correspond to differences in the composition and size of the population of paid workers, as outlined in section 3.4.4.

3.4.2 Definition of Wages/Salaries

In the SCF 1989 survey, wages and salaries are defined in comparable manner to the SWH 1981 and LMAS 1989. In the SCF, the definition of wages and salaries includes:

> gross cash wages and salaries received during the reference year from all jobs, before deductions for pension funds, hospital insurance, income taxes, Canada Savings Bonds, etc.... Should amount to 'total earnings before deductions' as shown in Box C of the T-4 slip less the value of 'taxable allowances and benefits' shown in Box K to O plus tips and gratuities and casual earnings for which no T-4 slips were provided. [SCF Microdata File Documentation 1989, p. 40].

Although the definition of wages and salaries is similar in the two surveys, the manner in which it is collected differs. In the SCF, the respondent is asked to provide an estimate of wages and salaries earned from all jobs for the previous year, drawing upon information already in the corresponding year's income tax return. This differs from the SWH/LMAS where annual earnings is derived from information on amount worked, the dollar amount earned, and the corresponding reference period.

The SCF also provides data on self-employment earnings. Net income from self-employment refers to gross income minus expenses and captures income from own-account, partnership in a unincorporated business, or independent professional practice.

Net self-employment income includes net income from farm and non-farm activities and roomers/boarders.[103] This variable can be negative as well as positive.

3.4.3 High Income Cut-off

High income cut-offs were not implemented in the SCF 1981 and 1989 data, although in each year different procedures were followed to ensure confidentiality of respondents. In the SCF 1981, 58 records were excluded in order to protect the identity of individuals with particularly high earnings, large losses from self-employment or investment, or some other unusual characteristic. However, in the SCF 1989, some individuals with very high earnings, rather than being removed from the public use microdata file to protect their identities, had selected characteristics set to 0.

The SCF also contains a number of observations with high wages and salaries. For example, in the age range 17 to 69 years being considered, in the SCF 1989 data there are 10 (unweighted) cases with wages and salaries greater than $250,000, which is the highest earnings observation in the LMAS 1989. The impact of the greater capture of high earnings in the SCF on estimates of earnings inequality, compared to those of the SWH/LMAS is assessed in the empirical section.

3.4.4 Definition of a Paid Job

The SCF collects wage and salary information from workers with paid work. The definition of paid work, however, differs from that used by the SWH/LMAS. In the

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[103]. SCF 1989 Microdata File Documentation, p. 45.

SCF, individuals are considered to have a paid job if they have an employer (as in the case of the SWH and LMAS), or if they are working owners of incorporated businesses and report wages and salaries as a source of income.

Defining the population of paid workers as all individuals between the ages of 17 to 69 years with positive wages or salaries gives rise to the population sizes for the SCF in 1981 and 1989, as shown in Table 1. While the population aged 17 to 69 years (in each year) is of a comparable size in the SWH/LMAS and SCF, the population of paid workers is larger in the SCF than in the SWH/LMAS. For example, in 1989, the population of paid workers in the SCF is about 1.1 million greater than the LMAS. One reason for the difference in population sizes is the different treatment of owners of incorporated businesses in the two surveys. In the LMAS, owners of incorporated businesses are classified as self-employed and their earnings are not recorded. In the SCF, some owners of incorporated businesses may classify themselves as paid workers and report wages or salaries. The inclusion of owners of incorporated businesses in the SCF may account for about one-half of the difference in the population of paid workers of the two surveys. This estimate is derived given that there are about 559,000 persons in the LMAS 1989 who reported that their first job was self-employment in an incorporated business.[104]

[104]. Estimated by S. Roller, Statistics Canada [personal communication, letter March 30, 1994].

Three other reasons may account for the larger population of paid workers generated by the SCF.[105] Note, however, that these reasons are counter to the finding of the higher mean annual earnings of the SCF, a point discussed in section 4. First, because the SCF is conducted in April and respondents are asked to use their completed tax returns as a guide, the SCF may capture more individuals because the tax return serves as a reminder of jobs performed. Individuals who work at a job for only a small amount of time, or at the beginning of the calendar year, may forget the work performed and, hence, fail to report the earnings in the LMAS. Second, the SCF may capture individuals who worked at the end of the year, whereas the LMAS may not, due a difference in an accounting principle. The SCF tends to capture earnings according to the month in which work was performed and the LMAS captures earnings according to the month received. Thus, payments for work performed in the latter part of the calendar may not be included in the LMAS. Third, the SCF may capture individuals who work in family-owned businesses because they report the income. When it comes to the LMAS, however, such individuals may not consider themselves to be paid workers and so are not included.

[105]. Suggested by S. Roller, Statistics Canada [personal communication, letter March 30, 1994].

3.5 EVALUATION OF THE DATA SETS

3.5.1 Evaluation Questions

Data sets, even those which collect information on similar concepts such as employment earnings, are unlikely to generate identical estimates due to the variety of measurement choices discussed in section 2, including the definition of income, population selection, sampling frame, measurement error, and treatment of outliers, among others. Given the basic parameters of how the data have been collected, researchers can make certain measurement choices in order to improve the comparability of estimates from different data sets. Before undertaking the empirical analysis in section 4, the SWH/LMAS and SCF are evaluated in terms of the three interrelated questions: can the SWH and LMAS generate comparable estimates of earnings inequality: what measurement choices must be made in order to derive estimates of earnings inequality from the SWH/LMAS and SCF estimates on a comparable basis; and why are these two data sets preferred to alternative data sets for examining the issue of earnings inequality?. Each of these questions are addressed below.

3.5.2 Comparability of the SWH and LMAS?

There is a problem of inconsistency between the SWH and LMAS with respect to the annual earnings variable. Modifying the calculation of the earnings variable in the SWH will, however, minimize the extent of bias arising from the measurement error. As noted in section 3.3.8, estimates of annual earnings in the LMAS are more accurate than those of the SWH because they take account of the actual stop and start dates of each job. In the SWH, this information is unavailable and hence, the annual earnings variable is overestimated. Consequently, observed trends in earnings inequality based upon these two data sets are biased.

The bias exists only for roughly 50 per cent of workers. A method is proposed in Appendix B for modifying the annual earnings variable for the group of workers for whom bias exists. This method uses information contained in the SWH data set to distinguish among workers who start, stop, or start and stop a given job, along with different assumptions about the number of weeks worked in these start- and/or stop-months. Given these assumptions, the simulation exercise undertaken in Appendix B demonstrates that estimates of earnings inequality are likely underestimated and, hence, any increase in inequality observed over the 1980s would be potentially overestimated.

The annual earnings variable generated by this method, using the most reasonable assumption about the number of weeks worked in the start- and/or stop-months, provides a more accurate estimate of annual earnings (and earnings inequality) than the usual method which is outlined in the microdocumentation accompanying the data. The most reasonable assumption is the case where individuals who start, stop or start and stop jobs are randomly assigned a number of weeks worked, between one and four, in the start- and/or stop-months. Thus, in the empirical component of this chapter, the revised annual earnings variable in the SWH will be used, thereby improving the comparability of annual earnings estimates between the SWH and LMAS and the reliability of observed trends in earnings inequality between 1981 and 1989.

This method is considered to be a better "choice" than using the data in the original form or revising the 1989 data as in other studies. The empirical impact of this choice will examined in section 4 by comparing the results of this study with those of Morissette et al. (1993).

3.5.3 Comparability of the SWH/LMAS and SCF Estimates?

While the SWH/LMAS and SCF potentially represent the same population, estimates of earnings inequality generated from the two surveys are expected to differ. A factor contributing to the similarity of earnings inequality estimates in the two surveys is the comparable definition of wages and salaries in the two surveys. For example, in both cases wages and salaries refer to the gross amount and exclude the value of fringe benefits. However, two factors indicate that the populations covered by the two surveys differ. While the two surveys are conducted as supplements to the LFS and, consequently, share the same sampling frame, they experience different non-response rates, so they differ in representativeness and capture different percentages of very low and very high observations as discussed in section 4. Secondly, while it is possible to get comparable populations from the two surveys in terms of an age group, there are differences in the definition of paid work in the two surveys which give rise to a substantial difference in the composition and size of the population. It is not possible to select a more comparable population.

3.5.4 Preferred Data Sets?

Even if a variety of data sets generate equally reliable estimates of earnings inequality, one data set might be preferred to another because of other information that it contains. Given the research questions asked in this thesis and perspective taken, that of a segmented labour market view (as discussed in chapters 3 and 4), the SWH/LMAS is potentially preferred to the SCF.

In chapters 3 and 4 of this thesis, trends in hourly wage rate inequality and causes of hourly wage rate and annual earnings inequality are explored in terms of a variety of factors including industrial and occupational shifts; consequently, it is important to have accurate and detailed data on all of these items. As the SWH/LMAS is likely to provide more accurate information on hours of work, this means that hourly wage rates can be generated. The SCF provides data on the usual number of hours worked per week which, combined with the information collected on number of weeks worked, would make it possible to calculate annual hours worked and the hourly wage rate. However, this method of collecting the information on hours is unlikely to generate such accurate data as those of the SWH/LMAS where the picture is built up through more detailed questions pertaining to each job held.[106]

There is also the measurement issue noted above concerning the potential inconsistency between the SWH and LMAS with regard to annual hours worked for workers who start or end a job during the year. However the annual hours worked

[106]. The Census only provides data on the number of hours in the previous week, and these data are subject to the same limitation as in the SCF.

variable is modified according to the above discussed method to minimize the measurement error.

In addition, the SWH/LMAS provides more detailed information on industry and occupation than in the SCF, and both categories are used in chapter 4. The SWH/LMAS provides data on 49 occupation and industry categories, whereas the SCF provides data on 49 occupation but only 14 industry categories.[107]

Having described the two data sets, we now examine the extent to which measurement choices affect estimates of earnings inequality in 1981 and 1989 and the trends over this period.

4.0 WHICH MEASUREMENT CHOICES AFFECT "FACTS" ABOUT EARNINGS INEQUALITY? SOME EMPIRICAL EVIDENCE

4.1 INTRODUCTION

Stylized facts about earnings inequality are socially constructed representations of the "real world" distribution of the returns to work. These facts do not exist independently of researcher measurement choices and these choices are influenced by conventions within the discipline and individual preferences about appropriate research questions and measurement methods. Even after deciding to focus upon the distribution of the returns to work among individuals rather than the distribution of welfare among families, numerous researcher measurement choices are made. Conceptually, the economics discipline is biased towards market or paid work and so facts about the

[107]. The Census provides data on only 16 occupation and 18 industry categories.

distribution of returns to work are actually about the distribution of returns to market work neglecting unpaid labour. Once researchers decide to use an existing data set, such as those available from government statistical agencies, there are still a variety of measurement choices to be made with respect to the treatment of outliers, time periods, selection of the population, and inequality indicators, as discussed in section 2 and summarized in Figure 1. The extent to which these choices affect estimates of, or facts about, earnings inequality is empirically examined below.

We start by examining trends in earnings inequality over the 1980s using the SWH/LMAS data and these are compared to other Canadian studies. In section 4.3, we ask whether the observed trend depends upon various measurement choices. The impact of the choice of data set is considered by comparing trends in earnings inequality derived from the SCF with those from the SWH/LMAS and reasons for the differences are explored. Note that the issue of non-response during data collection (the extent to which it varies between data sets and changes over time) and the bias it introduces cannot be examined. The impacts of a variety of other measurement choices on estimates of earnings inequality are examined and these choices are: the definition of earnings; the treatment of outliers; the population selected; and inequality indicators. Moving from a discussion of trends, section 4.4 summarizes the findings about which measurement choices affect facts about earnings inequality at a point in time (1989).

Detailed measures of central tenden and inequality o earnings, along with sample sizes for the SWH/LMAS and SCF are presented in Appendix D, Tables D2 through D12 and highlights are summarized in tables 1 through 10 in the text. Unless otherwise stated, the population selected is all individuals with positive wages and salaries between the ages of 17 and 69 years, regardless of the number of annual hours and weeks worked. Given the interest in the distribution of returns to work among **all** individuals with paid work, this study uses the largest consistent age range rather than focusing upon the age range which includes "prime age" workers or workers less than 65 years of age.[108]

4.2 DID EARNINGS INEQUALITY FOR PAID WORKERS INCREASE DURING THE 1980S? EVIDENCE FROM THE SHW/LMAS DATA

The question of whether earnings inequality for paid workers increased during the 1980s is examined by using evidence from the SWH 1981 and LMAS 1989, and the results are compared with those based upon the SCF 1981 and 1989 data in a subsequent section. In examining trends in earnings inequali.y, earnings are defined as the sum of earnings from all paid jobs for the population of workers who held at least one paid job; this definition includes workers who combined paid work and self-employment. Detailed evidence is presented in Appendix D, Tables D2 through D4 and selected results are summarized in Table 2.

For the population of all paid workers (men and women combined), both the position and shape of the earnings distribution changed between 1981 and 1989,

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[108]. As noted in Section 3.2, this age group was selected to achieve the largest age range and consistency between the SWH and LMAS data sets. The SWH 1981 provides earnings data for individuals aged 15-16 years in the first age category, through to individuals aged 70 plus, whereas the LMAS 1989 provides data on only for individuals aged 16 years in the first age category, through to 65-69 years.

according to the SWH/LMAS data. Mean earnings increased between 1981 and 1989 from \$18,286 to \$19,182 (in constant 1986 dollars) [Appendix D, Table D2(c)].[109] Median earnings increased from \$16,342 to \$16,883 during the 1980s. The increase in median earnings during the 1980s was very small compared to previous decades. For example, between 1967 and 1981, median earnings increased by \$3,678 (in 1986 dollars).[110]

Earnings inequality for the population increased between 1981 and 1989 according to only some of the inequality indicators. For example, the Gini Coefficient increased by 9 basis points, from .4026 to .4116, which is statistically significant at the 5 per cent level of confidence. Note, however, that the Atkinson index (r=-0.25, -0.5, and -1.0) indicates a decline in earnings inequality for the population [see Appendix D, Table D3(c)]. The change in the shape of the earnings distribution can also be seen by examining changes in the decile earnings shares. What is most noticeable, is that the top decile gained 1.0 per cent of total earnings [see Appendix D, Table D4(c)], implying an increase in disparity between rich and poor workers. These changes in the position and shape of the earnings distribution of the population of all paid workers reflect changes in the gender composition of the workforce, as well as changes in the composition of the

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109. The mean earnings values for 1981 and 1989 are deflated by the Consumer Price Index (1986=100) for their respective years.

110. This calculation is based upon the SCF, where the population is defined as all workers earning at least 5 per cent of the average industrial wage. Note that the largest increased in median earnings occurred between 1967 and 1973. Source: ECC (1991), Table 8-3.

separate male and female workforce in terms of such factors as age, education and work status.

The debate about the rise in earnings inequality of all workers (i.e., including both full-time and part-time workers) is a debate about changes in the labour market outcomes of male workers. Whether earnings inequality increased or decreased during the 1980s for the population (men and women combined) depends upon the inequality indicator used. However, earnings inequality increased among all male workers regardless of the inequality indicator. Mean earnings for both women and men increased in real terms between 1981 and 1989: mean earnings for women increased from $13,394 to $14,446 (an increase of $1,052); and mean earnings for men increased from $22,060 to $23,374 (an increase of $1,314) [Table 4(a-b)].

For women, earnings inequality remained quite stable over the period 1981 to 1989. This conclusion is based upon the finding that while each of the inequality indicators reported a decline in earnings inequality, only some of the declines are statistically significant (at the 5 per cent level). This result is probably due to the increased percentage of women working more hours [see Morissette et al (1993)]. For example, the Gini Coefficient decreased 8 basis points, from .4237 to .4158 between 1981 and 1989, a decline which is not statistically significant at the 5 per cent level of confidence. This relatively stability in earnings inequality for women during the 1980s continues the trend observed the earlier period of the 1970s.[111] This conclusion is

[111]. Using SCF data, both ECC (1991) and Morissette et al. (1993) find little difference in the Gini Coefficients between 1973 and 1981. Note, however, that ECC (1991) study reports an increase in earnings inequality for women between 1967 and

based upon a comparison of two cross-sectional estimates and will reflect changes in the composition of women in the labour force by age, education and work status among other factors.

Despite the stability in the degree of earnings inequality, the earnings distribution became more polarized during the 1980s. There was a decrease in the share of total earnings accruing to women in deciles 5 to 9 and increases in shares accruing to the bottom four and top deciles. This finding is consistent with changes in the distribution of hours worked by women, reported by Morissette et al. (1993), specifically an increase in the percentage of women working a larger number of hours, although still less than full-time.

Earnings inequality for men is less than earnings inequality for women in both 1981 and 1989 as expected, given the greater prevalence of full-time/full-year work for men. However, the increase in earnings inequality was greater for men than for women. An increase in earnings inequality for men between 1981 and 1989 is observed by each of the inequality indicators.[112] The Gini Coefficient, for example, increased about 17 basis points, from .3568 to .3742, which is statistically significant at the 5 per cent level of confidence. This increase in earnings inequality for men is not only statistically

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1973 whereas, Morissette et al. (1993) report a decrease in earning inequality between 1969 and 1973. See Appendix D, Table D5.

[112]. The magnitude of the increase in male earnings inequality varies by inequality indicator. For example, the Theil, CV^2, Atkinson (r=0.5) and Atkinson (r=-1.0) report increases, respectively, of 9.8, 13.9, 8.1, and 2.0 per cent over the period 1981-1989.

significant but represents a substantial departure from the trend in earnings inequality during the previous decade where earnings inequality had been quite stable.[113]

While the distribution of earnings became more polarized for women during the 1980s, for men, the earnings distribution became more upwardly skewed. The bottom seven deciles of the working male population received a smaller share of total earnings in 1989 compared to 1981 and the top decile gained an additional 1.4 percentage points of total earnings. Thus, the poorest seventy per cent of the working male population was made worse off during the 1980s relative to the richest 20 per cent of the working male population.[114] Even more illustrative of increased earnings disparity among men is the finding that, in 1981, the richest 10 per cent of men earned 24.5 times as much as the poorest 10 per cent of men; by 1989, the difference had increased to 26.6 [Appendix D, Table D4(b)].[115]

Not only did inequality increase for men during the 1980s in relative terms, but, in addition, the poorest 30 per cent of the male working population were worse off in 1989 in absolute terms compared to their counterparts in 1981. In 1981, 30 per cent of men earned less than $13,675 and this dropped to $13,588 in 1989 [see Appendix D, Table D4(b)].

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113. Using the SCF data. both Morissette et al (1993) and ECC (1991) show Gini Coefficients during the 1970s which exhibit little variation. See Appendix D, Table D5.

114. The eighth decile of the working male population received about the same share of total earnings in both years.

115. The richest 20 per cent compared to the poorest 20 per cent of the working male popuiation had 10 times the earnings in 1981 and 11.4 times in 1989.

These findings of an upward trend in earnings inequality for men and the relative stability in earnings inequality for women are similar not only in direction, but also in magnitude, to the findings of Morissette et al. (1993), see Table 6. Both, however, differ from the findings of Doiron and Barrett (1994). For women, Morissette et al. (1993) report a drop in the Gini Coefficient of 12 basis points compared to a drop of 8 basis points in this chapter, for the same period and same data set.[116] Doiron and Barrett (1994), however, find a substantially larger decline in earnings inequality for women between 1981 and 1988, with a drop in the Gini Coefficient of 20 basis points. Both Morissette et al. (1993) and Doiron and Barrett (1994) recode the last year, 1989 and 1988, respectively, which improves consistency with the SWH 1981 but makes the estimate in the last year more inaccurate. This study revises the 1981 data which not only improves the consistency between the two points in time, but also improves the accuracy of the 1981 estimates.

The rise in earnings inequality for men observed here is similar in direction and magnitude to the trend observed by Morissette et al. (1993). Morissette et al. (1993) report an increase in the Gini Coefficient of 13 basis points compared to 17 basis points reported here, for the same period. While the estimates of the trends in earnings inequality for men are similar for this study and Morissette et al. (1993), Doiron and Barrett (1994) report a decline in earnings inequality for men of about 9 basis points

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[116]. Note, however, that Morissette et al. (1993) use a slightly different population and income definition. Their population is all workers between the ages of 17 and 64 years; and their income definition captures workers with exclusively paid work, earning 2.5 per cent of the sex-specific mean annual earnings.

according to the Gini Coefficient. Doiron and Barrett (1994) use a different reference period, that of 1981 to 1988.[117] It is unlikely, however, that this difference can explain the discrepancy in results. Morissette et al. (1993), using the SCF data, provide estimates of earnings inequality in 1988 and 1989 which are only 2 basis points different in terms of the Gini Coefficient.

Comparison of trends in earnings inequality across countries is quite difficult because studies use different definitions of income, definitions of the population and indicators, although comparison with the United States is more straightforward in part because a large number of studies are now available. Earnings inequality increased for men in Canada during the 1980s only slightly less compared to the U.S. In the U.S., for men, between 1981 and 1987, the Gini Coefficient increased from .395 to .423, a change of .028, or about 1.2 per cent per year [see Appendix D, Table D5(c)]. In Canada, for men between 1981 and 1989, the Gini Coefficient increased from .354 to .380, an increase of .026, or about 0.9 per cent per year (using the SCF data which gives the larger increase). Note, however, that the Gini Coefficient for men increased between 1981 and 1986, from .3568 to .3784, a change of 22 basis points (using the SWH/LMAS data) as discussed in chapter 3. The increase in the Gini Coefficient over the period 1981 to 1986 for Canada is much closer to the increase in inequality recorded for the U.S.

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[117]. Further, the difference in mean earnings between 1981 and 1988 reported by Doiron and Barrett (1994) are substantially different than the findings of this study.

Comparison between trends in earnings inequality in Canada and other industrialized countries is much more difficult because studies use a variety of years, indicators, populations, treatment of outliers, and income definitions, making useful comparisons problematic. The LIS studies referred to in section 2, for the most part, have focused upon trends in inequality of total household income rather than individual employment earnings, the population and income concept used here.[118]

Estimates of earnings inequality for a variety of industrialized countries, for male heads of household, aged 25-54 years, have been generated using the LIS data set.[119] Selected results have been summarized in table form. See Table D5(d), Appendix D. Comparing these trends indicates that the annual increase in inequality in Canada was less than the increases experienced in the U.S. and in France but that inequality increased to a greater extent than in Finland and Israel. The annual percentage increase in male earnings inequality generated in this study is 0.8 which is slightly higher than the Gottschalk and Joyce (1995) [referred to in Smeeding (1995)] estimate of 0.7, which may be explained by differences in the population definition of the two studies.

In summary, trends in earnings inequality are quite different for women and men during the 1980s, with increases in earnings inequality for men and relative stability in earnings inequality for women. The distribution of earnings for women is characterized

118. See Fritzell (1992) for a comparison of family income inequality in various countries included in the LIS data set.

119. Smeeding (1995) reviews earnings inequality in various industrialized countries, including the work of Gottschalk and Joyce (1992, 1995). Table D5(d) in Appendix D summarizes some of these estimates of earnings inequality.

by increased polarization and the distribution of earnings for men became more upwardly skewed. In addition, men were made worse off during the 1980s in both relative and absolute terms. The increase in earnings inequality for men in Canada during the 1980s was large after the stability in earnings inequality experienced in the previous decade. The increase in earnings inequality for men was, however, smaller than the increase which occurred in the U.S. and in some other industrialized countries. Thus, the debate about increased earnings inequality is a debate about male labour market experiences, rather than women's.

Mean and median earnings increased only slightly over the decade which stands in sharp contrast to the large increase in average earnings occurring over the previous decade. These changes in the position and shape of the earnings distribution between 1981 and 1989 primarily occurred in the early part of the 1980s, rather than occurring uniformly over the decade, as will be discussed in chapter 3. Since the patterns of earnings inequality during the 1980s differed for men and women, all results will subsequently be discussed separately for men and women, without referring to the combined male and female population. The manner in which these trends depend upon certain measurement choices is assessed below.

4.3 DOES THE TREND IN EARNINGS INEQUALITY DEPEND UPON MEASUREMENT CHOICES?

4.3.1 The Choice of Method for Addressing Outliers?

Both researchers and statistical agencies affect the observed distribution of earnings: researchers through their various methods of excluding outliers and statistical agencies through their method of top-income coding. While statistical agencies implement top-coding to protect confidentiality, some researchers exclude outliers because they may unduly "bias" estimates of inequality. The methods used to exclude outlying observations may take a relative form, for example, the exclusion of the bottom 2 per cent of observations, or an absolute form, for example, the exclusion of all observations less than 5 per cent of average earnings.

Choices made by researchers to exclude certain high or low earnings observations, even though they may reflect the actual return to paid work for some individuals, reduce estimates of the degree of earnings inequality through the truncation of the tails of the earnings distribution. The impact of excluding outliers in both tails on estimates of earnings inequality will depend upon the number or percentage of observations excluded and their distribution within the tails. The impact on trends in inequality is unknown because it will depend upon the differences in the distributions of the affected observations at the two points in time. However, if over time the tails are becoming more elongated, then the exclusion of outliers will potentially underestimate the increase in earnings inequality.

The empirical impact of excluding outlying observations on estimates of earnings inequality is examined with respect to the use of a relative measure, and 1, 2, and 5 per cent of the top and bottom (weighted) observations are dropped from the sample. The impact of these choices on estimates of earnings inequality are presented in Appendix D, Tables D6 to D8 and highlights of these results are presented in Tables 3 and 4 in the text.

The exclusion of a certain percentage of top earnings observations has the result of underestimating the trend toward increased earnings inequality for men, and has little impact on the trend for women (Table 3). The amount of underestimation due to the exclusion of a certain percentage of top earnings observations depends upon the inequality indicator being used; the Theil or CV^2, for example, report larger degrees of underestimation. For example, for men, the absolute changes in various inequality indicators for the base case and when 2 per cent of the (weighted) observations are dropped are: .017 and .015 for the Gini Coefficient; and .061 and .034 for the CV^2 (Table 4). Excluding 2 per cent of the top observations for women does not noticeably affect estimates of trend in earnings inequality.

Excluding a certain percentage of bottom earnings observations does not have a noticeable impact on trends in earnings inequality for men, although for women, trends are underestimated according to most indicators. For example, the absolute change in the CV^2 is minus .013 when the bottom 2 per cent of observations are excluded and only minus .016 for the base case (Table 4); the difference for Atkinson (-1.0) is even larger.

The finding that dropping a percentage of top observations underestimates the increase in earnings inequality for men is an interesting result in the context of trends in earnings inequality in Canada during the 1980s. However, the application of this result to studies of Canada in another time period or to studies of other countries must be undertaken carefully since the conclusion depends upon the distribution of the affected observations and this is not constant over time oı place.

Top-income codes, like the exclusion of outliers, potentially result in the underestimation of earnings inequality at a point in time, and may underestimate trends if the tails become elongated. Underestimation of trends may occur if increases in the top-income code are small compared to the elongation of the tail over time. The degree to which inequality is underestimated will vary with level at which income is top-coded and hence the number of observations affected (i.e., the lower the code, the more observations affected and the greater the degree of underestimation of inequality). But the degree of underestimation will also depend upon the distribution of these observations in the excluded tail of the distribution, as is the case in excluding outliers.

The problem in comparing results across studies based upon different data sets is that the levels of top-coding are likely to differ. While the levels may be known, what is usually left unstated is the number of observations affected by the top earnings cut-off and their distribution. In addition, as in the U.S., the top-income codes are not revised annually but are only increased after an interval of several years, where the interval also varies over time (as discussed in section 2).

To assess the empirical importance of top-coding of income, a range of top income levels are used. In the U.S., in 1981, the top income code was $50,000. At the same time, median earnings for the population was about $10,000. Thus, one indicator of the nature of the top-income code is given by the ratio of top income code to median earnings, which in the case of the U.S. in 1981 is 5. This ratio is used to select three income levels at which incomes are top-coded and these are 3, 5, and 7 times the median earnings for the population in the given year. Observations greater than these 3 (5, or

7) times the median earnings are reduced to these values. Excluding a certain percentage of top and bottom observations potentially had similar impacts on trends in earnings inequality for men and women (although not empirically). However, the use of top-income codes will potentially affect trends in earnings inequality for men to a greater extent than women because a greater percentage of men have earnings larger than the top-income code, given that median earnings are taken for the population as a whole, rather than being the sex-specific median earnings.

Suppose that the top income indicator equal to five is implemented, given that this level is comparable to that in the U.S. This means that the top income code implemented in 1981 (in current dollars) is $61,690 and in 1989 is $96,233.[120] For men, in 1981, 21,897 (weighted) observations are affected, that is, have their earnings observations reduced to $61,690. This represents 0.3 per cent of the population. For men, in 1989, 42,054 (weighted) observations are affected by the top income code which represents about 0.7 per cent of the male population.

The implementation of top-coding does result in the underestimation of earnings inequality. First, the degree of underestimation is larger for men compared to women. For example, at the top coding level equal to 5, for women, the absolute change in the CV^2 is .012 (base case is .016) and for men, the absolute change is .042 (base case is .061). This result is not surprising given that there are greater percentage of male

[120]. The top income codes are derived as follows: in 1981 median earnings for the population was $12,338, so the top code is 5 times $12,338 which is $61,690, all in current dollars. In 1989, median earnings for the population was $19,247, so the top code is $96,233.

observations affected compared to female observations. For example, in 1989, 0.7 per cent of the weighted observations for men were affected by the top-coding at level 5 compared to 0.1 per cent of the female observations.

While, in general, the implementation of top-coding results in the underestimation of the increase in earnings inequality for men, some indicators exhibit greater sensitivity to this measurement choice than others. For example, for men, the base case where top coding is not implemented generates absolute changes in various indicators equal to: .017 for the Gini Coefficient; .022 for the Theil; and .061 for the CV^2. However, if top coding is implemented, at the level in the U.S. (i.e. top income equal to 5 times the median earnings), then the absolute changes in the indicators are: .016 for the Gini Coefficient; .018 for the Theil; and .042 for the CV^2; these results are summarized in Table 4.

The degree of underestimation also increases as the top code level is decreased. For example, if the top code is implemented at 3 (i.e. 3 times median earnings) then the Gini Coefficient reports an absolute increase in the Gini Coefficient of .011, compared to an absolute increase of .017 at the top code level of .017. Even at a top code level of 7, inequality indicators other than the Gini Coefficient report some underestimation.

So top-coding implemented at the levels used in the U.S. can result in the underestimation of earnings inequality. The exact result will depend, as is the case for the other measurement choices, not only on the inequality indicatoı used but also the distribution of the affected observations. In the case of top income coding, there is an additional confusion because the top income level is not revised upwards every year which results in an even greater underestimation of trends in earnings inequality. For example, the underestimation of earnings inequality would be greater if, in 1981, we used the top income indicator equal to 5 and in 1989, the top income indicator equal to 3. Alternatively, the trend is overestimated if there is a substantial increase in top-income code. For example, if in 1981, the data are top-coded at 3 and in 1989, the data are top-code at 5.

4.3.2 The Choice of Population Selected?

Apart from choosing how to define earnings, researchers also make decisions about which demographic groups (defined in terms of age and sex) to analyze. As noted in section 2, these choices have changed over time. Currently within the discipline it is accepted that labour market experiences of men and women should be analyzed separately. In the earnings inequality literature, two age groups have received particular attention, young workers [Myles et al. (1988) and prime age workers [Freeman and Needels (1993), Patrinos (1993a, 1993b). Studies such as Myles et al. (1988) have found that young workers in particular were adversely affected by labour market changes in the early 1980s; consequently, this group is separated out for closer examination here.

Many studies, such as those cited above, focus upon prime age workers on the grounds that this sub-group of the working population is relatively more homogeneous (particularly men), since they are more likely to have finished school, are not yet retired, and exhibit considerable labour force attachment. It could be argued that one test of the labour market changes of the 1980s is whether changes in earnings inequality are observed for this group of workers, in addition to younger and older workers. The same rationale is advanced for focusing upon the group of full-time/full-year workers where changes in the distribution of hours worked is less of factor in influencing changes in earnings inequality.

Thus, we consider the sub-group of full-time/full-year workers and the sub-groups of young and prime age workers for the reasons cited above, as well as for comparative purposes with other studies. Earnings inequality for more detailed age groups is undertaken in chapter 3. As already documented in section 4.2, it is important to disaggregate trends by gender since trends for men and women are quite different. At a given point in time, the degree of earnings inequality among young workers is expected to be greater than that for prime age workers, although relative trends cannot be predicted. Likewise, at a given point in time, the degree of earnings inequality among full-time/full-year workers is expected to be less than that for all workers. Again, trends cannot be predicted a priori. Empirically, clear differences in patterns of inequality over time between different age/sex groups emerge indicating that population selection is a critical determinant of trends in earnings inequality. Detailed evidence on earnings inequality for the two age groups and for full-time/full-year workers is presented in Appendix D, Tables D2, D9 and D10 and the highlights are presented in Table 5.

First, with respect to trends in earnings inequality for young workers, perhaps the most noticeable feature is that for young male workers (aged 17 to 24 years) earnings inequality declined slightly, whereas it increased for the population of all male workers. For example, for young male workers, earnings inequality declined, where the magnitude of the decrease depends upon the inequality indicator selected: the decline in the Gini Coefficient was insignificant but the Theil and CV^2 declined by 9 and 18 basis points, respectively. In comparison, for all male workers, earnings inequality increased by 17 basis points in terms of the Gini Coefficient. For young workers, there was quite a substantial increase in the polarization of earnings: for young women, the middle deciles (five through eight), lost about 2.1 percentage points of total earnings. For young men, the middle deciles (deciles four to eight), lost about 1.9 percentage points of total earnings [see Appendix D, Table D10]. Although the degree of earnings inequality remained about the same for young workers, real mean earnings for young workers dropped substantially during the 1980s. Real mean earnings dropped by $1,284 for women and $1,929 for men, aged 17-24 years (see Table 5).

Secondly, with respect to prime age workers, trends were more accentuated for prime age workers compared to all workers. The increase in earnings inequality was greater for male prime age workers than for all male workers, as indicated by an increase in the Gini Coefficient of 22 and 17 basis points, respectively (Table 5). For the prime age group of men, the top three deciles gained an additional 1.5 percentage points of total earnings, at the expense of the remaining deciles (Appendix D, Table D10).

Thirdly, with respect to full-time/full-year workers, the most striking result is that for women working full-time/full-year there was a substantial increase in earnings inequality, compared to the decrease in earnings inequality for all women workers. Earnings inequality increased by 18 basis points for full-time/full-year female workers, whereas it declined by 8 basis points for all female workers, in terms of the Gini

Coefficient (Table 5). The increase in inequality for full-time/full-year workers is observed for all indicators, although the increase is larger for the other indicators compared to the Gini Coefficient. For female full-time/full-year workers, real mean earnings increased by about the same amount as for all workers: $1,035 and $1,052, respectively (Table 5). It is likely that the factors causing the rise in male earnings inequality contribute to the increase in earnings inequality among women working full-time/full-year. However, the relative stability in earnings inequality among all women workers is likely due to changes in the amount of work performed by part-time women workers.

For full-time/full-year female workers, the top three deciles gained an additional 1.4 percentage points of total earnings, at the expense of the bottom 70 per cent of women working full-time/full-year (Appendix D, Table D10). The poorest 20 per cent of women working full-time/full-year were made worse off not only in relative terms, but also in absolute terms. The earnings cut-off for deciles one and two are lower in 1989 than in 1981 for full-time/full-year workers (Appendix D, Table D10).

For men working full-time/full-year, earnings inequality did increase but not as much as for the population of all male workers. While the increase in earnings inequality was smaller for male full-time/full-year workers, note that real mean earnings of full-time/full-year workers increased substantially more than for the entire male working population, an increase of $2,342 and $1,314, respectively. So men working full-time/full-year even in the poorest deciles were made better off over the 1980s which is in contrast to women in the comparable bottom two deciles (Appendix D, Table D10).

In summary, trends in earnings inequality differ critically depending upon the age, work status, and gender definition of the population. Firstly, we cannot generalize from the results based upon one sex to the experiences of the other. For example, while earnings inequality increased for the population of all workers, it was essentially due to the increase in earnings inequality for men, as earnings inequality for the group of all women workers remained roughly constant.

Trends in earnings inequality depend not only upon gender but the specific age sub-group of the population and on work status. With respect to age, the experiences of young workers in the labour market during the 1980s differed dramatically from all other workers. Real mean earnings of young workers declined during the 1980s, while they increased for all other population sub-groups considered; and earnings inequality declined slightly for young male workers compared to the increase in earnings inequality observed among all male workers. Trends for prime age workers tend to be slightly more accentuated than trends for all workers; and prime age men in the bottom two deciles in 1989 were worse off in absolute terms compared to their counterparts in 1981.

With respect to work status, the most striking observation is that earnings inequality increased for women working full-time/full-year whereas, earnings inequality actually declined for the group of all women workers. Women working full-time/full-year in 1989 in the bottom two deciles were worse off than their counterparts in 1981.

Thus, comparisons of estimates of earnings inequality from different studies within and across countries which use even slightly different definitions of the population in terms of age/sex sub-groups of the population and labour force attachment will be misleading, given the substantial variation in estimates of earnings inequality demonstrated here.

4.3.3 The Choice of Data Set?

Studies of earnings inequality use different data sets, a point most obvious in the case of cross-national studies. Consequently, differences in inequality estimates may arise from differences in sampling and measurement errors, as well as income definitions, top-coding, and other measurement issues. We do not have the data to examine the impact of differences in non-response rates, a common measurement error, on differences in estimates of trends in earnings inequality. However, by comparing results from the SWH/LMAS with those from the SCF, it is possible to assess the potential for the choice of data set to affect estimates of earnings inequality. Differences in estimates of earnings inequality derived from the SWH/LMAS and SCF should be minimal, given that the surveys are based upon the same sampling design and use similar definitions of income, as discussed in section 3. The nature of the trend in earnings inequality is the same in these similar surveys. The finding that several differences exist, however, should caution us from making sweeping generalizations across studies.

The comparison of results from the two data sets is interesting for another reason. As reported in section 3, there is a problem of inconsistency between the SWH and LMAS (minimized using the method discussed) which has called into question the reliability of trends derived from the SWH/LMAS. Confirming that trends from the SCF and SWH/LMAS are similar strengthens the argument to use the SWH/LMAS in further analyses of earnings inequality issues.

Detailed evidence of changes in earnings inequality generated from the SCF data is presented in Appendix D, Tables D2, D11 and D12 and the highlights are summarized in Table 2 in the text. In the SCF, the population is defined as all paid workers (class of worker categories 1 and 2), with positive wages and salaries, aged 17-69 years.

For paid workers, the trends toward increased earnings inequality for men and a decline for women observed in the SWH/LMAS is also found in the SCF. Hence, these trends are robust to the measurement choice between two frequently used Canadian data sets. Despite confirmation of these trends, there are at least two important differences in trends documented by the two data sets. Each of these points are elaborated upon below.

The SCF data, like the SWH/LMAS data, show that for paid workers, the increase in earnings inequality was primarily a male phenomenon (see Table 2). For the SCF data, the Gini Coefficients for male and female earnings, respectively, increased by 26 and declined by 4 basis points. These estimates are comparable to those of Morissette et al. (1993) who also used the SCF data. Morissette et al. (1993) report lower estimates of earnings inequality in each year, compared to this study (not shown in Table 6 but shown in Appendix D, Table D5). However, the changes in earnings inequality reported by the two studies are similar. Morissette et al. (1993) report that, according to the SCF data, the Gini Coefficient increased by 25 percentage points for men and declined by 7 percentage points for women; this compares to 26 and 4 percentage points found in this study (Table 6). The main difference between the two studies concerns the way in which the populations have been chosen. Morissette et al. (1993) choose all individuals aged 17 to 64 years, earning 2.5 per cent of the sex-specific mean annual earnings, with no self-employment earnings. The population of Morissette et al. (1993) is more homogeneous than the population used in this study. This is a plausible explanation of the lower estimates of earnings inequality at a point in time generated by Morissette et al. (1993).

While both the SWH/LMAS and SCF data sets indicate a similar trend in earnings inequality for paid workers, the magnitude of the changes in earnings inequality differ for men. The increase in earnings inequality for men is substantially greater according to the SCF data than for the SWH/LMAS data, with the Gini Coefficient indicating an absolute increase of 26 and 17 basis points, respectively, for the two data sets. The change in earnings inequality for women is reported as a decline of 8 and 4 basis points from the SWH/LMAS and SCF, respectively. Notice, however, that the difference between the SCF and SWH/LMAS for men in terms of the CV^2 is very large; the estimates of the absolute changes are .061 and .173 (Table 4).

So why should the SWH/LMAS and SCF generate different increases in earnings inequality for men? Part of the explanation may rest in the differences between the data sets in capturing observations in the upper tail of the distribution, as shown simply in the highest observations recorded in the two data sets:

Highest Earnings Observation (current dollars) for Men

	SWH/LMAS	SCF
1981	$131,984	$150,000
1989	$199,985	$925,172

In 1981, the highest earnings observation is similar in the two data sets. In 1989, however, the highest earnings observation is almost five times greater in the SCF compared to the SWH/LMAS, as shown above. Simple frequency distributions (Tables 7 and 8), show that, in 1989, the LMAS had 0.1 per cent observations greater than $150,000 and the SCF had 0.2 per cent of observations greater than $150,000, which does not appear to be much of a difference. To assess whether the capture by the SCF of a few, very large earnings observations affects estimates of earnings inequality, the Gini Coefficient was re-estimated after excluding all observations which are greater than the highest observations in the SWH/LMAS (i.e., $131,984 and $199,985 in 1981 and 1989, respectively). Excluding these observations results in an increase in the Gini Coefficient (for men) of 22 basis points compared to an increase of 26 basis points (Table 6).

This suggests, firstly, that the capture of a few (less than 0.1 per cent of the observations), very high earnings observations by the SCF in 1989, can partly account for the greater increase in earnings inequality in the SCF compared to the SWH/LMAS. Secondly, and more generally, trends in earnings inequality are very sensitive to differences among data sets in the capture of observations in the upper tail of the distribution, particularly if the CV^2 is chosen as the summary inequality indicator. Thus, complete or income non-response, can have considerable impact on trends in earnings inequality. This latter point is of concern for interpreting differences among countries in trends in earnings inequality which obviously are derived from different data sets.

While the magnitude of the increase in earnings inequality for men is considerably larger in the SCF compared to the SWH/LMAS, the increase in mean earnings is much smaller. Differences in the increase in real mean earnings (1981 to 1989) between the two data sets is greater for men than for women. The increase in real mean earnings (in 1986 dollars), are: for women, $1,092 in the SWH/LMAS and $1,242 for the SCF; and for men, $1,354 in the SWH/LMAS and only $109 in the SCF (summarized in Table 2). Median earnings for men (paid workers) actually declined between 1981 and 1989 according to the SCF data, although not in the SWH/LMAS [see Appendix D, Table D2]. Thus, choice of data set will affect the estimate of the extent of changes over time in mean annual earnings and also other considerations such as the change in the gender wage gap. In each year, the SWH/LMAS generates a smaller gender wage gap than the SCF. For example, in 1981, according to the SWH/LMAS, women's earnings as a proportion of men's earnings were .607 and according to the SCF were .546. Furthermore, while the gender wage gap declines according to both data sets, there is a more substantial decline according to the SCF.[121]

[121]. The estimate of the ratio of female to male annual earnings in a given year differs between the two data sets as shown below.

	SWH/LMAS (1986 dollars)		
	Women	Men	Women/Men
1981	13,394	22,060	.607

The SCF data, compared to the SWH/LMAS data, for a point in time, generate higher estimates of mean earnings for men. We explore below several features of the data which may lie behind this difference. First, examining frequency distributions of the earnings data for paid workers generated from the two data sets (Tables 7 and 8), provide an indication of why estimates of mean annual earnings differ.[122] In general, the SWH/LMAS record a greater percentage of lower earnings observations. For example, in 1981, for each of the earnings ranges between $1 and $20,000, the SWH/LMAS reports a higher percentage of observations compared to the SCF; this entire range accounts for about 65 per cent of all observations in the SWH and only 57 per cent in the SCF. In 1989, about 62 per cent of all observations in the LMAS are less than $30,000 compared to 58 per cent in the SCF. Thus, the greater percentage of observations of low earnings accounted for by the SWH 1981 and LMAS 1989 (relative to the SCF 1981 and 1989) contributes to the lower estimates of mean earnings in the SWH/LMAS compared to the SCF. This is in addition to the point made earlier, that the SCF captures a small number of very high earnings observations not captured by the SWH/LMAS.

1989	14,446	23,374	.618
	SCF (1986 dollars)		
	Women	Men	Women/Men
1981	13,575	24,885	.546
1989	14,817	24,994	.593

[122]. If we know the earnings level at which the discrepancy occurs this may also help in the identification of reasons why the sample sizes differ.

The difference in estimates of mean annual earnings generated by the two data sets is not, however, due just to the distribution of the earnings observations but may be related to the number and type of individuals being captured. As noted in section 3, the SCF definition of paid workers includes owner/operators of incorporated businesses, whereas the SWH/LMAS does not. To the extent that owner/operators of incorporated businesses have higher than average wages and salaries, this would raise mean earnings in the SCF. This point pertains to the SCF in both years under study.

What is even more interesting is that the group of paid workers as a percentage of the population aged 17 to 69 years in the SCF in 1989 is much higher than for the LMAS in 1989, 72.5 and 68.3 per cent, respectively (see Table 1). However, this is not simply a difference between the SCF and SWH since in 1981, both the SWH and SCF report the same percentage of the population involved in paid work, this being 69.3 per cent.

In summary, results from the two data sets agree that earnings inequality increased during the 1980s for male paid workers and declined for female paid workers. Thus, the fact of increased earnings inequality (for men) is robust to the choice between the two Canadian data sets. However, several qualifications are required. First, while both data sets indicate that earnings inequality increased for men during the 1980s, the degree to which earnings inequality increased does depend upon the data set employed, with the SCF generating larger increases. Second, the size of the increase in mean earnings for men differs substantially between the data sets, with the SWH/LMAS giving larger increases. The finding that two data sets, which are very similar in survey design and income concepts, generate differences in the magnitude of increases in real mean earnings and earnings inequality, indicates that attempts to compare changes in trends across countries should be undertaken with extreme caution.

4.3.4 The Choice of Definition of Earnings?

Empirical studies of earnings inequality typically use one of two definitions of earnings, namely, wages and salaries gained from paid employment and secondly (and less commonly), total earnings, which is the sum of earnings from paid employment and self-employment. In addition, however, it is possible to restrict the population being considered to those workers who are engaged exclusively in paid work.

There is little difference in earnings inequality trends for the population engaged exclusively in wage work and the broader population which combines paid work with self-employment, as discussed below with reference to the SWH/LMAS data. A comparison of inequality measures for workers exclusively engaged in paid work with those who may combine paid work with self-employment can be undertaken using the SWH/LMAS. The results are presented in detail in Appendix D, Tables D2 to D4 and summarized in Table 2. As shown in Table 2, the increase in earnings inequality for men is 17 basis points, regardless of the definition of paid work used.

The impact of excluding self-employment earnings from the definition of earnings does underestimate trends in earnings inequality, as expected. As suggested in section 2, the exclusion of self-employment earnings from the definition of earnings potentially underestimates the increase in earnings inequality. The potential for underestimation arises from the combination of two points, the increase in the percentage of the population classified as being self-employed, and secondly, the degree of earnings inequality at a point in time is greater when earnings are defined as including self-employment earnings. The SCF data permit the examination of the impact of including self-employment earnings with wages and salaries on estimates of earnings inequality, and these results are presented in Appendix D, Tables D2, D10 and D11 and summarized in Table 2.

Inequality estimates are calculated for total earnings where total earnings is the sum of wages and salaries and total self-employment earnings, for the age range 17 to 69 years.[123] For individuals with paid work, the wages and salaries variable is only positive; for individuals with self-employment, the total self-employment earnings can be negative or positive. In using the total earnings data (wages and salaries plus self-employment earnings), two groups of studies can be distinguished: those which restrict the sample to individuals for whom total earnings are positive, so that the full set of inequality indicators can be estimated; and those studies which include individuals with positive and negative total earnings, in which case only a selection of inequality indicators (the ones which do not require taking logs) are estimated.[124] The percentage

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[123]. The variable, total self-employment earnings, provided in the SCF data is itself the sum of three types of self-employment earnings, namely: net income from non-farm self-employment; net income from farm self-employment; and net income from roomers and boarders, as noted in Section 3. As noted previously, owners of incorporated businesses who report wages and salaries are included as paid workers; consequently, the number of self-employed workers is less than otherwise expected.

[124]. The populations of (i) paid workers and (ii) paid workers and self-employed workers differ not just because of the inclusion of workers with (exclusively) self-

of cases with negative total earnings is quite small, always less than 0.7 per cent. The number of unweighted cases with negative total earnings is: in 1981, 61 for women, and 198 for men; and in 1989, 82 for women and 189 for men.

The degree to which inequality is underestimated due to the exclusion of self-employment earnings depends upon the indicator being used. The degree of underestimation is much more noticeable if the Theil and CV^2 indicators are used, rather than the Gini Coefficient. For example, as shown in Table 4, for men, the absolute changes in the inequality indicators for wages and salaries and then wages and salaries plus self-employment earnings are, respectively: .026 and .027 for the Gini; .039 and .052 for the Theil. Notice the particularly large underestimation when the CV^2 is used, .173 and .387. The absolute change in the CV^2, in particular, may be affected by differences in the two years in capture of a few very high values of self-employment earnings. For men, the highest value of self-employment earnings in the SCF in 1989 is 6.6 times greater than the highest value in 1981 ($1,000,000 and $150,557, respectively), although the percentage of observations with very high values in both years is small: only 0.1 per cent of observations in 1989 are greater than $150,000 [see the frequency distributions presented in Tables 8 and 9].

Examining the distribution in a more disaggregated manner, for men, when earnings are defined as the sum of wages and salaries and self-employment earnings, the

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employment earnings but because the latter group will also include individuals with wages/salaries who do not classify themselves as paid workers (i.e. who classify themselves other than class of worker (cow)=1,2).

top decile gains an additional 2.3 percentage points of total earnings over the 1980s, compared to 1.9 percentage points when only wages and salaries are considered

The exclusion of self-employment earnings results in the underestimation of earnings inequality and, in addition, results in the underestimation of the increase in mean earnings. For example, for men, the increase in real mean earnings for wages and salaries plus self-employment for men is $408 compared to $109 for wages and salaries alone.

In summary, empirically, trends in earnings inequality are underestimated if earnings are defined solely as wages and salaries with the exclusion of self-employment earnings The degree of underestimation is greater when earnings inequality is measured by indicators such as the Theil and CV^2 compared to the Gini Coefficient.

4.3.5 Summary of the Impact of Measurement Choices on Trends in Earnings Inequality

The empirical impact of measurement choices on trends in earnings inequality is summarized in Figure 2 and Table 4 The critical measurement choice concerns that of population definition To take the most obvious example, the decision to disaggregate trends by gender demonstrates that the trend toward increased earnings inequality for the population masks the trends toward increased inequality for men and decreased inequality among all women workers. In Canada, at least, the phenomenon of the trend toward increased earnings inequality only becomes apparent if the data are analyzed separately for men and women Further, the issue of increased earnings inequality is one pertaining to men's labour market experiences. However, if researchers choose to define the population in terms of work status, then increased earnings inequality also emerges as an issue for full-time/full-year workers. For men, population definition also matters as earnings inequality declined for young male workers and increased for all male workers. It is particularly interesting that the increase in earnings inequality for the population of prime age male workers (25-54 years) is typically double that of all full-time/full-year male workers. Yet, researchers may think of prime age male workers and full-time/full-year workers as being synonomous.

Given the importance of population selection, we then ask whether trends in earnings inequality are robust to measurement choices, for a given population definition. For all women workers, all inequality indicators reported a decline in earnings inequality but the some of the changes were not statistically significant and therefore, the trend was reported as being relatively stable. The changes are robust to the measurement choices considered. Earnings inequality declined regardless of choices concerning the treatment of outliers, the definition of earnings, the data set, and inequality indicator. Likewise for all men workers, the trend of increasing earnings inequality during the 1980s is also robust to the measurement choices examined here. Earnings inequality increased regardless of how earnings are defined, the data set selected, and the treatment of outliers.

For both women and men, the magnitude of the changes in earnings inequality during the 1980s depends upon each of these measurement choices and this finding should caution researchers against forming detailed conclusions about the ranking of countries in terms of changes in earnings inequality. In particular, the choice of inequality indicator influences the magnitude of the change, with typically the Theil Entropy and CV^2 reporting much larger increases than the Gini Coefficient. Choices about top-coding of income, income definition and data set all influence the magnitude of trends in earnings inequality. Which measurement choice has the largest impact on trends in earnings inequality depends upon the inequality indicator selected.

4.4 WHICH MEASUREMENT CHOICES AFFECT ESTIMATES OF EARNINGS INEQUALITY AT A POINT IN TIME (1989)?

The various measurement choices affect estimates of earnings inequality at a point in time. Since many of these points have been raised in the context of discussing the empirical impact of measurement choices on trends in inequality, only a brief summary is provided here. Table 10 provides a review of inequality estimates for various measurement choices and inequality indicators for the year 1989 and Figure 2 summarizes the conclusions.

The SCF generates larger inequality estimates in 1989 than the LMAS data for men; for women, the relative sizes of estimates depends upon the inequality indicator.

With respect to definition of income, the decision to exclude self-employment earnings results in the underestimation of earnings inequality in 1989, for both women and men, regardless of indicator. For some indicators, the differences in the inequality estimates is sizeable; for example, for men, the Theil is .2417 for wages and salaries and .2866 for the sum of wages and salaries and self-employment earnings.

As in the case of interpreting trends in earnings inequality, the decision regarding population definition has a critical influence on estimates of earnings inequality in 1989.

For example, the decision about work status has a sizeable impact on the degree of inequality for women; the Gini Coefficient for all female workers compared to full-time/full-year female workers is .4158 and .2576 for the two groups, respectively. As suggested in section 2 (see summary in Figure 1), the degree of earnings inequality for full-time/full-year workers and prime age workers is less than that for all workers and the reverse for young workers. Estimates of earnings inequality vary considerably with the population sub-group selected, as indicated by a range in the Gini Coefficients from .2493 for male full-time/full-year workers to a high of .4527 for the group of young male workers.

The three methods of dealing with outlying observations all have the effect of reducing earnings inequality at a point in time. Dropping even 1 per cent of the top earnings observations has a noticeable impact on the degree of earnings inequality across all indicators. For example, the Gini Coefficient for men is .3742 with all observations and .3607 with top 1 per cent of observations excluded; this difference of .014 is almost the same magnitude as the increase in earnings inequality experienced by men during the 1980s. Although not shown in the summary tables, it must be the case that the greater percentage of top or bottom observations excluded, the lower the degree of earnings inequality.

The impact of these measurement choices on estimates of earnings inequality also varies according to the inequality indicator. Indicators such as the Theil and CV^2 show greater differences in inequality for a change in measurement choice than the Gini Coefficient.

In summary, at a point in time, clearly population definitions are critical in determining the degree of earnings inequality. However, for a given population, there exists considerable variation in estimates of inequality depending upon choices about income definition, data set, and treatment of outliers.

5.0 CONCLUSIONS

Trends in earnings inequality documented in this chapter signal a new era in labour market processes and more generally in society. During the 1980s there were substantial increases in earnings inequality among all male workers and among women full-time/full-year workers. This finding, which is consistent with results of other studies such as Morissette et al. (1993) although contrary to Doiron and Barrett (1994), supports the generally held perception of greater inequality within the Canadian labour market. Increases in earnings inequality have been experienced in other industrialized countries such as the U.S., U.K. and France. In comparison, the increased inequality in Canada has not been quite as severe. While average earnings increased marginally during the 1980s, certain groups of workers, such as young workers and the poorest 20 per cent of women working full-time/full-year were worse off both in relative and absolute terms. This phenomenon of an increase in earnings inequality and constant mean earnings is striking because it is a sharp departure from the relative stability of earnings inequality and substantial increase in mean earnings of the previous decade and represents, more generally, the end to growing prosperity and equality experienced previously. These trends are indicative of the transformation of labour market processes including rising unemployment and greater prevalence of casual work, which are discussed in chapter 3.

While this chapter is a case study primarily of trends in earnings inequality in Canada during the 1980s, it also provides the opportunity to reflect upon the practice of economics, albeit upon only one step of the research process, this being the generation of facts. The analysis of the potential variation and the demonstrated empirical variation in trends in earnings inequality resulting from various measurement choices (sections 2 and 4 respectively), is illustrative of the general point that "facts" about economic phenomena are socially constructed.

Even after deciding to focus upon the distribution of returns to work among individuals, rather than the distribution of welfare among families, researchers make a variety of choices about how to measure inequality which stem from personal preferences given the parameters of acceptability within the discipline. Economists conventionally choose to focus upon the distribution of the returns to paid work, given the preoccupation of neoclassical economists with market-related work. A further decision is then made to focus upon monetary earnings from a waged job rather than the comprehensive returns to waged work which would include benefits and returns to self-employment. This focus is typically due to data constraints and, conceptually, to the focus of labour economists on the capital-labour relationship exemplified in the marginal productivity theory.

Further choices are made by researchers concerning the population definition which today is typically defined in terms of gender, age, and work status, although these choices are socially and historically determined since, in previous decades, religion and geographical location would have been critical dimensions. The analyses undertaken indicate that trends in inequality depend critically on choices made by researchers concerning the research question and population which consequently affect our understanding of inequality within Canadian society.

For a given population sub-group defined by gender, age and work status, trends in earnings inequality are quite robust to other measurement choices. However, the magnitude of the changes in earnings inequality differ substantially depending upon the measurement choice. While the inequality literature shows clearly that the choice of inequality indicator affects trends in inequality in a country and ranking of countries, the preceding analysis demonstrates likewise that researchers' decisions about the treatment of outliers and income concept and the use of data which has been top-coded are important.

These results indicate the importance of being aware of how facts about earnings inequality have been constructed, particularly for interpreting cross-national trends in earnings inequality which have been derived without consistency in measurement choices. Extrapolating from this conclusion regarding the Canadian situation suggests, for example, that the increase in earnings inequality in the U.S. is actually underestimated due to the implementation of top-income coding; although one cannot be definitive because of differences in the percentage of observations affected and the distribution of these affected observations. This conclusion does not imply in this case that the ranking of trends in earnings inequality for Canada and the U.S. should be reversed but that the difference between the increase in earnings inequality in Canada and the U.S. is actually larger than studies suggest because the U.S. data have been subjected to top-coding and the Canadian data have not. The increase in earnings inequality in other countries may actually be greater than estimated if top-income coding has been implemented.

Estimates of earnings inequality at a point in time are even more sensitive to measurement choices than trends over time making cross-national comparisons at a point in time completely suspect. In terms of income definition, the exclusion of self-employment earnings underestimates the degree of earnings inequality. The choice of data set affects earnings inequality, with the SCF generating larger estimates of earnings inequality relative to the SWH/LMAS, for men. Population definition was shown to have a substantial impact on earnings inequality with larger estimates of inequality for all workers compared with prime age and full-time/full-year workers, and women compared to men. The various methods of treating outlying observations were shown to affect estimates of earnings inequality, which was noticeable even with the exclusion of only the top or bottom 1 per cent of observations.

The analysis sets the stage for the subsequent exploration of causes of changes in earnings inequality in chapters 3 and 4. Thinking ahead to this task, several conclusions are relevant. First, the SWH/LMAS data can be considered as an adequate source of data for examining trends in earnings inequality. The data for selected variables in 1981 are revised using the method presented in section 3, where these variables are annual earnings, hourly wage rates, annual hours worked, and annual weeks worked. The "best" estimate of each of these variables not only improves the accuracy of the estimates of earnings inequality in 1981 but, also, the consistency between 1981 and 1989 which represents an important advancement in the literature. The trends in earnings inequality derived from the SWH/LMAS are comparable to those from the SCF, although the magnitude of the increase in earnings inequality for men is less according to the SWH/LMAS. Thus, the SWH/LMAS is used in subsequent analysis given that it provides comparable trends to the alternative data set and more accurate data on hourly wage rates and annual hours worked.

The analysis has identified the population groups for whom changes in the returns to work have been particularly dramatic during the 1980s and the nature of these changes. Consequently, in the following chapter, we are concerned with examining returns to work of specific population groups. Causes of increased earnings inequality among all male workers and full-time/full-year female workers are explored, along with the decline of real mean earnings for young workers. Further, with respect to subsequent analysis, increases in earnings inequality for the population of all male workers and full-time/full-year workers were observed regardless of measurement choices concerning treatment of outliers and inequality indicators. With respect to outliers, there is no reason to think that, for example, the high earnings observations are in any way biased, so no observations are excluded. Since the inequality indicators generate differences in the magnitude of the increase in earnings inequality, the analysis will continue to use a variety of indicators.

As a case study of earnings inequality in Canada during the 1980s, this chapter undertook an analysis of how measurement choices affect our understanding of inequality and why certain choices are made. At the practical level, it has argued that certain choices result in better approximations of changes in inequality of the returns to individual work effort. This then lays the foundations for subsequent analysis of why increased inequality has occurred.

At a more abstract level, the case study, through the examination of factors contributing to certain choices and the impact of these choices, is used to question the position that data and facts exist in an independent, objective, and value-free manner. Arguing that facts are social constructions and potentially biased does not necessarily require the rejection of an empiricist epistemology. It does, however, call for a more critical and reasoned empiricist approach and evolution in the dominant positivist epistemology of neoclassical economics. Such an evolution at minimum requires that measurement choices are explained and justified, and requires greater self-awareness of the impact of theoretical preconceptions and predispositions of the discipline. It may however, require outsiders to assess the influence of the social context, to borrow Schumpeter's phrase, on our "subconscious craving to see things in a certain light".

FIGURE 1

POTENTIAL IMPACT OF MEASUREMENT CHOICES ON ESTIMATES OF EARNINGS INEQUALITY

MEASUREMENT CHOICE	POTENTIAL IMPACT ON EARNINGS INEQUALITY		EMPIRICALLY ASSESSED?
	Point in Time	Trend	
1. EARNINGS DEFINITION			
Non-wage compensation excluded	•underestimation	•underestimation	No: insufficient micro data
Self-employment earnings excluded	•underestimation	•underestimation	Yes: Chapter 2
Time period	•exact years matter •annual > hourly	•unknown •unknown	Yes: Chapter 2 chooses similiar points in business cycle, see also Chapter 3 Yes: Chapter 2 (annual); Chapter 3 (hourly).
2. TREATMENT OF OUTLIERS			
Exclusion of % Top or Bottom Observation	•underestimation	• probably underestimation	Yes: Chapter 2
Top-income codes	•underestimation	• probably underestimation	Yes: Chapter 2
3. POPULATION DEFINITION			
Gender	•women > men	•unknown	Yes: throughout thesis
Age	•smaller the age range, smaller the inequality; e.g. prime age < all	•unknown	Yes: Chapter 2 (youth, prime age) Chapter 3 (detailed age categories)
Work Status	•FT/FY < All	•unknown	Yes: Chapter 2

FIGURE 1 continued

POTENTIAL IMPACT OF MEASUREMENT CHOICES ON ESTIMATES OF EARNINGS INEQUALITY

MEASUREMENT CHOICE	POTENTIAL IMPACT ON EARNINGS INEQUALITY		EMPIRICALLY ASSESSED?
	Point in Time	Trend	
4. INEQUALITY INDICATORS			
	N/A	•indicators sensitive to transfers in tails report larger increases	Yes: Chapter 2
5. MEASUREMENT ERROR			
Non-response at data collection stage	•underestimation	•underestimation	No: insufficient micro data
6. DATA SET			
SCF compared with SWH/LMAS	•unknown	•unknown	Yes: Chapter 2

FIGURE 2

EMPIRICAL IMPACT OF MEASUREMENT CHOICES ON EARNINGS INEQUALITY

MEASUREMENT CHOICE	**EMPIRICAL IMPACT**		
	Point in Time	**Trend**	
		Women	**Men**
1. TREATMENT OF OUTLIERS			
Exclusion of Top % Observations	•underestimation	•little impact	•underestimates the increase
Exclusion of Bottom % Observations	•underestimation	•impact depends on indicator	•little impact
Implementation of Top Code	•underestimation	•under or over estimates depending on level	•underestimates the increase
2. POPULATION DEFINITION			
Gender	•women larger than men	•decreased	•increased
Age - 17-24 years	•larger for young than all with exception of Atk (-1 0)	•stable inequality, large decrease in means	
Age - 25-54 years	•smaller for prime age than all workers	•more accentuated than for all workers	
FT/FY Workers	•smaller for FT/FY compared to all workers	•increased	•increased but less than for all workers

FIGURE 2 continued

EMPIRICAL IMPACT OF MEASUREMENT CHOICES ON EARNINGS INEQUALITY

MEASUREMENT CHOICE	EMPIRICAL IMPACT		
	Point in Time	Trend	
		Women	Men
3. EARNINGS DEFINITION			
Exclusion of Self-employment	•underestimation	•depends on indicator	•underestimation of increase
Time Period		Chapter 3	
4. DATA SET			
SCF compared to SWH/LMAS	•women - depends on indicator •men - SCF larger	•SCF smaller decline	•SCF larger increase

TABLE 1

Population Sizes of the SWH 1981/LMAS 1989 and SCF 1981/1989

	SWH/LMAS				SCF			
	1981		1989		1981		1989	
	Cases[1]	%	Cases[1]	%	Cases[1]	%	Cases[1]	%
Total Pop., 17-69 yrs	16,119,664	100.0	17,833,490	100.0	16,335,161	100.0	17,940,227	100.0
With Paid Work	11,177,512	69.3	12,188,632	68.3	11,318,768	69.3	13,003,716	72.5
By Number of Jobs	11,177,512	100.0	12,188,632	100.0	N/A	N/A	N/A	N/A
Job 1	11,017,724	98.5	11,911,713	97.7				
Job 2	1,692,651	15.1	2,650,918	21.7				
Job 3	297,408	2.7	691,219	5.7				
Job 4	68,354	0.6	149,888	1.2				
Job 5	N/A	N/A	35,049	0.3				
With Paid Work and/or Self-employment								
All	N/A	N/A	N/A	N/A	12,479,790	76.4	14,237,024	79.4
Positive[2]					12,432,701	76.1	14,183,999	79.4

Notes:
1. Weighted number of cases
2. Sum of wages/salaries and self-employment earnings is positive

TABLE 2

Summary of Estimates of Earnings Inequality, Definitions of Earnings, and Data Sets, Women and Men, 1981 and 1989

	Mean Earnings (1986$)			Gini Coefficient		
	1981	1989	Change	1981	1989	Change
WOMEN						
SWH/LMAS						
Exclusively Paid Work	13,485	14,577	1,092	.4210	0.4121	-0.009
Paid Work	13,394	14,446	1,052	.4237	0.4158	-0.008
SCF						
Paid Work	13,575	14,817	1,242	.4185	.4141	-.004
Paid Work + Self-employ						
All	13,190	14,660	1,470	.4362	.4285	-.008
Positive	13,239	14,717	1,478	.4334	.4254	-.008
MEN						
SWH/LMAS						
Exclusively Paid Work	22,272	23,626	1,354	.3528	.3697	+.017
Paid Work	22,060	23,374	1,314	.3568	.3742	+.017
SFC						
Paid Work	24,885	24,994	109	.3536	.3800	+.026
Paid Work + Self-employ						
All	24,495	24,903	408	.3732	.4003	+.027
Positive	24,635	25,047	412	.3686	.3958	+.027
Paid Work excl. top observations[1]	24,878	24,765	113	.3534	.3749	+ 022

Notes: See Appendix D, Tables D2 to D4, D11 and D12 for details

1. Earnings observations greater than $131,984 and $199,985 in 1981 and 1989, respectively, are excluded, where these levels represent the highest earnings observations in the SWH/LMAS data (for men)

TABLE 3

Summary of Estimates of Earnings Inequality,
Excluding Outlying Observations, Women and Men, 1981 and 1989

Exclusion of Outlying Observations	Mean Earnings (1986$)			Gini Coefficient		
	1981	1989	Change	1981	1989	Change
WOMEN	13,394	14,446	1,052	.4237	.4158	-.008
Exclusion of Top Observations						
1%	12,924	13,936	1,012	.4113	.4028	-.009
2%	12,620	13,596	976	.4055	.3962	-.009
5%	11,902	12,803	901	.3953	.3836	-.012
Exclusion of Bottom Observations						
1%	13,527	14,587	1,060	.4181	.4102	-.008
2%	13,663	14,732	1,069	.4125	.4046	-.008
5%	14,075	15,169	1,094	.3959	.3885	-.007
Top Income Code/Median						
3	13,283	14,305	1,022	.4190	.4101	-.009
5	13,370	14,421	1,051	.4227	.4148	-.008
7	13,388	14,443	1,055	.4235	.4157	-.008
MEN	22,060	23,374	1,314	.3568	.3742	.017
Exclusion of Top Observations						
1%	21,447	22,613	1,166	.3456	.3607	.015
2%	21,044	22,150	1,106	.3401	.3546	.015
5%	20,098	21,071	973	.3303	.3437	.013
Exclusion of Bottom Observations						
1%	22,279	23,607	1,328	.3506	.3681	.018
2%	22,501	23,839	1,338	.3443	.3621	.018
5%	23,164	24,541	1,377	.3263	.3448	.019
Top Income Code/Median						
3	21,532	22,551	1,019	.3415	.3522	.011
5	21,982	23,221	1,239	.3546	.3701	.016
7	22,039	23,334	1,295	.3562	.3731	.017

TABLE 4

Summary of Change in Earnings Inequality, 1981 to 1989,
For Various Measurement Choices, Women and Men

	Absolute Change					Percentage Change				
	Gini	Theil	CV^2	A.5	A$^-$1.0	Gini	Theil	CV^2	A.5	A$^-$1.0
WOMEN										
DATA SET										
SWH/LMAS - Wages/Salaries	-.008	-.014	-.016	-.010	-0.35	-1.9	-4.5	-2.5	-6.2	-4.5
SCF - Wages/Salaries	-.004	-.005	-.002	-.004	-.001	-1.1	-1.8	-0.4	-2.3	0.1
INCOME DEFINITION										
SCF - Wages/Salaries + Self-empl.	-.008	-.010	.008	-.008	-.018	-1.8	-3.1	1.2	-4.6	-2.2
POPULATION DEFINITION										
SWH/LMAS - FT/FY Workers	.018	.014	.031	.007	.035	7.6	14.4	13.6	14.8	17.8
- 17-24 years	-.007	-.019	-.046	-.015	-.038	-1.6	-5.4	-5.8	-7.8	-4.9
- 25-54 years	-.014	-.019	-.024	-.013	-.046	-3.5	-7.2	-4.4	-8.9	-6.0
TREATMENT OF OUTLIERS										
SWH/LMAS - Exclude Top 2%	-.009	-.015	-.017	-.011	-.037	-.2.3	-5.6	-3.2	-7.3	-4.8
- Exclude Bottom 2%	-.008	-.013	-.013	-.010	-.063	-1.9	-4.5	-2.1	-6.3	-9.8
- Top code 5	-.008	-.013	-.012	-.010	-.035	-1.9	-4.4	-1.9	-6.2	-4.5

TABLE 4 continued

Summary of Change in Earnings Inequality, 1981 to 1989,
For Various Measurement Choices, Women and Men

	Absolute Change					Percentage Change				
	Gini	Theil	CV^2	A.5	A1.0	Gini	Theil	CV^2	A.5	A1.0
MEN										
DATA SET										
SWH/LMAS - Wages/Salaries	.017	.022	.061	.010	.015	4.9	9.8	13.9	8.1	2.0
SCF - Wages/Salaries	.026	.039	.173	.016	-.035	7.4	17.8	41.2	13.3	-4.5
INCOME DEFINITION										
SCF - Wages/Salaries + Self-empl.	.027	.052	.387	.018	-.036	7.3	22.3	81.8	14.1	-4.6
POPULATION DEFINITION										
SWH/LMAS - FT/FY Workers	.010	.010	.033	.004	.000	4.3	10.9	15.8	9.1	.000
- 17-24 years	-.001	-.009	-.018	-.009	-.051	-0.3	-2.6	-2.4	-5.0	-6.6
- 25-54 years	.022	.025	.059	.013	.128	7.5	17.0	20.3	16.9	24.9
TREATMENT OF OUTLIERS										
SWH/LMAS - Exclude Top 2%	.015	.016	.034	.008	.013	4.3	7.8	9.5	6.7	1.9
- Exclude Bottom 2%	.018	.022	.060	.010	.014	5.2	10.7	14.6	9.3	2.6
- Top code 5	.016	.018	.042	.008	.014	4.2	8.2	10.2	7.0	1.9

TABLE 5

Summary of Estimates of Earnings Inequality, Population Definitions, Women and Men, 1981 and 1989

Population Definition	Mean Earnings (1986 $)			Gini Coefficient		
	1981	1989	Change	1981	1989	Change
WOMEN						
FT/FY Workers	20,581	21,616	1,035	.2395	.2576	.018
All Workers - 17-24 yrs	9,494	8,210	-1,284	.4572	.4500	-.007
- 25-54 yrs	15,162	16,368	1,206	.3948	.3811	-.014
- 17-69 yrs	13,394	14,446	1,052	.4237	.4158	-.008
MEN						
FT/FY Workers	28,167	30,509	2,342	.2390	.2493	.010
All Workers - 17-24 yrs	12,377	10,448	-1,929	.4541	.4527	-.001
- 25-54 yrs	26,058	26,919	861	.2890	.3107	.022
- 17-69 yrs	22,060	23,374	1,314	.3568	.3742	.017

Note: See Appendix D, Tables D2 to D4, and D9 for details.

TABLE 6
Changes in Gini Coefficients, 1981 - 1989, Paid Workers, Selected Studies, Women and Men

SWH/LMAS DATA			
	MacPhail 1981- 89	Morissette et al.	Doiron/Barrett 1981 - 88
Women	-.008	-.012	-.020
Men	+.017	+.013	-.009
Population	+.009	N/A	-.009

SCF DATA			
	MacPhail 1981 - 89	Morissette et al. 1981 - 89	MacPhail 1981 - 89 excl. top obs.
Women	-.004	-.007	-
Men	+.026	+.025	+.022

Note: See notes accompanying Apppend.x D, Table D5.

TABLE 7

Frequency Distribution of Wages and Salaries[1].
Women and Men, 1981 and 1989, SWH/LMAS Data

Current $	Women		Men	
	1981	1989	1981	1989
0 - 5,000	31.9	19.9	15.3	11.1
5,001 - 10,000	22.9	16.5	13.9	9.4
10,001 - 15,000	21.8	16.1	17.5	8.7
15,001 - 20,000	12.8	14.1	18.2	9.5
20,001 - 25,000	5.8	12.6	15.2	11.0
25,001 - 30,000	2.7	7.8	10.4	12.1
30,001 - 35,000	1.1	4.8	4.3	10.4
35,001 - 40,000	0.4	3.1	2.0	8.0
40,001 - 50,000	0.4	3.1	2.1	10.6
50,001 - 75,000	0.1	1.8	0.8	7.6
75,001 - 100,000	0.0	0.2	0.1	1.2
100,001 - 150,000	0.0	0.1	0.1	0.5
150,001 - 200,000	0.0	-	-	0.1
200,001 - 230,000	-	-	-	0.0
230,001 -	-	-	-	-
Min.	$5	$6	$11	$13
Max.	$160,000	$148,773	$131,984	$228,442
Mean	$10,112	$16,468	$16,655	$26,646
Nw[2]	4,869,926	5,722,973	6,307,586	6,465,659

Notes: 1. The population is all workers aged 17 - 69 years, with positive earnings from paid work.
2. Number of weighted cases.

TABLE 8

Frequency Distribution of Wages and Salaries[1].
Women and Men, 1981 and 1989, SCF Data

Current $	Women		Men	
	1981	1989	1981	1989
0 - 5,000	31.7	20.1	14.1	10.5
5,001 - 10,000	22.8	15.7	12.1	9.4
10,001 - 15,000	21.8	14.7	13.5	9.0
15,001 - 20,000	12.9	14.2	17.3	8.5
20,001 - 25,000	5.7	12.9	16.2	10.0
25,001 - 30,000	3.1	8.4	11.4	10.3
30,001 - 35,000	1.1	5.1	7.0	10.6
35,001 - 40,000	0.5	3.8	3.7	8.8
40,001 - 50,000	0.2	3.1	4.4	12.0
50,001 - 75,000	0.1	1.8	1.1	8.8
75,001 - 100,000	-	0.2	0.2	1.5
100,001 - 150,000	-	0.0	0.1	0.6
150,001 - 200,000	-	-	-	0.1
200,001 - 230,000	-	-	-	0.0
230,001 -	-	-	-	0.1
Min.	$3	$16	$3	$18
Max.	$70,000	$134,044	$150,000	$925,172
Mean	$10,249	$16,891	$18,788	$28,493
Nw[2]	4,923,647	6,046,890	6,395,121	6,956,826

Notes: 1. The population is all workers aged 17 - 69 years, who are paid workers (class of workers = 1,2), and positive wages/salaries.
2. Number of weighted cases.

TABLE 9

Frequency Distribution of Wages and Salaries plus Self-employment Earnings[1], Women and Men, 1981 and 1989, SCF Data

Current $	Women		Men	
	1981	1989	1981	1989
0 - 5,000	0.1	0.1	0.2	0.2
-4,999 - -2,500	0.1	0.0	0.1	0.1
-2,499 - -1	0.2	0.2	0.2	0.2
1 - 5,000	33.5	20.9	14.9	10.6
5,001 - 10,000	22.4	16.0	13.0	9.9
10,001 - 15,000	21.0	14.7	13.7	9.5
15,001 - 20,000	12.3	13.8	16.8	8.6
20,001 - 25,000	5.5	12.3	15.2	9.9
25,001 - 30,000	3.0	8.2	10.7	9.9
30,001 - 35,000	1.1	5.0	6.5	10.0
35,001 - 40,000	0.5	3.6	3.6	8.3
40,001 - 50,000	0.2	3.0	3.4	11.5
50,001 - 75,000	0.2	1.9	1.3	8.7
75,001 - 100,000	0.0	0.3	0.3	1.5
100,001 - 150,000	0.0	0.0	0.1	0.7
150,001 - 200,000	-	0.0	0.0	0.1
200,001 - 230,000	-	0.0	-	0.0
230,001 - 300,000	-	-	-	0.0
300,001 - 600,000	-	-	-	0.0
600,001 -	-	-	-	0.0
Min.	$-11,362	$-80,000	$-62,000	$-80,000
Max.	$110,000	$223,000	$150,557	$1,000,000
Mean	$9,958	$16,712	$18,493	$28,390
Nw[2]	5,306,933	6,481,452	7,172,857	7,755,572

Notes: 1. The population is all workers aged 17 - 69 years, with earnings from wages and salaries and/or self-employment.
2. Number of weighted cases.

TABLE 10

Summary of Earnings Inequality in 1989,
For Various Measurement Choices,
Women and Men

WOMEN

	Atk(.5)	Atk(-1.0)	Gini	Theil	CV^2
Base Case					
SWH/LMAS Wages/Sal	.1536	.7415	.4158	.2913	.6253
Data Set					
SCF - Wages/Sal	.1562	.7793	.4141	.2889	.5868
Income Definition					
Wages + S.E.	.1645	.4690	.4254	.3075	.6557
Population Definition					
FT/FY	.0543	.2283	.2576	.1118	.2580
17-24 years	.1715	.4414	.4500	.3362	.7584
25-54 years	.1314	.3800	.3811	.2466	.5184
Outliers					
Excl. 5% Top	.1350	.7217	.3836	.2446	.4560
Excl. 5% Bottom	.1272	.4670	.3885	.2501	.5514
Top code (3)	.1495	.7390	.4101	.2791	.5635

TABLE 10 continued

Summary of Earnings Inequality in 1989,
For Various Measurement Choices,
Women and Men

MEN					
	Atk(.5)	Atk(-1.0)	Gini	Theil	CV²
Base Case					
SWH/LMAS Wages/Sal	.1308	7325	.3742	2417	.4968
Data Set					
SCF - Wages/Sal	.1351	.7325	.3800	2545	.5924
Income Definition					
Wages + S E	1458	4115	.3958	.2866	.8588
Population Definition					
FT/FY	0515	2035	2493	1060	2453
17-24 years	1731	.7223	4527	.3368	7323
25-54 years	0907	.6413	3107	1690	3481
Outliers					
Excl. 5% Top	1155	.7167	3437	.2030	3587
Excl 5% Bottom	1038	4469	3448	2208	4291
Top code (3)	1190	.7230	.3522	.2109	3792

CHAPTER 3

MACRO CAUSES-MICRO EFFECTS: UNEMPLOYMENT AND TRENDS IN INDIVIDUAL EMPLOYMENT EARNINGS INEQUALITY IN THE 1980S

1.0 INTRODUCTION

Inequality in individual employment earnings for the population of all male and all female workers combined increased during the 1980s in Canada, as in other industrialized countries, as documented in chapter 2.[125] However, facts about trends in earnings inequality depend critically upon the measurement choices such as definition of the reference population, with gender, age, and work status being important dimensions.[126] For a given reference group, trends in earnings inequality are quite robust to other measurement choices. Choices about the data set and inequality indicator, for the most part, influence the magnitude rather than the direction of the trend.

[125]. Although these studies have been mentioned in chapter 2, they are referred to here for completeness. For a comprehensive review of U.S. studies, see Levy and Murnane (1992). The recent literature on individual earnings inequality in Canada is not extensive and may even be limited to the following studies: ECC (1991), Blackburn and Bloom (1993), Morissette et al. (1993), Patrinos (1993a, 1993b), and Doiron and Barrett (1994). For studies focusing upon the distribution of jobs by hourly wage rate and earnings levels, see Myles, Picot and Wannell (1988) and Picot, Myles, and Wannell (1990). For cross-country comparisons including Canada, of changes in earnings inequality and/or total income inequality, see for example, Gottschalk (1993), Fritzell (1992), Jantti (1993), Smeeding and Coder (1993), and Davis (1992).

[126]. Population selection is also an important choice for measuring trends in earnings inequality in the U.S. Earnings inequality did not increase when the population includes both men and women, but did increase when the data are analy 1 separately for men and women.

The trend toward greater earnings inequality in the 1980s represents a new labour market outcome. Increased earnings inequality in the 1980s was accompanied by stagnant real earnings, which contrasts with the relative stability of earnings inequality in the 1970s and the doubling of average real earnings between World War II and the early 1970s. Further, the finding that the degree of earnings inequality was greater in 1989 compared to 1981, implies that labour markets in the 1980s differ fundamentally from earlier periods.

The trend toward increased earnings inequality is interesting not only in an abstract sense of departing from previous decades but because of its practical implications. Changes in earnings inequality are of critical importance to the lives of the working poor. Since in the 1980s earnings inequality increased around a relatively constant mean, the poorest of the labour force became worse off in **both** relative and absolute terms. Given the adverse impact on the working poor, the increase in earnings inequality in the 1980s implies not only changes in the distribution of the returns to work effort but also, changes in the perceptions of the fairness of Canadian society.

Understanding the trend toward increased earnings inequality is important not only because of its implications for poverty and societal perceptions but also for policy. If increased earnings inequality is caused by cyclical macroeconomic conditions, then earnings inequality can be viewed as a temporary phenomenon and one which standard macroeconomic economic policies can alleviate. If however, the increased earnings inequality is an outcome indicative of permanent labour market changes, then it calls for policy changes beyond the macroeconomic.

The debate over the causes of increased earnings inequality has centred upon distinguishing among various microeconomic explanations such as changes in the relative demand and supply of skilled labour (skill "mismatch"), deindustrialization, import competition, deunionization, and technological change, particularly that of computer-based automation.[127] The focus on microeconomic explanations of increased earnings inequality has overshadowed a conventional explanation, that of a slowdown in economic activity which had received considerable attention in previous decades [Blinder and Esaki (1978), and Beach (1977), and more recently, see Blank and Blinder (1986), Perron and Vaillancourt (1988), Blank and Card (1993), and Richardson (1994)]. In the U.S., it appears that the recession in the early 1980s has been rejected as an explanation of increased earnings inequality. Levy and Murnane (1992, p. 1351) state:

> A traditional cause of inequality--an economic downturn--was ruled out because careful studies showed that by almost any measure inequality had kept growing in the post-1982 recovery (Karoly 1988). To the contrary, the data suggested that annual earnings inequality was being driven more by growing wage rate inequality among both men and women than by the cyclical movement in hours worked.

The finding that macroeconomic conditions are relatively unimportant for explaining increased earnings inequality in the U.S. during the 1980s, should not however, preclude its examination as a potential cause of increasing earnings inequality in Canada. Recent

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[127]. In the Canadian context, for tests of the de-industrialization hypothesis, see Patrinos (1993b). For references to the U.S. studies of various explanations of increased earnings inequality, see Levy and Murnane (1992). In a cross-country context, for tests of the technological change, deindustrialization and import competition hypotheses, see Gottschalk and Joyce (1992). For analyses of the contributions of different components of total income to changes in income inequality, using a cross-country approach, see Jantti (1993), Gottschalk (1993), Fritzell (1992), Blackburn and Bloom (1993), and Smeeding and Coder (1993).

studies have demonstrated a variety of ways in which the trends and causes of increased income inequality differ between the two countries. For example, the education premium has risen dramatically in the United States, whereas the increase in the education premium in Canada is smaller and it is questionable whether over the decade of the 1980s there has been any increase [Blackburn and Bloom (1993), Freeman and Needels (1993), Patrinos (1993), and Bar-Or et al. (1995)].[128] There are also differences between the two countries in the relative empirical importance of hypothesized causes of increased income and earnings inequality. For example, the government transfer system has likely dampened the rise in total income inequality in Canada compared to the United States [Fritzell (1992)]; and the greater supply of workers with college/university degrees in Canada relative to the U.S. partially accounts for the less rapid rise in the education premium and smaller increase in earnings inequality [Freeman and Needels (1993)].

This chapter focuses upon the impact of the business cycle on the distribution of individual employment earnings during the 1980s and attempts to distinguish between cyclical and secular trends. The emphasis on macroeconomic determinants of changes in earnings inequality does not deny the importance of distinguishing among microeconomic causes of increased earnings inequality such as those noted above, given

[128]. Chapter 4 documents a slight rise in the education premium for male and female workers between 1981 and 1986 only. Using a partial equilibrium model of the labour market, key determinants dampening the rise in the education premium are identified such as the increase in the relative supply of a more educated labour force, the rising rates of unionization (of women) and shrinking employment opportunities in the goverment sector. While factors such as deindustrialization and technological change were shown to have an insignificant impact on the education premium this does not imply that these factors did not affect changes in overall earnings inequality through changes in within-education-group earnings inequality.

their direct implications for policy decisions, and this ongoing debate is examined in chapter 4.

The focus in this paper is upon individual earnings as opposed to other income definitions and units of analysis, such as total family income, because inequality in individual earnings increased to a greater extent during the 1980s than total family income [Wolfson (1986), Jantii (1993)].[129] An effort is made to identify and justify other methodological choices as they arise in the development of this chapter, athough this is not a main objective.

Underlying this empirical study of the relationship between macroeconomic conditions and earnings inequality is a particular theoretical view of how labour markets adjust to cyclical fluctuations which is that firms responding to changes in economic incentives arising from macroeconomic fluctuations alter their job structures. Selected strands of literature, namely empirical work on cyclical fluctuations in income distribution, segmented labour market approach, and efficiency wage models, are reviewed in section 2. This review provides the background for a model presented in

[129]. For a discussion of how researchers' choices about income concepts and units of analysis are related to the types of questions being asked about trends in inequality, see chapter 2. Also note that the focus here is upon changes in the distribution of individual earnings, using summary measures and changes in shares of earnings accruing to deciles of the working population. In contrast, another strand in the literature focuses upon changes in the distribution of jobs and particularly, upon the hypothesis of increased polarization of jobs. The approach to studying trends in the polarization of jobs is briefly discussed in chapter 2. It is typically examined by examining the proportion of workers in various earnings categories where the categories are defined in absolute or relative terms over time. For examples of this approach see Picot et al. (1988), Morissette et al (1993), and for the U.S. see Levy and Murnane (1992). This hypothesis is not examined here. Polarization of jobs and increased earnings inequality are two different concepts requiring different indicators.

section 3 of how firms adjust their job structures over the business cycle and the implications for the distribution of individual employment earnings. More specifically, the model demonstrates the conditions under which a rise in the unemployment rate results in an increase in the proportion of casual jobs and an increase in earnings inequality. The empirical work draws upon the comparable Survey of Work History 1981 and the Labour Market Activity Surveys 1986 and 1989 which are described in section 4. Evidence of the impact of macroeconomic conditions on earnings inequality is presented in section 5 with attention paid to the trend for the population of all workers (men and women combined), the variation in the impact of macroeconomic fluctuations among several population sub-groups, and whether or not changes in earnings inequality arise from changes in hourly wage rates or annual hours worked.

2.0 CYCLICAL MACROECONOMIC CHANGES, LABOUR MARKET MODELS, AND EARNINGS INEQUALITY: A SELECTED LITERATURE REVIEW

2.1 INTRODUCTION

This section reviews several, somewhat disparate, strands of literature which offer insight into the issue of modelling the process by which labour markets adjust to macroeconomic fluctuations and the implications for income inequality. We start by noting certain technical features of these empirical studies and observing that such studies are typically conducted without reference to either a macro or a labour market model. Second, we review features of two approaches to the labour market in which the quantity of labour is derived from the demand for output. The segmented labour market perspective offers many interesting explanations of important labour market phenomena, although less attention is given to formal models. The second approach, that of efficiency wage models, is reviewed because this literature incorporates certain segmented labour market features and the demand for different types of labour is derived from formal micro-optimizing models. While both the segmented labour market and efficiency wage approaches aid our understanding of the operation of labour markets, neither explicitly considers the impact of cyclical fluctuations on income distribution. Rather than providing an exhaustive survey of competing labour market approaches, the purpose of this review is to extract some building blocks from the literature to assist in developing a model of labour market adjustment to cyclical fluctuations which considers the impact on income distribution more explictly than has currently been done.

2.2 THE RELATIONSHIP BETWEEN MACROECONOMIC FLUCTUATIONS AND EARNINGS INEQUALITY: AGGREGATE EVIDENCE BUT NO EXPLICIT LABOUR MARKET MODEL

The relationship between macroeconomic activity and the distribution of income has been examined empirically for various time periods and countries over the past 30 years.[130] Many of these studies explicitly aim to test the hypothesis that the poor suffer to a greater extent than the rich during an economic slowdown, and more specifically, that the regressive effects of unemployment are greater than inflation. Although this hypothesis is not unambiguously supported, the weight of the evidence does lean in this

[130]. For Canada, see Buse (1982), Erksoy (1994), and Osberg, Erksoy and Phipps (1993). For the U.S., see Beach (1977), Blinder and Eskai (1978), Blank and Blinder (1986), Cutler and Katz (1991), and Blank and Card (1993). For Italy, see Brandonlini and Sestito (1994) and for the U.K, see Weill (1984).

direction for Canada and the U.S. This section highlights selected results and technical features of these studies, for the purpose of informing subsequent empirical analysis in this chapter, rather than for examining contradictory results.

Typically these empirical studies are not based upon a particular theory concerning the labour market adjustment mechanisms through which macroeconomic activity affects the distribution of income [for example, Weill (1984), Brandolini and Sestito (1994), Blinder and Eskai (1978), and Cutler and Katz (1991)]. This is somewhat surprising given that labour market income comprises a large proportion of total income and it is recognized that cyclical changes in the distribution of labour market earnings are likely an important determinant of cyclical changes in total income. As Blank and Blinder (1986, p. 183) state:

> The primary channels by which low-income households 'catch up' in periods of growth are very large procyclical movements in the labor income of the household head: real wages, hours of work, and labor force participation all increase among the poor during an expansion. The effect is so strong that it overcomes the fact that labor income is a relatively low percentage of total income (35.3 percent) for poor households.

Even those studies that explicitly recognize the importance of labour market outcomes in determining income inequality do not link the empirical work to a specific model of how labour markets adjust to macroeconomic fluctuations [Blank and Blinder (1986), Beach (1977), and Buse (1982)]. Although none of these studies reviewed here provides an explicit labour or macroeconomic model, two papers do explore possible mechanisms by which macroeconomic activity may affect income inequality. Beach (1977) examines empirically the impact of macroeconomic activity on certain labour market variables such as participation and employment rates and thereby, the effect on income inequality A specific labour market model is not discussed, however Buse (1982) demonstrates theoretically, using a simple economy comprised of workers (employed and unemployed) and capitalists, that cyclical fluctuations do not necessarily imply counter-cyclical changes in income inequality. In Buse's (1982) model, a decline in the unemployment rate implies greater equality between unemployed and employed workers but, if this accompanied by increased inequality between workers and capitalists, then the overall change in inequality is ambiguous.

All of the studies cited above use total income as the income concept and about half of them use families as the unit of analysis and the other half use individuals. Using the individual as the unit of analysis avoids the complication of changes in the composition of families over time. The use of total income as the income concept has the advantage of providing a better indicator of changes in the distribution of welfare over time, compared to a more narrow definition of income, as discussed in chapter 2. However, over the business cycle, the contributions of various sources of income to total income may change, particularly those of government taxes and transfers[131]. Consequently, simple inference from the distribution of individual total income to individual employment income is inappropriate. Results of studies in the 1980s indicate that fluctuations in market earnings are greater than fluctuations in total income because of the counteracting impacts of government benefits, although there is considerable variation among countries. Canada, for example, has had greater success in off-setting

[131]. Hanratty and Blank (1992) show that, in Canada, the government managed to raise incomes of low-income families enough to keep poverty rates from rising. See also Wolfson (1986) for the earlier period.

unequalizing effects of market incomes through government interventions than did the U.S.[132] While most studies of the type described here do not distinguish among cyclical movements of the various components of total income, there are some notable exceptions. Osberg, Erksoy and Phipps (1993) show that, for Canada, the inequality of the present value of male earnings would be much more sensitive to business cycle effects in the absence of Unemployment Insurance benefits. Brandolini and Sestito (1994) argue that, for Italy, the pro-cyclical movement of income inequality is due largely to the behaviour of self-employment earnings.

In general, studies of the relationship between macroeconomic fluctuations and income inequality use a direct method for examining the impact of the business cycle on income inequality. That is, a variety of macroeconomic variables, such as the rates of unemployment, inflation, and labour force participation, are regressed upon a summary measure of income inequality such as the Gini Coefficient, or an income share.[133] Two exceptions are Beach (1977), in which an indirect quantile approach is used, and Osberg, Erksoy, and Phipps (1993) which is based upon a microsimulation method.

Key results concerning the relationship between macroeconomic conditions and income inequality are summarized below. First, for the U.S. and for Canada, the

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[132]. See Janti (1993) and Gottschalk (1993) who show that, for many industrialized countries, the exceptions being the United States and United Kingdom, the operation of governments' tax/transfer systems served to dampen increases in inequality of family income.

[133]. Other independent variables include the unemployment rate squared, a linear time trend, dummies for any structural changes such as changes in the data or tax policy, and lagged inequality measures.

results, at least until the mid-1980s, support the hypothesis that income inequality moves counter-cyclically. For example, for the U.S., a 1 percentage point increase in the unemployment rate roughly causes a loss of .26 to .30 percentage points of national income to the lowest 40 per cent of the population and a gain to the richest 20 per cent. [Blinder and Eskai (1978), Blank and Blinder (1986) and see also Beach (1977) and Blank and Card (1993)]. However, for the U.S., Cutler and Katz (1991) report that the relationship between macroeconomic conditions and income inequality is substantially weakened in the late 1980s. For Canada, Buse (1982) finds support for the hypothesis, although the empirical impact is much smaller than in the U.S. Brandolini and Sestito (1994) find, in contrast to these studies, that income inequality moves pro-cyclically in Italy, and Weill (1984) finds for the U.K. that unemployment adversely affects the rich and has no significant impact on the poor.

Second, the studies indicate that, where costs of macroeconomic fluctuations occur, they are not distributed evenly among population sub-groups. Blank and Blinder (1986) show that non-white and young workers are more severely affected by an economic downturn than other population sub-groups. Erksoy (1994) shows that in a recession, income is redistributed from the young to the old, and from women to men.

Third, the degree of sensitivity of income inequality to cyclical factors depends upon the inequality measure used. Beach (1977), for example, shows that inequality measures such as the Variance of the logarithm of income or bottom quintile share are much more sensitive to cyclical factors compared to the Gini Coefficient.

Given this review, in analyzing the impact of macroeconomic activity on income inequality in the 1980s, the following points are considered. Firstly, we assess whether the relationship weakened in the latter part of the 1980s. Secondly, we examine whether certain sub-groups of the population were particularly disadvantaged by the recession of the early 1980s. Thirdly, a variety of inequality indicators are used in the assessment, including the Variance of the natural logarithm of income which is sensitive to changes in the distribution of income in the lower tail.[134]

2.3 SEGMENTED LABOUR MARKETS THEORY: USEFUL INSIGHTS BUT NO EXPLICIT MODELS

The past three decades of research from the (diverse) segmented labour market perspective offers insights into modelling the relationship between cyclical change and earnings inequality. This perspective is of interest because it can account for a variety of labour market phenomena, such as involuntary unemployment, that are inconsistent with market clearing models. Work in the 1960s outlined the basic dimensions of segmentation, and the 1970s and 1980s contributed, respectively, to our understanding of the cyclical and secular impacts on labour market segmentation[135]. However, the

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[134]. While the Variance of the Natural Logarithm is a useful indicator of inequality because it is sensitive to changes in the lower tail of a distribution, it does not meet the desirable property known as transfer sensitive. If an indicator is transfer sensitive (as for example, are the Gini Coefficient, the Coefficient of Variation, and the Theil Entropy) this means that a progressive transfer (a transfer from a relatively rich unit to a poorer one) reduces inequality but the decrease in inequality is greater the lower the income of the poorer unit.

[135]. Although the foci and time period overlap, key pieces of work are as follows. In the early 1970s, Doeringer and Piore (1971) and Edwards (1975) introduced

implications of cyclical and secular impacts for the distribution of earnings have remained at best, implicit and modelling of labour market change has typically not been formally undertaken.

From the labour segmentation perspective of the 1960s and early 1970s, labour markets are comprised of two or more segments in contrast to the neoclassical view of a homogeneous labour market [Doeringer and Piore (1971) and Edwards (1975)] The segments are characterized by different mechanisms for setting wages and hence returns to work effort and mobility between segments is limited. Primary sector jobs are associated with high wages, benefits, job security, including full-year work, and career advancement; and secondary sector jobs are characterized in the opposite manner In general, there is limited inter-sectoral mobility Jobs in the primary sector, compared to the secondary sector, are less influenced by external competitive labour market forces given the existence of internal labour markets This notion of two distinct segments corresponds to a bi-modal pattern of "job rewards", referred to as strict duality by Ryan (1981), and contrasts with his notion of heuristic duality which would be reflected in simply a broad dispersion of job rewards

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segmentation theory drawing upon case studies in the 1960s In the late 1970s and early 1980s, see writers such as Sengeberger (1981), Ryan (1981), Rubery and Wilkinson (1981) and Rubery (1978) For the latter period, see for example, Harrison and Bluestone (1989), Atkinson (1987), Piore and Sabel (1984). Labour market segmentation theory can be traced back to the 1800s to the work of Cairnes (1874), and to the 1940s and 1950s in the American institutionalist writings of Kerr (1954) and Dunlop (1957) The formulation of labour market segmentation in the 1960s focused upon explaining urban poverty and underemployment, particularly of blacks in the U S However, the theory was quickly extended to the whole U S economy and to other advanced capitalistic countries

Employment income (wages, benefits, hours of work, and job stability) are viewed as being associated with jobs. Thus, an earnings structure arises from differentiation among firms, and not differentiation of individuals' productive characteristics. The allocation of workers to jobs reflects norms and discrimination, rather than a random process, and as a result, non-whites, women and youths are over-represented in the secondary sector, after controlling for human capital characteristics.[136] Further, certain groups of workers are thought to experience greater upward job mobility and others experience greater downward mobility. These features give rise to the key outcome of segmentation, that workers comparable in terms of education and skills receive quite different rewards for work depending upon their sector of attachment [Ryan (1981)]. Further, changes in the process of segmentation are experienced differently by various population sub-groups.[137]

Segmentation theories indicate that the nature of segmentation changes over time as a result of the actions of firms and workers, in response to changes in economic conditions and policy environment.[138] Segmentation theory formulated in the 1960s,

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[136]. Some writers have argued that segmentation theory oversimplifies the allocation process, particular with respect to women, because, for example, gender segregation occurs throughout labour markets and is not simply a primary/secondary-male/female dichotomy [Hartmann (1981) and Rubery (1988)].

[137]. See DeFreitas, Marsden and Ryan (1991) for empirical evidence on youth employment patterns. Merrilees (1982) argues that the Canadian labour market exhibits segmentation by age and sex.

[138]. In general, theories have emphasized demand side and institutional factors causing changes in segmentation, rather than supply side factors, such as individual "productivity" characteristics, emphasized by the market clearing models. While Rubery (1978), writing from a segmentation approach emphasizes the supply side, particularly forms of worker resistance, in shaping segmentation, this differs from a neoclassical

in the context of an economy with relatively low unemployment rates[139], emphasized a stable form of labour market segmentation arising from differences among firms in the nature of product demand, industrial structure, and technological conditions. Firms producing products with stable demand, in an oligopolistic market structure, are more likely to use capital-intensive production processes and offer primary sector jobs, since they desire a workforce which will acquire firm-specific skills and has low turnover [Doeringer and Piore (1971), Piore (1975) and Harrison (1972)].

In the 1970s, segmentation theory became more dynamic, moving away from the analysis of the existence of segmentation, to concern with changes in the boundaries or nature of segmentation, predominately as a result of employers' responses to the economic environment of greater volatility and uncertainty.[140] Sengeberger (1981) for example, focused upon employer-generated changes in the boundaries between primary and secondary employment in West Germany during the recession of 1974-75. He argued that during recessions, employers provide fewer primary jobs, remove barriers (such as internal labour markets) to expose primary sector workers to greater competition, and provide more secondary sector jobs through an increase in fixed short-term contracts and leasing of personnel. When macroeconomic conditions improve, firms seek to hold onto workers by providing primary sector employment and

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emphasis on individual characteristics.

[139]. In this economic context, upward mobility to the primary sector was probably more important than downward mobility to the secondary sector.

[140]. Piore (1980) argues that a primary labour market sector is more likely to occur in situations where workers and firms have the capacity to insulate themselves from uncertainty.

strengthening internal labour markets, in order to reduce the impact of competition for labour from other firms. A variety of case studies in 1981 documented that firms reacting to conditions of uncertainty, unstability and low product demand adopted various labour strategies including the increased use of secondary labour in the form of non-standard jobs [Michon (1981)] and casual/temporary work and outwork [Villa (1981), Moore (1981), Rubery and Wilkinson (1981)].

Segmentation theory in the 1980s continued to analyze how employers change the nature of jobs in response to changes in the macroeconomic and policy environment, although the emphasis tended to be on secular rather than cyclical changes. As in previous decades, the focus was on the manner in which employers use secondary sector jobs to achieve flexibility. However, the term flexibility took on new meanings. In the 1980s, it was common to distinguish three types of flexibility: wage, numerical and functional [Atkinson (1987), Harrison and Bluestone (1989)]. Wage flexibility refers to the increased ability of firms to alter wage levels and differentials in accordance with labour market conditions and is associated with phenomena such as wage rollbacks, wage freezes, performance pay, and union avoidance. Numerical flexibility refers to the greater freedom of firms to alter both the number of workers and hours of work of individual workers, so for example, firms could combine a smaller group of permanent/core workers with the greater use of secondary workers and the contracting-out of certain services and production processes. Functional flexibility involves changes in the organization of work and requires that a core set of workers have, in contrast to the past, a greater willingness and technical capacity to perform a broader range of tasks.

Although business cycles did occur in the 1980s, segmentation theorists have tended to focus upon various secular or structural explanations of the changing nature of labour market segmentation. Some writers have argued that the increased uncertainty and volatility of product demand, combined with rapidly changing technology, provides firms with incentives to develop strategies to attain a more flexible workforce [Piore and Sabel (1984) and Atkinson (1987)].[141] Consistent with this line of argument, various writers have explored, in a more historical manner, the technological and institutional factors which lead employers to strive for greater labour flexibility. The 1980s, it is argued, represents the start of a new techno-economic paradigm and a break from the earlier "Fordist" paradigm based upon mass production, automation, and the rise of technical and bureaucratic forms of labour control[142]. Along this line of argument, Harrison and Bluestone (1990) argued that falling rates of profits have led firms to introduce new management practices and to scale down plants, both of which have resulted in greater wage and numerical flexibility. Apart from Harrison and Bluestone's (1990, p. 351) statement that such explanations are consistent, "at least a priori, with the empirical evidence of growing national wage inequality", the implications of changing labour market segmentation for changes in earnings inequality has received little attention.[143]

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[141]. For case studies supporting this view see Christopherson and Storper (1989), and Tarling (1987).

[142]. The Fordist paradigm is described in Edwards (1979), and Gordon et al. (1982) and elements of the new paradigm are described in Freeman and Soete (1987).

[143]. In general, the emphasis of empirical studies has not been on examining the implications of segmentation for income distribution but on demonstrating the existence of labour market segments often by showing differences between segments in wage determination processes, such as smaller returns to education and experience in the

An alternative to the argument that the emergence of "flexible firms" has caused increases in earnings inequality is that deindustrialization or the increased relative importance of the service sector has resulted in greater labour market flexibility [Rubery (1989)]. Since the service sector has traditionally employed a larger proportion of casual workers than the manufacturing sector, any increase in the proportion of employment accounted for by this sector will cause an increase the proportion of casual jobs.

Given that an objective of this chapter is to place an empirical assessment of the relationship between macroeconomic fluctuations and earnings inequality within the context of a particular view of how labour markets adjusts, the segmented labour market literature reviewed above suggests several useful ideas. First, the notion of strict duality of job rewards is used for modelling purposes here, although it is recognized that given actual complexity, heuristic duality may be a better representation. More specifically, given the two labour market sectors, it is assumed that the primary sector is associated with higher average annual earnings and lower variance of earnings. This latter feature stems from the assumption of greater (annual) stability of primary jobs and their full-time nature. Second, population sub-groups are not randomly allocated to the two sectors and certain groups of workers such as the young and possibly women are expected to be relatively more adversely affected by changes in segmentation. Third, labour market segmentation arises from differences among firms (due to for example, variability of

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secondary sector. Examples of such studies are Merrilees (1982), Dickens and Lang (1985), Osberg et al. (1986), B.‸ston (1990), Magnac (1991), Boumahdi and Plassard (1992), Ebmer and Zweimuller (1992), Fichtenbaum et al. (1994), and Theodossiou (1995).

product demand and technology), rather than variation among workers' productivity characteristics; and changes in the distribution of employment income emanate from firms reactions rather than changes in workers' productivity characteristics. Fourth and related to the previous point, firms respond to decreased aggregate demand by laying off primary sector workers and providing more secondary sector jobs. Having summarized the key features of the labour market model to be developed, we turn now to the efficiency wage model literature in which some models have incorporated the segmented labour market ideas in a formal manner.

2.4 EFFICIENCY WAGE MODELS: FORMAL LABOUR MARKET MODEL BUT NO EXPLICIT TREATMENT OF CYCLICAL FACTORS AND EARNINGS INEQUALITY

The efficiency wage literature has not directly examined the issue of how labour markets adjust to cyclical disturbances and the implications for income distribution, although it offers certain insights into the modelling of this issue. The literature is interesting because it shares certain features with the segmented labour market literature reviewed above, such as the emphasis on demand side determinants of the wage structure, and the ability to account for the phenomena of involuntary unemployment and wage variation amongst observationally equivalent workers. Further, there is a direct link, albeit typically implicit, between changes in the demand for labour (of different types) and changes in aggregate economic growth, since labour demand is a derived demand from product demand.

Two efficiency wage models are reviewed below because they raise useful insights into this particular modelling issue.[144] Basically these models demonstrate, under the assumption of individual firm profit maximization, the conditions under which firms will choose to offer either primary or secondary employment or some combination of the two.

Bulow and Summers (1986) extend the one-sector model of Shapiro and Stiglitz (1984). They focus upon how different assumptions in firms' abilities to monitor workers' performances gives rise to labour market segmentation. Fundamental to the Bulow and Summers model is the idea that firms face different costs of monitoring workers' performances, presumably due to differences in technical conditions and production processes, and this gives rise to labour market segmentation. Firms for which monitoring worker performance is difficult or costly are more likely to create primary sector jobs. They pay workers a higher wage than available in the alternative secondary labour market, in order to provide an incentive not to shirk, allocate some resources to monitoring workers' levels of work intensity, and dismiss workers found to be shirking.

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[144]. Efficiency wage models differ in the reason given for firms paying wages above a market clearing level: for shirking, see Shapiro and Stiglitz (1984); for reducing turnover costs due to hiring, firing and training, see Weiss (1980); and for morale and productivity enhancement, see Akerlof and Yellen (1987). The empirical tests of efficiency wage models have tended to focus upon the wage implications. For example, all other things being equal, if firms do not adjust wages and supervisory intensity in response to short-term fluctuations in labour market conditions, then an increase in unemployment will have the effect of increasing work intensity and hence productivity [See Weiskopff (1987), Rebitzer (1988, 1989)]. Efficiency wage models are also consistent with the observation of several other phenomena which are inconsistent with conventional market clearing models, such as large and persistent wage differentials linked to industry [Dickens and Katz (1987)] and to employer size [Rebitzer and Robinson (1991)].

For firms where monitoring is costless, secondary sector jobs are provided and wages are set at the level which clears the market.

Labour market segmentation in the Bulow and Summers model arises from the assumption concerning variation in firm's monitoring technology of worker performance. In contrast, labour market segmentation arises from uncertainty of product demand in a paper by Rebitzer and Taylor (1991). In addition, Rebitzer and Taylor (1991) demonstrate that, under certain conditions, a single firm may offer both primary and secondary jobs, whereas in other models, firms were assumed to offer only one type of job.

The main innovation of Rebitzer and Taylor (1991) arises from the assumption that the uncertainty of product demand directly affects the derived demand for labour. Note however, that in the Rebitzer and Taylor (1991) model, uncertainty of demand is a firm-specific shock rather than an aggregate demand shock.[145] They use a conventional output function and introduce uncertainty through the assumption that price is a random draw from a known distribution which then gives rise to a probability that the firm will need to lay workers off. For comparative purposes, note that in the Bulow and Summers (1986) model, lay-off depends upon the exogenous separation rate. The firm specifies the number of employment contracts, the effort intensity and wage, and how many workers will be laid off if a "low" price is drawn.

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[145]. The Rebitzer and Taylor (1991) formulation of the supply side and the non-shirking condition is similar to that of Bulow and Summers (1986). Workers can control their work efforts and choose to shirk or not shirk depending upon the incentives of the wage premium, the probability of shirking detection and dismissal, and the turnover rate.

In addition to demonstrating the relationship between the firm level of demand (as reflected in the firm's price draw) and the use of layoffs, Rebitzer and Taylor (1991) show the conditions under which a firm may choose to offer: firstly, all secondary jobs which depends upon the relative productivity of the two types of jobs and relative wages associated with these jobs; and secondly, a combination of secondary and primary jobs which occurs when firms use lay-offs to adjust to fluctuations in demand.[146]

Although not considered explicitly by Bulow and Summers (1986) or Rebitzer and Taylor (1991), we can make some inferences about the distribution of employment income from these models. In both models, the implicit link between labour market adjustments and changes in the earnings distribution is simply the proportion of workers employed in the two sectors. However, the models ignore both complementary mechanisms such as variation in hours of work associated with the two types of jobs and the response of firms to cyclical changes in aggregate demand.

In the Bulow and Summers' (1986) model, a distribution of wages occurs due to variation among firms essentially in ability to monitor workers performance. The distribution of wages gives rise to a distribution of employment income, since it appears that all jobs are essentially full-time/full-year jobs and primary and secondary jobs do not vary in terms of hours/day and days/year.

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[146]. Although firms lay off workers when the draw is low, they keep more than would be expected given the relationship between the wage premium and the expected length of employment contract; this is the idea behind labour hoarding unrelated to the fixed costs of employment.

Thus, in the Bulow and Summers' (1986) model, a change in the distribution of employment income would come about solely through a change in the distribution of wages which in turn, could result from: firstly, an increased wage premium due to such factors as an increase in the separation rate or increased probability of dismissal, both for a given level of aggregate demand; or secondly, from increased variation among primary sector firms. Although changes in the distribution of employment income is not examined in the Bulow and Summers model, it can be shown that an increase in the proportion of secondary jobs would result in an increase in employment income under certain conditions. This point is taken up in section 3.

Likewise in Rebitzer and Taylor (1991), the distribution of employment income arises from the distribution of wages. Here, however, the distribution of wages is due to a distribution of prices where a firm's price draw determines its specific demand conditions, and a given exogenous probability relating to shirking detection. A change in the inequality of employment income could arise from a change in these exogenous probabilities, such as shirking detection, or the distribution from which prices are drawn.

The emphasis of the testable predictions derived from the models has been on the wage premium paid to primary sector workers. For example, Bulow and Summers (1986) explore such theoretical considerations in terms of the relationship between the primary sector wage and factors such as the probability of detecting shirkers, turnover rates, and proportion of primary sector employment.[147]

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[147]. More specifically, a rise in the primary sector wage is necessitated by: a decline the probability of detecting a shirker which reduces the opportunity cost of dismissal; likewise an increase in the rate of turnover reduces the cost of dismissal; and an increase

Variation in hours of work can only be introduced through the (unrealistic) assumption that workers only gain primary sector employment from unemployment and not from secondary employment. Rebitzer and Taylor (1995) elsewhere introduce variation in hours of work by assuming that workers laid off from the primary sector await recall rather than taking jobs in the secondary sector.

The two representative efficiency wage models reviewed here demonstrate how demand side features, such as variation among firms in technological conditions and uncertainty of product demand side, can be incorporated into a neoclassical profit-maximizing expression and give rise to labour market segmentation. However, the models do not consider variation in hours of work associated with different jobs, the distribution of employment income, and firms' reactions to cyclical changes in aggregate demand.

3.0 A MODEL OF UNEMPLOYMENT AND ANNUAL EARNINGS INEQUALITY

3.1 INTRODUCTION

In this section, the theoretical relationship between unemployment and earnings inequality is examined. The proposed mechanism underlying this relationship is that changes in the unemployment rate affect the incentive structure faced by firms that are all assumed to be responsive to price signals, and correspondingly alter their job structures. This mechanism is modelled following Osberg (1995) and takes account of

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in the number of primary sector jobs reduces the time spent by a worker waiting to return to the primary sector if dismissed and reduces the opportunity cost of shirking.

the points raised by the segmented labour market and efficiency wage approaches as summarized in section 2. Consistent with the segmented labour market perspective, the labour market is viewed as having the following characteristics: dualistic and earnings are related to the job and not the worker; wage differentials persist across the two sectors; involuntary unemployment or underemployment exists; employers respond to a macroeconomic slowdown and an increase in the unemployment rate by changing the job structure and, specifically, by reducing the number of permanent jobs and increasing the number of casual jobs offered; and various population sub-groups experience segmentation and changes in segmentation differently, with women and the young potentially experiencing greater adverse affects (after controlling for human capital productivity characteristics).[148]

Following the efficiency wage literature, a firm's decision about what types of jobs to offer - the combination of permanent and casual jobs - is modelled within a profit-maximizing framework. The labour market model and the specific argument that a rise in the unemployment rate increases the proportion of casual jobs is outlined in section 3.2. The conditions under which a rise in the proportion of casual jobs results in an increase in earnings inequality is examined in section 3.3, modifying Robinson (1976) who considered a similar problem in the context of the Kuznet's hypothesis.

[148]. This latter feature is not part of the formal model but is empirically investigated.

3.2 A MODEL OF UNEMPLOYMENT AND JOB STRUCTURE

The posited relationship that an increase in unemployment causes an increase in earnings inequality is argued here to occur through a particular mechanism or form of labour market adjustment: an increase in the unemployment rate causes an increase in the percentage of casual jobs in the economy. A model of this labour market adjustment is outlined below, directly adapting the model of Osberg (1995).[149] The model exhibits characteristics of segmented labour market models and efficiency wage models as noted above.

Firms generate a segmented (dual) labour market in response to various incentives in the context of variable product demand during the year. Suppose that there are H hours in a year, during which firms expect product demand to be on average smaller for H_1 hours (the slow hours) and expect product demand to be on average higher for H_2 hours (the busy hours), such that equation (1) is true:

(1) $H_1+H_2=H.$

For each firm, the rate of sales for the slow hours is Q_1 and for the busy hours is Q_2. Thus, total output per year for each firm can be written as equation (2)

(2) $H_1*Q_1+H_2*Q_2=Q.$

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[149]. Osberg's (1995) model demonstrates that hysteresis in unemployment exists partly as a consequence of how firms responding to various incentives alter the structure of jobs offered.

In this economy, firms choose between two types of job structures in order to produce their profit-maximizing levels of output and this corresponds to two types of firms: Permanent Firms hire only permanent workers who work for the full-year; and Just-in-time Firms hire a combination of permanent (full-time) workers and casual workers hired for part of the year. The profit-maximizing expression for the marginal Permanent Firm (π_p) is shown in equation (3), where the first component is the total revenue generated from product sales; P is the assumed exogenous price of the product, Q is the quantity of output produced. The second component is the total cost where W_p is the exogenous average hourly wage rate paid to permanent workers, L_p is the number of permanent workers, who are each hired for an average of H annual hours per year.

$$(3) \qquad \pi_p = P*Q - W_p*L_p*H.$$

The marginal Permanent Firm is assumed to make zero profit (i.e. equation (3) for this firm is equal to zero). However, firms that have the ability to sell a higher "quality" product may charge a higher price, and hence, some Permanent Firms make positive profits.

Given that product demand is variable during the year, some firms, the Just-in-time Firms, find it profitable to hire a group of permanent workers for the full-year of H hours and hire a group of casual workers to meet desired production levels on the busy hours of the year for H_2 hours. The Just-in-time Firms hire A_p permanent workers, who are each hired for an average of H hours, and A_c casual workers, who are each hired for the busy sales periods, for an average of H_2 hours. The casual workers are assumed to have a lower productivity per hour q_c than permanent workers q_p, so to produce the same level of output Q requires more workers, $A_p + A_c > L_p$. Note that the lower productivity of casual workers is not due to differences among workers' inherent productivities but arises, according to the segmented labour market perspective, from reasons such as differences between permanent and casual jobs, in the type of job performed, production technology and social organization of work including the greater start-up time required in casual jobs. Alternatively, the relative productivity differential associated with the jobs arises, according to an efficiency wage argument, from such factors as the lower "job rewards" of the casual workers which reduces their morale and productivity. This is a function of the job and work conditions rather than inherent worker productivity characteristics.

Total output demanded per hour for the slow hours is Q_1. This can be met by a number of permanent workers A_p with productivity q_p as in equation (4). A combination of a number of permanent workers A_p and a number of casual workers A_c with their respective productivities can be used to meet the production target Q_2 for the busy hours in equation (5):

(4) $q_pA_p = Q_1$

(5) $q_pA_p + q_cA_c = Q_2$.

The x of the argument is the assumption that Just-in-time Firms can only find a proportion of the desired number of casual workers X, and that this proportion depends upon the unemployment rate, as in (6).

(6) $X=x(u)$, where $0 \leq X \leq 1$

Thus, there is a risk associated with moving to a Just-in-time strategy since firms will forego profits during the busy sales periods if they cannot find all of the casual workers which they desire. Variation in risk associated with adopting a Just-in-time labour strategy among firms occurs, if there exists variation among firms, in the percentage of total profit accounted for by the busy sales hours (i.e. the potential percentage loss). The larger the potential percentage loss, the greater the risk involved in switching to a Just-in-time strategy. The potential percentage loss of sales will itself depend upon the price of the product and the number of busy sales hours. Thus, firms with a stable product demand, where $H_2=0$, are expected to use all permanent workers.

As the unemployment rate increases, the pool of unemployed workers increases and consequently, the firm is able to hire a greater proportion of casual workers that it desires. Thus, an increase in the unemployment rate reduces the risk associated with adopting a Just-in-time labour strategy.

In period $t=1$, given an unemployment rate U_1, then X_1 is the proportion of the total number of desired casual workers that a firm is able to hire, and the profit-maximizing expression for the representative Just-in-time Firm (π_{jit}) is shown in equation (7), assuming that permanent workers are paid an average daily wage of W_p and casual workers are paid an average daily wage of W_c:

(7) $\pi_{jit} = P[Q_1{*}H+X_1(Q_2-Q_1)H_2] - [W_p{*}A_p{*}H+W_c{*}X_1{*}A_c{*}H_2]$.

For simplicity, it is assumed that the economy is stable, with a given size of labour force and N firms, and that workers always immediately accept any job offered.[150]

For the purposes here, all that matters is that in the initial period $t=1$, the given unemployment rate U_1 and corresponding X_1, gives rise to some proportion of all firms B_1 which find it profitable to adopt a Just-in-time labour strategy. For these B_1 Just-in-time Firms, equation (7) is greater than equation (3). Some firms find equation (7) is greater than equation (3) for such reasons as their production technologies are relatively simple and workers do not require firm-specific training, consequently the productivities of casual and permanent workers are similar which enables these firms to use the cheaper casual workers. Alternatively, firms which experience some variability in product demand, may find that equation (7) is greater than equation (3), if $H_2 > 0$, but the labour strategy will depend upon the firm's assessment of the risk, the potential loss of sales due to the inability to hire the desired number of casual workers. We do not investigate the conditions under which equation (7) is greater than equation (3), defined in terms of W_c, W_p, and X_1, although this is shown in Osberg (1995). If firms differ in the variability of demand as suggested, this introduces another condition.

To isolate the impact of a change in aggregate demand on the job structure, the technological, institutional, and market structures are assumed constant. Although not

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150. The introduction of a steady turnover rate of firms and workers does not change the nature of the analytics. The turnover rate of firms refers to the equal flows of firms going bankrupt and new firms entering. The turnover rate of workers refers to the equal flows of new labour force entrants and workers retiring. Likewise, the basic ideas are not altered by introducing the complexity that a certain number of unemployment days arise due to time required to fill a vacancy or find a job.

analyzed here, each of these factors could induce a change in the proportion of firms (B_1) adopting a Just-in-time labour strategy. For example, a technological change may make it more feasible for firms to hire the casual workers they need, causing an increase in X for a given level of unemployment, and hence an increase in B, from B_1 to B_2. A decline in the real minimum wage makes permanent workers even more costly relative to casual workers, likewise causing an increase in B. Since firms in some industries may have a higher propensity to use casual workers, a shift in industrial structure will result in a change in the proportion of casual workers.

Suppose there is an exogenous shock to aggregate demand causing an increase in the unemployment rate ($U_2 > U_1$), then the following effects are expected:

- an increase in X which means that firms can hire a greater proportion of the casual workers which they desire ($X_2 > X_1$);
- the increase in X reduces the risk associated with moving to a Just-in-time labour strategy which causes an increase in the proportion of firms adopting a Just-in-time strategy, an increase in B ($B_2 > B_1$)[151]; and
- for a given number of firms N, this reduces the proportion of permanent jobs and increases the proportion of casual jobs. The proportion of casual jobs in the economy in period 1 is less than in period 2 as shown in (8).

[151]. It may also cause existing Just-in-time Firms to adopt a more intensive use of casual labour but this possibility is not explored here, i.e. where $A_{c1} < A_{c2}$.

(8) $[NB_1*X_1*A_c] / [(N-NB_2)*L_p+NB_2*A_p+NB_2*X_2*A_c] <$

$[NB_2*X_2*A_c] / [(N-NB_2)*L_p+NB_2*A_p+NB_2*X_2*A_c]$,

given $B_1 < B_2$, $X_1 < X_2$, and $A_c+A_p>L_p$

Having outlined the labour market model, we turn now to examine the relationship between changes in job structure and changes in the distribution of employment earnings.

3.3 THE RELATIONSHIP BETWEEN CHANGES IN THE JOB STRUCTURE AND CHANGES IN INDIVIDUAL EMPLOYMENT EARNINGS INEQUALITY

A distribution of individual annual employment earnings corresponds to a given structure of jobs, under certain simplifying assumptions. From the above labour market model, the economy generates a dual labour market with a certain proportion of permanent and casual jobs and this job structure gives rise to a distribution of earnings per job. The distribution of earnings per job is equivalent to a distribution of earnings per worker or equivalently, the distribution of individual employment earnings, under the assumptions: that each worker holds only one job at a time, each permanent worker holds his/her job for the period of a year, and each casual worker holds his/her job for part of the year.[152] Thus, a change in job structure corresponds directly to a change in the distribution of individual employment earnings.

Changes in the degree of earnings inequality follow an inverted U-shaped pattern, as the percentage of casual workers increases, as illustrated in Figure 1. This point has

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[152]. Clearly the labour market situation in the 1980s is more complex with workers holding multiple jobs.

been demonstrated mathematically to hold under certain conditions for at least three standard inequality indicators, namely, the indicators are the Variance of Natural Logarithms (VLN), the Gini Coefficient, and the Square of the Coefficient of Variation (CV^2), as will be investigated subsequently.[153] As the percentage of casual workers increases, for example from Point A to Point C in Figure 1, then the degree of earnings inequality increases. If the percentage of casual workers increases beyond a certain point, such as Point C, then earnings inequality actually declines and reaches the lowest degree of inequality when 100 percent of the workforce is casual.

Therefore what has happened to earnings inequality in Canada, when the percentage of casual workers increases, is an empirical question, since theoretically, inequality could increase or decrease. The exact percentage of casual workers at which the maximum degree of inequality occurs (the value of C), and the maximum degree of earnings inequality (the value of D) are also empirical questions. In the context of this chapter, we are interested in whether a rise in the percentage of casual workers results in an increase in earnings inequality. For this relationship to hold, it is necessary that the change in job structure resulting in an increase in the percentage of casual workers occurs somewhere between Point A and C, in Figure 1.

The argument and conditions under which earnings inequality follows this inverted U-shaped pattern as the percentage of casual workers increases is demonstrated below using the VLN inequality indicator. However, the argument can be generalized, beyond the case of the VLN, to several other indicators such as the Gini Coefficient and the

153. See respectively, Robinson (1976), Knight (1976), and Ogwang (1995b).

CV^2. What these three indicators share is the property that the degree of earnings inequality of a population can be decomposed into the within-group inequality of each sector. Each within-group inequality is weighted by its population share, which is the proportion of casual or permanent workers. The VLN indicator is chosen for detailed analysis in this chapter because it exhibits greater sensitivity to transfers of income in the lower tail and the conditions under which the inverted U-shaped pattern can be derived are less restrictive, compared to the other two indicators.[154] However, after outlining the arguments in terms of the VLN indicator, the conditions under which the Gini Coefficient and CV^2 exhibit similar results are summarized.

The argument that changes in earnings inequality follow an inverted U-shape pattern adapts those of Robinson (1976), who examined a similar problem in the context of the Kuznet's hypothesis of the relationship of income inequality and economic development. The proportions of permanent and casual workers are Jp and Jc, with

(9) $J_p + J_c = 1$

where $J_c = [NB*X*A_c] / [(N-NB)*L_p+NB*A_p+NB*X*A_c]$

and $J_p = [(N-NB)*L_p+NB*A_p] / [(N-NB)*L_p+NB*A_p+NB*X*A_c]$

for all X and B.

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[154]. As noted in chapter 2, the VLN indicator does not always satisfy the Principle of Transfer because at incomes considerably greater than the geometric mean, a transfer from a rich to relatively poor individual may cause an increase in inequality [see Kanbur (1984)].

Table 1 below summarizes the variable definitions. The overall mean of the natural logarithm (Ln) of annual earnings of all workers $\bar{Y}$ is the sum of the mean Ln annual earnings of the two types of workers weighted by their respective population shares shown in (10), where $\bar{Y}_c$ and $\bar{Y}_p$ are respectively, the mean Ln annual earnings of casual workers and permanent workers.

(10) $\bar{Y}=J_c\bar{Y}_c+J_p\bar{Y}_p$

The above job structure model was developed in terms of a representative Permanent Firm and representative Just-in-time Firm. However if firms differ in hourly wage rates and hours of work offered, then mean Ln annual earnings of casual workers and permanent workers ($\bar{Y}_c$ and $\bar{Y}_p$) are derived from the geometric means of Ln wages and hours, as shown in (11) and (12).

(11) $\bar{Y}_c=[1/(NB*X*A_c)]*[\Sigma LnW_c+\Sigma LnH_c]$

(12) $\bar{Y}_p=[1/((N-NB)*L_p+NB*A_p)]*[\Sigma LnW_p+\Sigma LnH_p]$.

Therefore, the VLN of annual earnings in the two jobs sectors are non-zero, and the overall VLN of annual earnings for all workers σ^2_y is shown in (13) where σ^2_{yc} and σ^2_{yp} are respectively, the VLN of annual earnings for casual and permanent workers.

(13) $\sigma^2_y=J_c\sigma^2_{yc}+J_p\sigma^2_{yp}+J_c(\bar{Y}_c-\bar{Y})^2+J_p(\bar{Y}_p-\bar{Y})^2$.

Note that the VLN of annual earnings for casual and permanent workers can be derived from the VLN of hourly wage rates and VLN of annual hours worked for each type of worker.[155]

If the VLN of annual earnings and mean Ln earnings for each type of job (σ^2_{yc}, σ^2_{yp}, $\bar{Y}_c$, $\bar{Y}_p$) remain constant over time, then changes in overall annual earnings inequality (σ^2_y) is simply a function of the proportion of each type of job, as shown in (13). The assumption of stability over time is justified by efficiency wage type arguments, that it is the relative permanent-casual earnings which are important for establishing and maintaining permanent workers' morale and hence productivity. As a result, employers are reluctant to alter earnings, and the earnings structure is quite stable.

An increase in the unemployment rate causes an increase in the proportion of Just-in-time Firms and an increase in the proportion of casual workers (J_c). Directly following Robinson's (1976) argument, substituting (9) and (10) into (13), one can derive (14) which is a quadratic function defining a parabola in J_c.

(14) $\sigma^2_y = \alpha J_c^2 + \gamma J_c + \delta$

where

$$\alpha = -(\bar{Y}_c - \bar{Y}_p)^2$$
$$\gamma = (\sigma^2_c - \sigma^2_p) + (\bar{Y}_c - \bar{Y}_p)^2$$
$$\delta = \sigma^2_p$$

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[155]. For casual and permanent workers respectively, if the VLN of hourly wage rates are σ^2_{wc} and σ^2_{wp}, the VLN of annual hours worked are σ^2_{hc} and σ^2_{hp}, and the covariances between Ln wages and hours are $\sigma_{wc,hc}$ and $\sigma_{wp,hp}$, then the VLN of annual earnings, σ^2_{yc} and σ^2_{yp} are shown in (a) and (b):

(a) $\sigma^2_{yc} = \sigma^2_{wc} + \sigma^2_{hc} + 2*\sigma_{wc,hc}$

(b) $\sigma^2_{yp} = \sigma^2_{wp} + \sigma^2_{hp} + 2*\sigma_{wp,hp}$.

If mean Ln earnings of casual and permanent workers ($\bar{Y}_c, \bar{Y}_p$) differ, then Equation (14) is a quadratic function, since then the first derivative of (14) with respect to J_c is positive.[156] Equation (14) reaches a maximum since the second derivative of (14) with respect to J_c is negative, given that α is negative.[157] Thus, as the proportion of casual workers J_c increases, inequality as measured by σ^2_y increases, reaches a maximum and then decreases.

In the context of this problem, it is necessary that the σ^2_y reach its maximum value when J_c lies between 0 and 1, as $J_c = 0$ occurs when there are no casual workers and $J_c = 1$ occurs when all workers are casual. To assess whether this is likely, we take the first derivative of (14) with respect to J_c and set this function to 0. This gives the value of the proportion of casual workers (J_c) at which σ^2_y is maximum, $\hat{J}_c$, as in (15).

(15) $\hat{J}_c = (\sigma^2_{yc} - \sigma^2_{yp})/[2(\bar{Y}_c - \bar{Y}_p)^2] + 1/2$

If we assume that the mean of Ln earnings of casual and permanent workers are substantially different, and the VLN of earnings of casual and permanent workers are similar, than the first term of (15) is driven to zero, making $\hat{J}_c$ equal to 1/2. Under these assumptions, σ^2_y increases as the proportion of casual workers (J_c) increases, σ^2_y reaches a maximum when 50 percent of workers are casual, and thereafter, declines.

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[156]. $\partial\sigma^2_y/\partial J_c = 2\alpha J_c + \gamma > 0.$

[157]. $\partial^2\sigma^2_y / \partial J_c^2 = 2\alpha$ which must be < 0 since $\alpha = -(\bar{Y}_c - \bar{Y}_p)^2 < 0.$

The inverted U-shaped pattern of earnings inequality as the percentage of casual workers increases, as shown in Figure 1, can be generalized beyond the case of the VLN inequality indicator. In the context of the relationship between income inequality and economic development [as for Robinson (1976)], Knight (1976) examines the conditions under which the Gini Coefficient follows an inverted U-shaped pattern due to the transfer of part of the population from the poor to the rich sector. He demonstrates that, under the assumptions of, firstly, a difference in mean incomes of the two sectors and, secondly, perfect equality of income within each of the two sectors, inequality follows the inverted U-shape. Knight's (1976) arguments applied to this context indicate that the greater the relative mean earnings of the two job sectors, the greater the maximum value of the Gini Coefficient and, secondly, the greater the percentage of casual workers at which the maximum degree of earnings inequality occurs.

In terms of the CV^2, Ogwang (1995) proves that changes in inequality follow an inverted U-shaped pattern under the conditions of either perfect equality of earnings within the two sectors [as in Knight (1976)], or equal variance of earnings in the two sectors. He also demonstrates that, under both of these conditions, the maximum degree of earnings inequality occurs within the logical specification of a 0,1 range. More specifically, he shows that the maximum value of the CV^2 must occur in the 0.5-1.0 range, if the mean of Ln earnings of permanent workers are greater than the mean of Ln earnings of casual workers.

We can derive a number of implications from the above equations for the problem of analyzing changes in earnings inequality during the 1980s. First, as the percentage of casual workers increases, the overall mean of Ln earnings, $\bar{Y}$ will decline. The result occurs because: the mean of the Ln of earnings of casual workers is less than the mean of the Ln of earnings of permanent workers ($\bar{Y}_c < \bar{Y}_p$), given that the mean of the Ln of wages of casual workers is less than for permanent workers (mean $W_c <$ mean W_p), and the mean of the Ln of "busy" hours worked by casual workers is less than the mean of the Ln of annual hours worked by permanent workers (mean Ln $H_2 <$ mean Ln H)

Secondly, and what is most interesting, is that the inverted U-shaped pattern of earnings inequality occurs regardless of whether the VLN of earnings of permanent workers (σ^2_{yp}) is greater than or less than the VLN of earnings of casual workers (σ^2_{yc}). Their relative sizes affect only how quickly the maximum is reached and not the inverted U-shaped pattern of inequality itself. If we assume that $\sigma^2_{yp} < \sigma^2_{yc}$, the maximum degree of inequality will be reached at a higher value of $\acute{J}_c$, for a given rate of change of the workforce between the two types of jobs, than if the reverse assumption is made. This relationship is plausible since permanent workers work full-time/full-year and consequently, in comparison to casual workers there is less potential for variation in hours worked.

For the purposes here, an increase in the percentage of casual workers results in an increase in earnings inequality if the change occurs between 0 and 50 per cent of the workforce[158]. Although we cannot estimate the percentage of casual workers, it is plausible to assume that casual workers comprise less than 50 per cent of the workforce.

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[158]. Given the assumption of similarity of variances in the two sectors and a large difference in means.

For example, Morissette et al. (1993) estimate that about 50 per cent of the labour force held the same full-time job all year.

3.4 IMPLICATIONS OF THE MODEL TO BE EMPIRICALLY EXAMINED

In section 5, we examine three selected implications of this model. First, we examine whether or not trends in earnings inequality for the whole working population move counter-cyclically where the implicit (untested) mechanism is that a rise in the unemployment causes a rise in the proportion of the casual workforce.

Although this is an implicit mechanism, it is one which is plausible but difficult to test directly. While there is no direct measure of a "casual" worker and hence no direct method of measuring trends in the proportion of casual workers, other indicators are suggestive of such a trend. For example, Pold (1994) reports that the number of full-time jobs declined during the recessions of the early 1980s and early 1990s. Further, involuntary part-time employment corresponds closely with the business cycle [see Noreau (1994), Chart A and Logan (1994)]. Finally, there has been an increase in multiple job holding which is consistent with the idea of a rise in casual work.

As shown in the section 3.3, since earnings inequality is a quadratic function in J_c, for earnings inequality to increase, the change in earnings inequality must occur before earnings inequality reaches the maximum (which occurs if J_{c1}, $J_{c2} < \hat{J}_c$). Since an increase in earnings inequality cannot be predicted unambiguously from this model, the subsequent empirical investigation is of critical importance. Although, as noted above, it is reasonable to expect that casual workers comprise less than 50 per cent of the workforce and so a rise in the unemployment rate is expected to raise earnings inequality. In section 5, first, the empirical relationship between the unemployment rate and earnings inequality is examined directly. Specifically, we hypothesize that, over the business cycle in the 1980s, earnings inequality should increase and then decrease, for the implict changes in the proportion of the casual workforce. Additionally, overall mean annual earnings should decrease during the recession, as proportionately more of the workforce becomes casual.

The model, however, does not capture several recent labour market phenomena which may affect these two predictions. The increase in "moonlighting", and particularly, the phenomena of multiple part-time or casual job holding by individuals is not captured in this model since we have assumed a direct one-to-one correspondence between jobs and workers which permits the direct mapping of the distribution of earnings from the distribution of jobs. For example, if we allow for multiple casual job holding, than overall mean earnings may not fall, although individuals' economic insecurity has still increased.

Further, this model has assumed that, while the variances of earnings in the two sectors may differ, they remain constant over time. This assumption will not hold if, for example, firms respond to the incentives by reducing the number of permanent workers and requiring a percentage of the smaller number of permanent workers to work longer hours. The variance of earnings of permanent workers would increase if it results in greater variation in hours worked among permanent workers.

Second, from the segmented labour market perspective we expect that the labour market adjustments over the business cycle will not be experienced equally by all groups. In general, we expect that young workers, and possibly women, will be relatively more adversely affected. The argument that women, compared to men, may be more adversely affected by labour market adjustments to cyclical fluctuations is clearly too simple, given the degree of occupational and industrial segregation by gender and the possibility that women are segregated into occupations or industries that are relatively more "insulated" from recessionary affects. In addition, not only has the labour force participation rate of women continued to rise in the 1980s (although by no means by the same amount as in the 1970s), women are also working more hours per year than in the past. The literature reviewed in section 2 indicates why young workers may in particular be adversely affected by recessions and high unemployment conditions. Employers will be more able to weaken the internal labour market during periods of high rates of unemployment, and consequently, young workers taking up entry level positions may be offered lower wages than offered in non-recessionary times. In addition, if firms are offering fewer permanent sector jobs then, in the short run at least, firms are likely to reduce hiring of new workers at the entry level positions and maintain their existing workforce of older workers. The decrease in demand for young workers would be associated with a drop in the average earnings of young workers relative to the entire working population. The argument is premised on one or more hypotheses such as: older workers embody a high degree of firm-specific capital which firms risk losing if they lay off older workers; and there are large fixed costs associated with firing old workers in the form of severance pay, who would only have to be hired back once economic activity increased. Thus wages, hours and earnings, for young workers are expected to decline during a recession.

Third, we examine trends in the components of annual earnings inequality over the business cycle, namely the inequality of hourly wage rates and annual hours worked. The changes in overall inequality of hourly wage rates and annual hours worked over a business cycle can be analyzed in an identical manner as overall annual earnings inequality. Analytically, one can simply substitute hourly wage rates or annual hours worked for annual earnings in equation (13).

An increase in the unemployment resulting in an increase in the proportion of the casual workforce has the same implications for wages and hours, as for annual earnings as discussed above. Overall mean hourly wage rates and overall mean annual hours worked will decline, along with overall mean annual earnings. Similarly, as long as wage and hours inequality have not peaked, an increase in the unemployment rate will increase wage and hours inequality.

While a rise in the unemployment rate leads to increases in inequality of hourly wage rates, annual hours worked, and annual earnings, the model does not give us an indication of the relative contributions of changes in wage and hours inequality to changes in earnings inequality. Consequently, empirical testing is particularly important in this respect.

From a segmented labour market/efficiency wage perspective, we expect that changes in inequality of hours worked over a business cycle will contribute to a greater extent to changes in overall earnings inequality, compared to changes in inequality of hourly wage rates. The argument that the inequality indicator increases in response to an increase in the proportion of the casual workforce is based upon the assumptions that the means and variances of the two sectors, permanent and casual jobs, remain constant. However, this may be an oversimplification as, during a recession, firms may choose to reduce the number of permanent jobs and alter the hourly wage rates and annual hours worked, for example, by permanent workers. If this is the case, given this analytical perspective, it is expected that employers will alter hours of work, rather than hourly wages, for efficiency wage or internal labour market reasons, where the relative permanent-casual wage and notions of "fairness" are thought to be critical factors in determining productivity.

4.0 DESCRIPTION OF THE DATA

This chapter uses Statistics Canada data from the comparable Survey of Work History (SWH) 1981 Person File and the Labour Market Activity Survey (LMAS) 1986 and 1989, Cross-sectional Person Files. Since the SWH 1981 and LMAS 1989 have been described in considerable detail in chapter 2, this section makes only several comments about the data. The SWH 1981 data used here, as in chapter 2, is the revised data (Estimate 5) which corrects for the bias in annual hours worked in the original data. The LMAS 1986 data is the first year of a two-year panel survey (1986 and 1987) and the methodology on which it is based is virtually identical to the LMAS 1989 data. For example, the definition of earnings in the LMAS 1986 and 1989 are identical. Top-coding of earnings was not applied to the LMAS 1986, since one very high earnings observation (earnings equal to $ 422,289) occurs and this observation is dropped because it appears to be a clerical error.[159] The number of jobs accounted for by the SWH 1981 and LMAS data sets does differ. However, this is unlikely to substantially affect the results since the percentage of individuals affected is small (see Appendix E, Table E1).[160] The sample selected in each of the three data sets refers to all individuals between the ages of 17 and 69 years of age, with positive earnings from wages and salaries (i.e. at least one paid job).

5.0 RESULTS: THE RELATIONSHIP BETWEEN UNEMPLOYMENT AND EARNINGS INEQUALITY IN THE 1980s

5.1 DID EARNINGS INEQUALITY CHANGE COUNTER-CYCLICALLY IN THE 1980s?

The key prediction of the model is that annual earnings inequality will move in a counter-cyclical manner over the business cycle, as a result of counter-cyclical changes in the proportion of the casual workforce. This relationship is examined firstly, through a simple inspection of trends in earnings inequality and macroeconomic conditions,

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159. Dropping this one observation from the LMAS 1986 is consistent with the approach of dropping the one observation from the SWH 1981 which also appears to be a clerical error.

160. The LMAS 1986 and 1989 Cross-sectional Person Files account for up to five jobs held by each individual, whereas the SWH 1981 accounts for only four jobs. In both the LMAS 1986 and 1989, about .3 per cent of the sample considered in this Chapter held five jobs. In the LMAS 1986 and 1989, about 1.1 and 1.2 per cent of the sample, held four jobs in the respective years; and this compares with 0.6 per cent of the sample of individuals who held four jobs in 1981, according to the SWH data.

proxied by the unemployment rate and then, more formally, using regression analysis to disentangle cyclical and structural trends

Casual inspection of trends in the unemployment rate and earnings inequality for the whole working population indicate the trends are consistent with the basic hypothesis that earnings inequality moves counter-cyclically, see Graph 1 and Table 2 The unemployment rate (UE) rose from 7 5 per cent in 1981 to a peak of 11 8 in 1983, and back to 7 5 per cent in 1989 The average unemployment rate was 9 9 per cent between 1980 and 1986 and 8 3 per cent between 1986 and 1989. For comparison purposes, note that during the 1970s, the unemployment rate was, on average, 6 7 per cent [161]

Given this pattern of changes in the unemployment rate, if a direct relationship exists between unemployment and inequality of employment earnings, then earnings inequality would correspondingly rise during the period 1981 to 1986 and fall between 1986 and 1989. Since the average unemployment rate during the period 1986 to 1989 of 8.3 per cent is higher than that experienced during the 1970s, earnings inequality in the late 1980s is not expected to fall to the 1981 level, particularly since in this model, firms adjust their job structures only on an annual basis

During the period 1981 to 1986, when the average unemployment rate increased, earnings inequality increased among the population of all workers the VLN of annual earnings increased about 6 per cent, from 1 2517 to 1 2862, which is a significant difference at the 5 per cent level (see Table 2) Mean earnings increased slightly, from

[161]. Annual unemployment rates for the population of women and men combined are presented in Appendix D, Table D2

$ 18,284 to $ 18,653 (in 1986 dollars), rather than declining as the model predicts.[162]

Although the model was presented in terms of the VLN inequality indicator because of its convenient decomposition property, a variety of standard inequality measures have been calculated. Not only does this permit comparison with other studies but it is important methodologically given that inequality indicators reflect different degrees of sensitivity to transfers at various points in the distribution. This point was illustrated in chapter 2, where it was demonstrated that whether earnings inequality for women increased or decreased during the 1980s depended upon the inequality indicator selected. For example, the VLN inequality indicator exhibits greater sensitivity to transfers in the lower tail, the Gini Coefficient to transfers in the middle range of the distribution, and the CV^2 to transfers in the upper tail of the distribution. The VLN inequality indicator, as noted earlier, does suffer from the limitation of not always satisfying the Principle of Transfer.

Earnings inequality increased according to each of these inequality indicators, and deciles 2 through 7 lost income shares (as shown in Appendix E, Table E3(a)). The Gini Coefficient for example, rose 17 basis points, an increase of 4 per cent, which is significant at the 5 per cent level.[163] This is a sizeable increase, given the relative stability in earnings inequality for Canada during the 1970s, as noted in the previous chapter. The ECC (1991) study, using the SCF data, reports an increase in the Gini

[162]. The increase in mean earnings occurs between two points in time and does not indicate that mean earnings increased in each of the intervening years.

[163]. Richardson (1994) reports an increase in weekly wage inequality of 34 basis points over the same period.

Coefficient of 16 basis points over the same period.[164] Note also that, while results for the U.S. indicate a greater degree of earnings inequality at a point in time, the increase in inequality is actually larger in Canada for this 1981-1986 period for the working population as a whole. For the period 1981 to 1986, for the U.S., Karoly (1988) reports an increase in the Gini Coefficient of 1 per cent and an increase in the VLN of 3 per cent, whereas the increase for Canada was 4 per cent and 6 per cent for the same measures. This may reflect the greater severity of the recession in Canada compared to the U.S.

During the growth period between 1986 and 1989, the movement in both earnings inequality and mean earnings are consistent with the model's predictions, that earnings inequality declines and mean earnings increase, implicitly due to the decline in the proportion of casualized workers. When the unemployment rate returned to 7.5 per cent from 9.5 per cent in 1986, earnings inequality decreased among the population of all workers: the VLN of annual earnings decreased by about 11 per cent, from 1.2862 to 1.1389 (see Table 2). Mean earnings also rose slightly in the latter part of the 1980s, from $ 18,653 to $ 19,182 (in 1986 dollars). Earnings inequality also decreased according to a variety of standard inequality measures, and deciles 1 through 5 showed

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[164]. Note that the ECC (1991) result is based upon the SCF data and refers to the sample of all individuals greater than 15 years of age, earning at least 5 per cent of the average industrial wage, and includes self-employment earnings. [ECC (1991), Table 8-3, p. 142]. See also Chapter 2 and Appendix D, Table D5(a).

some improvement in their income shares. Details are presented in Appendix E, Table E3(a).[165]

Although the unemployment rates in 1981 and 1989 were the same, whether earnings inequality in 1989 was higher or lower than in 1981 depends upon the inequality indicator used. The degree of earnings inequality was actually lower in 1989 than in 1981 according to the VLN inequality indicator, as well as several of the Atkinson indicators (r=-0.25, -0.5, and -1.0). However, for the other inequality indicators used, earnings inequality rose between 1981 and 1986 and thereafter decreased but not to the 1981 levels. For example, the Gini Coefficients in 1981, 1986 and 1989 were .4025, .4190, and .4116, and the values in 1981 and 1989 are significantly different at the 5 per cent level. The distribution of earnings does show some hollowing out, since the share of total earnings accruing to the middle deciles 3 through 8 was smaller in 1989 compared to 1981.

This pattern, of an increase in earnings inequality between 1981 and 1986 and then a decline between 1986 and 1989, is similar to the pattern of earnings inequality observed by Richardson (1994) in terms of weekly wages for Canada and Karoly (1993) in terms of annual earnings for the United States. Karoly (1993) shows that earnings inequality increased rapidly from about 1981 to 1983, declined from 1983 to 1985, and remained stable or increased very slightly from 1985 to 1987, and then dropped sharply in 1989.

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[165]. The change in earnings inequality between 1986 and 1989 for the population as a whole (men and women combined) reported here cannot be compared to either Dorion and Barrett (1994) or Morissette et al. (1993). Doiron and Barrett (1994) use data for 1981 and 1988 and Morissette et al. (1993) provide estimates of earnings inequality disaggregated by gender which are referred to in the next sub-section.

While earnings inequality remained greater in the post-1982 recession period compared to 1981, in 1989, it dropped almost to the 1981 level [Karoly (1993), Figure 2.12, p. 66].[166] Thus, Karoly's (1993) estimates show that earnings inequality peaked around 1983 and after the recession there was a decline in earnings inequality. While the exact trend described above refers to earnings inequality measured by the VLN indicator, the trend is independent of indicator as similar trends are observed when the CV, Theil Entropy, and Mean Logarithmic Deviation indicators are used [Figures 2.12, p. 66 and 2.13, p. 68]. Karoly's (1993) result contrasts with Levy and Murnane's (1992) conclusion that earnings inequality continued to rise throughout the 1980s which is based upon data only up to 1987.

The above casual inspection of trends in earnings inequality and the unemployment rate indicates that macroeconomic performance has distributive consequences, and in particular that slow macroeconomic growth, as proxied by high rates of unemployment, has a regressive impact on the distribution of earnings. This relationship is examined more directly below using regression analysis.

To measure the contribution of the unemployment rate to earnings inequality, equation (16) specifies that the level of earnings inequality reflected by the VLN indicator (or various other inequality indicators) in 1981, 1986, and 1989, is determined by the unemployment rate and structural economic factors (such as the degree of unionization,

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[166]. Karoly's (1993) estimates are based upon data from the Current Population Survey using a sample of all individuals with positive earnings from wages and salaries.

relative minimum wages, industrial structure, occupational structure, and education levels, among other factors) and a time trend.

$$(16) \qquad INEQ_t = a_0 + a_1UE_t + a_2STRUCTURE_t + a_3TREND_t + e_1$$

where:

INEQ = Indicator of Earnings Inequality
UE = Unemployment Rate
STRUCTURE = Structural Factors
TREND = Linear Time Trend (1981=1, 1986=6, 1989=9)
t = 1981, 1986, 1989
e_1 = Random Error Term

Equation (17) is the first difference of (16) and represents the relationship between the **changes** in the unemployment rate and **changes** in earnings inequality, for the periods 1981-86 and 1986-89, where it is assumed that the permanent structural factors (STRUCTURE) did not change. However, if the structural factors did change over the 1980s then this will be captured by the time dummy. Changes in selected structural factors are explicitly considered in chapter 4.

$$(17) \qquad CGINEQ_t = b_0 + b_1CGUE_t + b_2CGUE{*}TDUMMY_t + b_3TDUMMY_t + e_2$$

where:

CGINEQ = Change in Earnings Inequality Indicator
CGUE = Change in the Unemployment Rate
TDUMMY = Time Dummy Variable (1981-86=0; 1986-89=1]
t = 1981-86=0 and 1986-89=1
e_2 = Random Error Term

Equation (17) is estimated using ordinary least squares, for all workers (women and men combined). Earnings inequality indicators (the VLN, as well as Gini Coefficient, Theil

Entropy, Atkinson (r=-1.0), and Deciles Shares) are calculated for the ten provinces in each of the three years and then changes in each indicator are calculated between 1981-86 and between 1986-89. Likewise the unemployment rates are provincial and the changes are taken over the same two time periods.[167] The data for ten provinces and the two time periods (1981-86 and 1986-89), generates 20 observations. This procedure of examining the impact of the unemployment rate on earnings inequality from cross-provincial variation in two periods differs from the usual approach of using a longer time-series data set. Table 3 presents the ordinary least squares regression results for equation (17).

The regression results (from equation (17)) indicate that macroeconomic conditions, or more specifically, the recession in the early 1980s contributed to increased earnings inequality (see rows (1) -(4), Table 3). Between 1981 and 1986, the increase in the unemployment rate had a positive and significant effect on earnings inequality for the population of all workers.[168] For example, a one percentage point increase in the unemployment rate resulted in an increase of .0457 basis points in the VLN indicator (Table 3). There were also significant increases in earnings inequality according to the other three indicators as well. The magnitude of the increase varied among the indicators, with the Atkinson and VLN indicators showing the largest increases in earnings inequality since they are most sensitive to changes in the lower tail.

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[167]. The provincial unemployment rates are taken from Statistics Canada, Historical Labour Force Statistics, Catalogue 71-201.

[168]. Significance is determined using a two-tailed test, at the 10 per cent level, with 17 degrees of freedom generating an absolute critical t-value=1.740.

Taking a more disaggregated view of the cyclical effects on earnings classes, rows 5 to 14 in Table 3, also indicate that between 1981 and 1986, increases in the unemployment rate had a regressive impact on the distribution of earnings. There is a negative relationship between changes in the unemployment rate and changes in the shares of total earnings accruing to the bottom six deciles, although only the changes for the bottom three deciles are significant. For example, a one percentage point increase in the unemployment rate results in a loss of .037 and .068 percentage points in the share of earnings accruing to the first and second deciles. For comparison purposes, Blinder and Eskai (1978) find that for the U.S. between 1947-74 using family income, that a one percentage point increase in the unemployment rate, results in loss to the first quintile of about .13 of a percentage point. For deciles seven through ten, there is a positive relationship between the change in the unemployment rate and changes in the shares of total earnings accruing to each of these deciles, although only the changes for deciles eight and nine are significant.

While earnings inequality for the population of all workers (men and women together) was influenced by the recession in the early 1980s, macroeconomic growth in the latter part of the 1980s may not have decreased earnings inequality to the extent expected. The unemployment rate variable interacted with the time trend dummy (CGUE*TDUMMY) is negative and significant for the VLN indicator. Between 1986 and 1989, a one percentage point decline in the unemployment rate resulted in a slight increase of .0168 basis points (.0457-.0625) in the VLN indicator. A similar result occurs for the other inequality indicators considered. As shown in rows one through four, the CGUE*TDUMMY variable is negative and significant. This finding suggests that the relationship between cyclical factors and earnings inequality differed between the two periods and that during the period of economic growth in the late 1980s, workers with low earnings did not gain back the losses experienced during the recession. This point is supported by the finding that the time dummy variable (TDUMMY) is significant for same of the regressions.

This finding for the population of all workers is not, however, robust to equation specification. The first change in equation specification is the exclusion of the time dummy variable for the period 1986-89 (TDUMMY) in equation (17) and the results are presented in Table 4. These results indicate that conclusions about whether or not the unemployment-inequality relationship differs beween the two periods depends on the inequality indicator. The results for the Gini Coefficient and Theil Entropy indicators show a positive unemployment-inequality relationship in the 1986-89 period as for the previous specification. However, the Atkinson ($r=-1.0$) suggests unemployment had the same impact on inequality in both periods and the VLN indicator suggests that unemployment had no impact in the latter period. The results for decile shares suggest, as in the previous specification, that workers in the lower deciles of earnings continued to experience a relative decline in their shares of total earnings despite the improvement in macroeconomic conditions.

Estimating the equation in terms of levels rather than changes generates a more substantial difference in results. Three versions of equation (16) are estimated, although in each case structural variables are excluded. Version 1 includes the unemployment rate interacted with a time dummy variable for 1986 and the unemployment rate interacted with a time dummy variable for 1989 [TDUM86 takes the values 0 in 1981 and 1989 and 1 in 1986; TDUM89 takes the values 0 in 1981 and 1986 and 1 in 1989]. Version 2 includes the unemployment rate interacted with a time dummy variable for 1986 and 1989 combined [TDUM86-89 takes the values 0 in 1981 and 1 in both 1986 and 1989]. Version 3 adds to Version 2 a trend variable [TREND takes the values 1, 6, and 9 in 1981, 1986 and 1989]. The results for the four inequality indicators are presented in Table 5.

Estimating the equation specified in terms of levels rather than changes leads to a different conclusion about the impact of the unemployment rate on earnings inequality in the late 1980s Contrary to the results of Table 3, in these equations, the weight of the evidence indicates that decreases in the unemployment rate in the late 1980s resulted in decreases in earnings inequality. In Panel A, the unemployment rate interacted with the dummy variables for 1986 and 1989 are either insignificant [Gini Coefficient and Theil Entropy], significant and positive in 1986 indicating a stronger impact of unemployment on earnings inequality [Atkinson (r=-1.0)], or significant and negative in 1989 indicating a weaker impact [VLN] In Panels B and C, the unemployment rate interacted with the dummy for the period 1986 and 1989 is always insignificant indicating that the unemployment-earnings inequality relationship in the early and late 1980s did not differ, with the exception of the Atkinson (r=-1.0) in Panel C.

In summary, the results of the equation (17) estimated in terms of changes in unemployment rates and changes in earnings inequality presented in Table 3 for the population of all workers women and men combined, indicate that there were counter-cyclical changes in earnings inequality during the 1980s but that the impact of macroeconomic conditions on earnings inequality differed between the two periods of the 1980s. The finding that the unemployment rate variable is significant and has the expected sign for the four inequality indicators, the bottom three deciles and deciles eight and nine is indicative that cyclical macroeconomic conditions affected earnings inequality during the early 1980s. Further, the recession not only increased earnings inequality but disadvantaged the poorest of workers. These results are consistent with the idea that firms responded to a rise in the unemployment rate by increasing their proportions of casual workers resulting in increased earnings inequality. However, the impact of macroeconomic conditions on earnings inequality in the late 1980s were weakened.

A weakened relationship between unemployment and inequality is consistent with the model outlined in section 3 since how firms change their labour strategies in response to changes in the unemployment rate is hysteretic in nature. Here a rise in the unemployment rate causes an increase in the proportion of Just-in-time Firms. However, an equal decline in the unemployment rate may not cause an equal decline in the proportion of Just-in-time Firms. The decline may well be smaller if there are productivity and direct financial costs associated with changes in work organization. More importantly, the rise in the proportion of Just-in-time firms itself causes additional unemployment as a result of permanent workers being laid off. The increase in the size of the pool of unemployed workers increases the ability or profitability for other firms to adopt a Just-in-time labour strategy.

The conclusion of weaker cyclical impact in the latter part of the 1980s is tentative. Firstly, changes in the gender composition of the workforce need to be considered. Women increasingly were represented in the labour force during the 1980s and in particular there was an increase in the number of hours worked by part-time women. Further, a segmented labour market hypothesis is that different groups of workers are affected unequally by the process of labour market segmentation. For these two reasons, trends in earnings inequality are examined separately for men and women in the next section.

Secondly, the results presented in Tables 3 and 4 indicate that the issue of whether or not the relationship between macroeconomic conditions and earnings inequality for the population weakened in the late 1980s is sensitive to issues of equation specification, such as the inclusion of a trend dummy when specifying in terms of changes and levels compared to changes. Another specification point to be considered is that even the specification in levels ignores the pattern of unemployment rates in the intervening years. Although the level of the unemployment rate for the population for Canada was the same in 1981 and 1989, the pattern in the intervening years for the two periods was quite different, primarily due to the high rate of unemployment in 1983. As noted earlier, the average unemployment rate was 1.6 percentage points higher in the 1981-1986 period.

To distinguish between cyclical and structural impacts on earnings inequality ideally requires a long, annual data series on earnings inequality estimates and unemployment rates. While annual estimates of inequality are available from Statistics Canada in published materials, the income concept used is total income rather than employment earnings, the income concept of interest in this chapter. Morissette et al. (1993) published inequality estimates for employment earnings for 13 years over the period 1969 to 1991, although only for women and men separately and not for the population of all workers. These estimates are used along with the gender-specific unemployment rates (for the relevant years) in the following sub-section for comparative purposes.

5.2 ARE SOME GROUPS OF WORKERS AFFECTED BY CYCLICAL FLUCTUATIONS TO A GREATER EXTENT THAN THE POPULATION?

5.2.1 Do cyclical fluctuations affect male and female earnings inequality equally?

The counter-cyclical pattern of earnings inequality observed for all workers (women and men combined) also exists for men however, the pattern of earnings inequality for the group of all women workers depends upon the inequality indicator. For men, earnings inequality increased between 1981 and 1986 as predicted by the model, implicitly due to the rise in the proportion of the casual workforce. The VLN of annual earnings increased 14 per cent, from .9838 to 1.1222, a change which is statistically significant at the 5 per cent level (see Table 2). Mean earnings increased in real terms from $ 22,060 to $ 22,782 (in 1986 dollars) over this period, rather than decreased as predicted by the model. Earnings inequality also increased according to each of the inequality indicators selected and the bottom six deciles of the working male population lost together 1.6 percentage points of total earnings (see Appendix E, Table E3(c)).

For men, between 1986 and 1989, the VLN of annual earnings declined 9 per cent from 1.1222 to 1.0238 and mean earnings increased, as predicted by the model (Table

2). The lower deciles (deciles 1 through 5) gained income shares, which is consistent with the implicit mechanism of a decline in the proportion of the casual workforce during this period. Earnings inequality also decreased according to all inequality indicators used, with the exception of the CV^2 but the increase in the CV^2 is not statistically significant (see Appendix E, Table E3(c)).

Earnings inequality in 1989 is not statistically different from earnings inequality in 1981, according to the VLN indicator. The same result holds for other inequality indicators which are sensitive to the lower tail, such as the Theil, and the Atkinson index where the inequality aversion parameter is high (in this case $r=-0.5$ and -1.0). However, for other inequality indicators, such as the Gini and the Atkinson index ($r=0.5$ and -0.25), inequality in 1989 is statistically higher than in 1981. While deciles 1 through 5 had improved their earnings shares between 1986 and 1989, the shares did not return to the more advantageous 1981 position.

These results for men are similar to results from other studies both for Canada and for the U.S. For example, between 1981 and 1986, the Gini Coefficient increased by 27 basis points and 31 basis points for two different Canadian studies (respectively, ECC (1991) and Morissette et al. (1993))[169], by 28 basis for a U.S. study (Karoly (1988), and 22 basis points in this study. Between 1986 and 1989, this study reports a decline in the Gini Coefficient for men of 4 basis points and Morissette et al. (1993) find a decline of 6 basis points.

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[169]. Note that both ECC (1991) and Morissette et al. (1993) results are based upon the SCF data.

For women, the pattern of earnings inequality during the 1980s depends upon the inequality indicator used. The VLN of annual earnings indicator shows a decline throughout the 1980s, rather than following the counter-cyclical pattern predicted by the model (which was supported by the regression results for the populations of male workers and combined male and female workers dicussed previously). For the VLN indicator, the change in earnings inequality between 1986 and 1989 and the overall change between 1981 and 1989 are statistically significant. Mean earnings increased during both time periods of the 1980s. However, in terms of a variety of other inequality indicators, earnings inequality increased between 1981 and 1986 and declined between 1986 and 1989, a pattern which is consistent with the model's predictions. For example, the Gini Coefficient increased by 4 basis points and then declined by 12 basis points, although only the change between 1986 and 1989 is significant. It is likely that earnings inequality remained quite stable for women partly because of the increase in the number of annual hours of work, particularly by women working less than the full-time number of hours, and this could have offset both cyclical and structural increases in earnings inequality.

These results for women are comparable to other studies. Using the Gini Coefficient, between 1981 and 1986, we find an increase in earnings inequality for women of 4 basis points, compared to an increase of 8 basis points reported by Morissette et al. (1993) and 12 basis points for women in the U.S. reported by Karoly (1988). Between 1986 and 1989, we find a decline in the Gini Coefficient of 12 basis points compared a decline of 15 basis points in Morissette et al. (1993).

These casual observations suggest that trends in earnings inequality and macroeconomic conditions are related, although more strongly for men than for women. Direct evidence concerning this relationship is now explored by estimating equation (17) which is terms of changes. The results are found in Tables 6 through 12. For men, the recession of the early 1980s contributed to increased earnings inequality. The unemployment rate had a positive and significant impact on earnings inequality as measured by the VLN indicator, as well as the Atkinson (r=-1.0) (Table 6). For example, a one percentage point increase in the unemployment rate resulted in a .05 basis point increase in the VLN indicator (Table 6). The cyclical downturn of the early 1980s had a regressive impact on the distribution of earnings as shown in the equations where deciles shares of total earnings are used as the dependent variables. Focusing upon those deciles shares which show a significant impact, a one percentage rise in the unemployment rate results in a loss of .05 and .08 percentage points of total earnings accruing to the first and second deciles, respectively, and a rise of .10 percentage points of income accruing to the eighth decile.

For men, the relationship between the unemployment rate and earnings inequality did differ between the two periods in this specification. The CGUE*TDUMMY variable is negative and significant for the VLN indicator and positive and significant for the first two decile shares. The fall in the unemployment rate between 1986 and 1989 did not cause earnings inequality to decline. A one percentage point decline in the unemployment rate resulted in an increase in the VLN indicator by .005 basis points (.0505-.0557). The conclusion that cyclical factors had a weakened impact in the latter part of the 1980s must be treated with some caution, since the CGUE*TDUMMY variable is insignificant when the Atkinson indicator is used as the dependent variable.

Further, and most importantly, six alternative specifications were estimated. The evidence indicates that the unemployment-earnings inequality relationship for men did **not** weaken in the latter part of the 1980s. Dropping the time dummy from equation (17) suggests that in terms of the VLN indicator, the unemployment rate had a weakened impact on earnings inequality in the late 1980s, as opposed to a positive impact as in the previous specification (see Table 7). Interestingly, in this specification, all four inequality indicators are significant and the Gini Coefficient, Theil Entropy and Atkinson (r=-1.0) show that the relationship between unemployment and earnings inequality did **not** differ between the two periods. The three versions of estimating the equation in terms of levels, see Table 8, show that the relationship was not weakened and, in some cases, was actually strengthened in the late 1980s. For example, in Panel C of Table 8, a one percentage point increase in the unemployment rate resulted in an increase in earnings inequality of .019 basis points in the VLN in the early 1980s and in the late 1980s, a one percentage point drop in the unemployment rate resulted in a drop of .032 (=.019+.013) basis points.

Finally, equation (18) was estimated using estimates of male earnings inequality reported by Morissette et al. (1993) and the male unemployment rates for the corresponding years.[170] Equation (18) was estimated with the Theil Entropy and Gini

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[170]. Morissette et al. (1993) provides inequality estimates for 13 years over the period 1969 to 1991.

Coefficient as the inequality indicators since these were also used to estimate equation (17). The results are presented in Table 9.

$$(18) \qquad INEQ_t = c_0 + c_1 UE_t + c_2 UE{*}TDUMMY + c_4 TREND + e_3$$

where:

INEQ = Indicator of Earnings Inequality
UE = Unemployment Rate
TDUMMY = Structural Change Time Trend (1969-1983=0,1986-1989=1
TREND = 1,3,5,7,9,11,13,15,18,20,21,23
t = 1969,1971,1973,1975,1977, 1979, 1981,1983,1986,1988,1989,1991
e_3 = Random Error Term

The OLS results of equation (18) for men indicate that cyclical factors continued to be important in the late 1980s and there is no evidence that structural factors influenced earnings inequality. A one percentage point increase in the unemployment rate between 1969 and 1983 inclusively, resulted in an increase in the Theil Entropy indicator of .0072 basis points and in the Gini Coefficient of .0061 points (Table 9). A one percentage point decrease in the unemployment rate over the period 1986 to 1991 caused a decline in the Theil Entropy indicator of .0100 basis points (.0072+.0028) and a decline in the Gini Coefficient of .0086 basis points (.0061+.0025) (Table 9). Both the unemployment rate and unemployment rate interacted with the time dummy are positive and significant in both regressions. The inclusion of the time trend (Panel B of Table 8), offers similar results. The adjusted R^2 for equation (18) are considerably higher compared to those for equation (17), although they are not strictly comparable given the different equation specifications. Differences in the results of equation (17) and (18) may arise because in equation (18) is estimated with data which better reflects the actual pattern of unemployment during the 1980s and particularly, the high rates of unemployment in the early 1980s.

The results suggest cyclical factors are important in determining trends in earnings inequality for men throughout the 1980s and not just in the early 1980s. We turn now to examine the nature of the relationship for women. The regression results for women indicate, as for men, that the deterioration in macroeconomic conditions in the early 1980s resulted in an increase in earnings inequality and a redistribution of earnings in a regressive manner (see Table 10). Between 1981 and 1986, a one percentage point rise in the unemployment rate caused an increase of .037 points in the VLN indicators. The effect on the Gini Coefficient was also positive and significant but the effects on the other indicators were insignificant. A one percentage point rise in the unemployment rate also causes a loss in earnings of .060, 095, and .107 percentage points in total earnings accruing to the deciles two, three and four, respectively.

In this specification of the equation (i.e. variables expressed as changes and with the TDUMMY included), the relationship between the unemployment rate and earnings inequality appears negative in the late 1980s. Earnings inequality continued to rise despite the drop in the unemployment rate. A one percentage point decline in the unemployment rate resulted in an increase in the VLN indicator of .0257 basis points (.0371-.0628); and a similar result is found in terms of the Gini Coefficient.

This finding of a negative unemployment-earnings inequality relationship in the late 1980s is not robust to equation specification issues. Further, in three of the next six alternative specifications, a positive relationship was found, albeit weaker than for the earlier period. Dropping the TDUMMY variable from the original specification does not change the findings (see Table 11). However, estimating the equation in terms of levels generates quite different results (see Table 12). In Panel B of Table 12, the Gini Coefficient, Theil Entropy and VLN all show a positive relationship between the unemployment rate and earnings inequality for women during the entire 1980s, although the relationship is weaker in the latter 1980s. A one percentage point increase in the unemployment rate causes an increase of .027 basis points in the VLN indicator in 1981 and a one percentage point decrease in the unemployment rate in 1986 and 1989 result in a drop in the VLN by .014 (.027+.013) basis points.

To provide a check on this result, equation (18) was estimated for the longer period 1969 to 1991 using the data from Morissette et al. (1993) as for men. The results are presented in Table 9. The results suggest that the second period (1986-1991) did not differ significantly from the earlier period (1969-1983) as the unemployment rate interacted with the time dummy is insignificant in both periods. However, the adjusted R^2 figures are very low.

Comparing the results of equations estimated in terms of levels, the weight of the evidence suggests that a positive relationship between the unemployment rate and earnings inequality exists for men and women. The conclusions drawn upon the unemployment-earnings inequality relationship do differ depending upon researchers' choices about equation specification (particularly the choice of estimating the equation in terms of levels rather than in terms of changes) and inequality indicator.

While a positive relationship exists for both men and women, there are several important differences. In general, the equations better capture the experience of male workers during the 1980s judging by the higher adjusted R^2 and the unemployment rate had a larger impact on inequality judging by larger coefficients on the unemployment rate in each of male equations. Secondly, any change in the unemployment rate-earnings inequality relationship during the 1980s is greater for women than for men. This result may be explained by increases in the amount of labour women provided to the labour market during the 1980s unrelated to changes in macroeconomic conditions.

Having examined the gender dimension of trends in earnings inequality, we turn now to the issue of whether young workers experienced cyclical fluctuations in the 1980s differently from the population as a whole.

5.2.2 Do cyclical fluctuations affect young workers more strongly?

Mean earnings of young workers fell substantially over the 1981 to 1986 period when macroeconomic conditions deteriorated. This observation is consistent with the explanation that the decreased demand for permanent workers, resulting from a macroeconomic slowdown, is not equally shared in a labour market characterized by features such as rationed permanent jobs, as well as other segmented labour market features such as internal labour markets.

Considering all workers together, the largest change in mean earnings for any age group relative to the mean earnings of the working population, occurred for the youngest age group 17-24 years. In 1981, 1986 and 1989, mean earnings of the age group 17-24 years, relative to the working population, were 60 per cent, 48 per cent, and 49 per cent (see Table 13). The age groups 35-44 years, 45-54 years, and 55-64 years all experienced increases in mean earnings relative to the working population between 1981 and 1986. Mean earnings of young women relative to mean earnings of the entire working population of women fell between 1981 and 1986, from 52 to 42 per cent (Table 14). Young male workers also on average fared badly compared to the entire working population, as their relative mean earnings dropped from 68 to 53 per cent of the average earnings for the population between 1981 and 1986 (Table 15). Relative mean earnings of women older than 55 years also dropped, as did relative mean earnings of men older than 65 years. However, the proportion of the labour force accounted for by workers 65 years and older is quite small; for example, women and men aged 65 years and over represented only 1 per cent of the labour force in 1981.

The deteriorating average labour market experiences of young workers in Canada in the 1980s as reported here, has also been documented in other Canadian studies and a variety of U.S. studies. The ECC (1991) study reports a smaller decline in relative mean earnings of young workers over the 1981 to 1986 period, a decline in relative mean earnings from 0.56 to 0.49.[171] Morissette et al. (1993) for the period 1981 to 1988, report a drop in mean earnings of workers aged 17-24 years of 18 per cent for men and 11 per cent for women, keeping the age and education composition fixed at the 1981

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[171]. Note, however, that their reference population differs slightly, as young workers are defined as workers 25 years of age or less and the results are based upon the SCF data.

levels.[172] In the U.S., according to Levy and Murnane (1992), real mean earnings of younger men fell substantially during the 1980s, while mean earnings of older men fell only slightly, resulting in a sharp increase in the experience premium.

A drop in relative average earnings of young workers indicates an increase in between-age-group inequality. This is not, however, the only cause of an increase in overall earnings inequality because earnings inequality within many age groups also increased. For example, the Gini Coefficient increased by 9 basis points for women aged 17-24 years, by 12 basis points for women aged 55-64, by 9 basis points for men aged 17-24 years, and by 32 basis points for men aged 55-64 years (see Tables 13 and 14).

The magnitude of the decline in the average earnings of youth workers relative to the average earnings of the entire working population and increases in earnings inequality within some age groups lead to the following question: were changes in overall earnings inequality due to changes in between-age-group inequality, or to changes in within-age-group inequality?

The relative contribution of within-age and between-age inequality to changes in overall earnings inequality over the business cycle, is examined formally by decomposing the Theil Entropy index. The Theil Entropy index of inequality (T) can be decomposed in order to analyze the contribution of these two components (between and within group inequality) to overall inequality [Shorrocks (1980)]. The Theil Entropy index is written as in equation (19):

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[172]. This compares to 13 per cent and 9 per cent for men and women, respectively, for the period 1981 to 1989, without controlling for age and education compositional factors.

$$(19) \quad T = {}_g\Sigma\ (n_g u_g / n_t u_t) T_g + T_g^*$$

$$\text{and} \quad T_g = 1/n_g\ {}_i\Sigma(y_i/u_g)Ln(y_i/u_g)$$

$$\text{and} \quad T_g^* = 1/n_t\ {}_g\Sigma(n_g u_g/u_t)Ln(u_g/u_t)$$

where:

- g = age groups (6)
- i = individual i
- T = Theil Entropy index for the population
- T_g = Theil Entropy index for group g
- T_g^* = Theil Entropy index for group g calculated on the assumption that each individual in group g receives mean earnings u_g
- n_g = number of individuals in group g
- n_t = number of individuals in the population
- u_g = mean earnings of group g
- u_t = mean earnings of the population

The first term on the righthand side of equation (19) is the within-group component of inequality and represents the sum of the Theil index for each age group (T_g)[173] calculated separately and weighted by its share of earnings. The second term represents the between-group component of inequality which is calculated using the Theil index formula, on the assumption that all individuals in a given age group (g) receive the group's mean earnings (u_g).

The results of the Theil decomposition, presented in Table 16, indicate: firstly, that changes in between-age-group inequality followed a counter-cyclical pattern whereas within-age-group inequality increased throughout the 1980s; and secondly, that changes in earnings inequality during the 1980s were influenced to a greater extent by changes

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[173]. Six age groups are used, namely, 17-24 years, 25-34 years, 35-44 years, 45-54 years, 55-64 years, and 65-69 years.

in between-age-group inequality than by within-age-group inequality. For the population of women and men combined, the Theil Entropy index follows the predicted pattern of an increase between 1981 and 1986 and a decline between 1986 and 1989. Within-age-group earnings inequality rose by an absolute amount of .0009 in each period. Between-age-group earnings inequality rose in the first period by .0205 basis points and declined in the second period by .0114 basis points. The continued rise in within-age-group inequality throughout the 1980s is by no means uninteresting and may be indicative of structural changes but it does not negate the importance of changes in between-age-group inequality. The absolute changes in between-age-group inequality are consistent with the model of cyclical changes and mechanism of labour market adjustment proposed here, as indicated by their appropriate signs. As noted earlier, the increase in between-age-group inequality is being driven primarily by the drop in relative mean earnings of young workers which is consistent with the hypothesis that young workers are particularly disadvantaged when macroeconomic conditions deteriorate. Even in the first period, where both within- and between-age-group inequality increased, the absolute increase in between-age-group inequality is substantially larger, and accounts for a much larger share of the overall increase in earnings inequality.

The result that changes in between-age-group earnings inequality are an important explanation of changes in earnings inequality for the entire working population also holds when the data are disaggregated by sex. For women, within-age-group earnings inequality declined in both periods (.0147 and .0104 basis points in the two periods) and the absolute changes in between-age-group have the expected signs. Between-age-group earnings inequality increased in the first period by .0173 basis points and declined by .0059 basis points in the second period. For men, within-age-group earnings inequality rose in both periods (as for the whole population) and between-age-group earnings inequality rose in the first period by .0233 basis points and declined in the second period by .0116 basis points. Even in the first period, the absolute increase in between-age-group earnings inequality was substantially greater than the increase in within-age-group inequality.

In summary, for both men and women, the counter-cyclical pattern of changes in between-age group earnings inequality are consistent with the hypothesis that cyclical fluctuations in macroeconomic activity particularly affects young workers. During a recession, the decrease in proportion of permanent jobs offered by firms disproportionately reduces the demand for permanent young workers, resulting in a decline in their average earnings relative to average earnings of the entire working population. The decline in relative mean earnings of young workers is reflected in a rise in between-age-group inequality (noting that for most other age groups, relative mean earnings rose) and this contributed to increases in overall earnings inequality during the recession.

The argument that macroeconomic fluctuations contribute to this observed pattern of changes in between-age-group earnings inequality is plausible not only because it consistent with the model outlined above but because the conventional supply side explanations of changes in between-age-group inequality is not applicable. The proportion of the workforce aged 17-24 years declined between 1981 and 1986 from 28 per cent to 24 per cent. Thus, the decline in relative average earnings of young workers over this period is substantial given that the relative supply of young workers declined. Katz and Revenga (1989) for the U.S. also suggest that macroeconomic conditions affected the relative earnings of young workers in a counter-cyclical manner. Based upon an analysis of mean earnings by age-education group across regions in the U.S., Katz and Revenga (1989) find a negative correlation between changes in the unemployment rate and changes in real hourly earnings of new male high school entrants (r=-0.85, for the period 1979-1987).[174]

5.3 THE RELATIVE CONTRIBUTIONS OF HOURLY WAGE RATES AND ANNUAL HOURS WORKED TO CHANGES IN ANNUAL EARNINGS INEQUALITY

The model outlined in section 3 predicts that a rise in the unemployment rate provides an incentive for firms to alter the job structure towards a more casual workforce and this results in an increase in earnings inequality. Substituting hourly wages or annual hours worked for annual earnings into equation (13) indicates that a rise in the unemployment rate will also cause an increase in the inequality of hourly wage rates and annual hours worked (and a decrease in mean wages and hours).[175] While the model

[174]. For example, in New England, when the unemployment rate declined from 5.4 to 3.3. per cent, the real hourly earnings of male high school new entrants increased by 2.5 per cent; and, in the "Rust Belt", when the unemployment rate rose from 6.1 to 7.2 per cent, hourly earnings of male high school new entrants fell by 26 per cent [Katz and Revenga (1989), p.547].

[175]. The increase in inequality of hourly wages (or annual hours worked) occurs under the same assumptions specified earlier, that mean Ln wages (or hours) of casual and permanent workers are substantially different and the VLN of wages (or hours) of

predicts an increase in both the inequality of hourly wage rates and annual hours worked, their relative contributions to the overall increase in (predicted) earnings inequality needs to be assessed empirically.

To assess the relative contributions of these two components to changes in overall annual earnings inequality, the VLN of annual earnings can be decomposed into three components: the VLN of hourly wage rates; the VLN of annual hours; and the Covariance between Ln wages and Ln hours. While the VLN inequality indicator has this attractive decomposition property, it does have the weakness of not always satisfying the Principle of Transfer, as noted earlier. For each individual worker, annual earnings can be written as in equations (20) and (21):

$$(20) \qquad E = W*H$$
$$(21) \qquad e = w+h$$

where:

E,W and H = annual earnings, hourly wage rate, annual hours worked
e,w and h = natural logarithms of E, W and H

Then the VLN of annual earnings can be decomposed as in equation (23):

$$(23) \qquad \mathrm{VLN}(e) = \mathrm{VLN}(w)+\mathrm{VLN}(h)+2\mathrm{Cov}(w,h)$$

where:

VLN(e) = Variance of e
VLN(w) = Variance of w
VLN(h) = Variance of h
Cov(w,h) = Covariance between w and h

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casual and permanent workers are similar.

Results for assessing whether patterns of wage and hours inequality follow those predicted by the model are presented in Tables 17 and 18 and the results of equation (23) concerning the relative contributions of wage and hours inequality to overall earnings inequality are reported in Table 19.[176]

In general, the results suggest that the patterns of inequality and relative contributions of wages and hours to changes in overall earnings inequality during the 1980s differ considerably depending upon the reference population, inequality indicator selected, and time period considered.

We start by discussing the results with reference to men because the large increases in earnings inequality observed during the 1980s occurred primarily for this population group and also with reference to the VLN inequality indicator because the theoretical implications have been developed primarily in terms of this particular indicator. For men, focusing upon the VLN indicator suggests firstly, that patterns of wage and hours inequality follow the pattern predicted by the model. Between 1981 and 1986, the VLN of wages and Ln hours increased by .026 and .028 basis points, respectively. Then between 1986 and 1989, wage and hours inequality declined by .015 and .043 basis points, respectively (see Table 17). These numbers suggest, along with the decomposition results shown in Table 19, that during the early 1980s, the rise in both wage and hours inequality contributed more or less equally to the rise in overall earnings

[176]. The individual hourly wage rate refers to the individual's average hourly wage rate from all jobs and is calculated simply as the individual's annual earnings from all jobs divided by the individual's annual hours worked in all jobs. Note that this measure differs from the one employed in studies of the distribution of jobs by wage levels, see, for example, Myles et al. (1988).

inequality. In the late 1980s, however, the drop in hours inequality was greater than the drop in wage inequality.

Secondly, changes in annual earnings inequality over the business cycle are driven to a greater extent by changes in inequality of annual hours worked relative to hourly wage rates. The decomposition results indicate that the counter-cyclical pattern of annual earnings inequality is due to a greater extent to the counter-cyclical change in inequality of annual hours worked, relative to the change in inequality of hourly wage rates. The absolute change in inequality of annual hours worked is greater than the absolute change in inequality of hourly wage rates in each of the periods and the absolute change in the covariance term is larger than both these terms. At a given point in time, even for men, who are more likely than women to work full-time/full-year, the variance of hours worked is almost twice that of the variance of wages.

Thirdly, for men, while both wage and hours inequality moved counter-cyclically in terms of the VLN indicator, the rise in earnings inequality over the entire period 1981 to 1989 was due to the rise in wage inequality and the rise in covariance between the Ln of wages and the Ln of hours, because of the large decline in hours inequality in the late 1980s. For the period 1981 to 1989, wage inequality increased by 11 basis points and hours inequality declined by 14 basis points. Doiron and Barrett (1994) similarly document for men a large decline in hours inequality in terms of the VLN indicator, although they also report that both hourly wage rate and annual earnings inequality declined between 1981 and 1988, in contrast to the increases reported here.

The covariance between the Ln of wages and the Ln of hours for men increased from .089 to .111 over the 1981 to 1989 period, and contributed more to the overall increase in earnings inequality than the increase in wage inequality (Table 19). The increase in the covariance between the Ln of wages and the Ln of hours is consistent with the findings of Dorion and Barrett (1994) for Canada and Burtless (1993) for the U.S.[177]

These three conclusions concerning the pattern of wages and hours over the business cycle and their relative contributions to increased earnings inequality can only be held tentatively since they are based upon patterns observed for only one inequality indicator, the VLN. In terms of cyclical patterns, the other three inequality indicators also demonstrate an increase in both wage and hours inequality in the first period consistent with the model's predictions (see Table 18). However, for the second period, not all of the wage and hours inequality indicators report a decline in inequality. For example, hours inequality continued to increase in the second period according to the Gini Coefficient and CV^2 and wage inequality increased according to the CV^2.

The conclusion that inequality of hours worked declined over the entire period of the 1980s likewise depends upon the indicator used. While hours inequality decreased for the VLN indicator, for the other three indicators, hours inequality increased during the 1980s.

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[177]. Burtless (1993, p. 133) for example reports that there has been growth in the correlation between low weekly hours and low annual weeks at work and low hourly wage rates which contributes to growth in annual earnings inequality.

On the final point of the relative contribution of changes in wage and hours inequality to overall earnings inequality we turn to an alternative method to seek comparison with the decomposition technique. The alternative method is a simulation exercise in which we ask by how much would inequality have increased if hourly wage rates (or annual hours worked) had remained the same as in 1981? Then the increase in annual earnings inequality can be attributed to the changes in inequality of annual hours worked (hourly wage rates). The problem with this technique is that it does not reflect any changes in the covariance between wages and hours over the period.

The results of the standardization exercise are presented in Table 20. The first two rows of each panel are the actual estimates of earnings inequality. The standardized estimates are in rows three and four; the earnings inequality estimate in row three is what would have occurred if the wage distribution had remained the same as in 1981 (and the hours distribution and population weights were as reported in 1989); the earnings inequality estimate in row four is what would have occurred if the hours distribution had remained the same as in 1981 (and the wage distribution and population weights were as reported in 1989). In both cases, the matching method was by ranked wages; in row three, wages in 1981 and 1989 were ranked, and the top wage in 1981 was matched with the hours associated with the top wage in 1989; in row four, wages in 1981 and 1989 were ranked, and the hours associated with the top wage in 1981 was matched with the top wage in 1989.

A similar exercise was undertaken by Morissette et al. (1993) but they use a different matching procedure which may explain the difference between the results of these two studies, as discussed subsequently. The main difference in method between these two studies is that Morissette et al. (1993) rank by annual earnings and, in this chapter, we rank by hourly wage rates. Morissette et al. (1993) also divide workers into centiles. For each centile, they calculate total hours and mean wage rates. They derive total earnings in 1989 for each centile as the product of mean wage rate 1981 (or mean wage rate 1989) and total hours 1989 for the centile (or total hours 1981). Then the new estimates of inequality are derived from the simulated centile data.

As shown in Table 20, the relative contribution of changes in wage or hours inequality depends upon the indicator. The Gini Coefficient and Atkinson (r=-0.25, -0.50) indicate that changes in wage inequality contributed very slightly to a larger extent to increased earnings inequality. The Theil, Atkinson (r=0.5, -1.0) and particularly the CV^2 indicate that changes in hours inequality were larger. However, in general, with the exception of the CV^2, the changes in the distributions of wages and hours contributed roughly equally to the increase in earnings inequality. This is consistent with the findings of the decomposition technique which showed that, for the period 1981 to 1986, the absolute changes in wage and hours inequality were equal and the higher change in hours inequality in the second period.

These results differ from those of Morissette et al. (1993) which suggests that the method of ranking does make a difference in the results, particularly for women. Morissette et al. (1993) conclude on the basis of the standardization exercise for the Gini Coefficient that most of the increase in earnings inequality is due to changes in the distribution of hours.

Given that patterns of inequality differ depending upon a variety of measurement choices (such as the income concept - hourly wage rates or annual earnings, the reference population, inequality indicator, and time period), comparison with the U.S. situation, while interesting is restricted to a couple of studies which use similar measurement choices to the ones in this study. For men, in terms of the VLN inequality indicator, the trends in inequality of "time spent working" and the "price paid for work" appear similar for the U.S. and Canada. **Hourly** wage rate inequality in Canada shows greater cyclical variation than **weekly** wage inequality in the U.S., but over the entire 1980s, both "price" inequality indicators increased. For the U.S., both Karoly (1993) and Juhn et al. (1993) show that weekly wage inequality was higher in 1989 than in 1981.[178] In both countries, the inequality in "time spent working" has declined, as measured by inequality of **annual hours worked** in Canada and **weeks worked** in the U.S.[179]

For women, the pattern of wage inequality follows the model's predictions but hours inequality does not. In terms of the VLN indicator, wage inequality increased from .2580 to .2700 between 1981 and 1986, and declined to .2505 between 1986 and 1989 (see Table 17). However, hours inequality continued to decline throughout the 1980s. These patterns of wage and hours inequality are similar for the four inequality indicators selected (see Table 18). This finding cannot be interpreted to mean that hours do not respond in a counter-cyclical manner but that counter-cyclical changes, if they occurred,

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178. Karoly (1993), Figure 2.14, Panel B, p. 69 and Juhn et al. (1993), Figure 10, Panel B, p. 439.

179. Juhn et al. (1993), Figure 10, p.439 for the U.S. results.

are overrided by the secular increases in number of hours of work performed by women, particularly by women working less than full-time, and a reduction in hours by women working full-time (see Appendix E, Table E6).

Secondly with respect to women, over the entire 1981 to 1989 period, in terms of the VLN indicator, wage, hours, and earnings inequality all declined, and the changes in hours inequality accounted for a largest proportion of this decline (Table 19). Morissette et al. (1993) indicate that, in terms of the Gini Coefficient, the entire drop in earnings inequality for women is due to the decline in inequality of hours worked. The standardization results for women (Table 20) cannot be interpreted as straightforwardly as those for men. For women, the Atkinson indicators suggest that changes in the hours distribution over the 1980s contributed to decreased earnings inequality. However, the opposite conclusion is reached with the Gini Coefficient, Theil Entropy and CV^2 indicators.

Although not directly related to the model of cyclical fluctuations in earnings inequality, a variety of observations emerge about gender differences in trends in earnings inequality. At a given point in time, the degree of inequality in the hourly wage distributions for men and women are more similar than hours inequality. For example, the VLN of wages for men and women in 1986 are .288 and .270 whereas, the VLN of hours for men and women in 1986 are .571 and .811.[180] The greater inequality of earnings for women compared to men is due to women's greater hours inequality. For

[180]. Whether the degree of wage inequality is greater for women or men at a point in time depends upon the inequality indicator selected.

example, in 1981 hours inequality as a percentage of overall earnings inequality is 68 per cent for women and only 55 per cent for men.[181] Over the entire 1981 to 1989 period, wage inequality increased only for men and while both men and women experienced declines in hours inequality, the drop in hours inequality was particularly large for women.

While the trends in wage inequality during the 1980s for men in Canada and the U.S. are similar, this is not the case for the reference group of men and women combined. For the entire working population in Canada, in terms of the VLN indicator, earnings inequality decreased slightly (from 1.216 to 1.139), wage inequality remained constant (.278 to .280), hours inequality declined substantially (.723 to .619), and the covariance between the Ln of wages and Ln of hours increased (see Table 19). For the U.S., Karoly (1993) reports that annual earnings inequality in 1989 was slightly higher than in 1981, but that wage inequality increased and was higher in 1989 than in 1981.[182] While trends on wage inequality for women are not reported for the U.S.,

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[181]. Doiron and Barrett (1994) examine gender differences in wage, hours, and earnings inequality for Canada over the period 1981-1988 and also report that the greater earnings inequality of women is due to greater hours inequality. For 1981, they report that hours inequality accounts for 64 per cent of total inequality for women and 51 per cent of total inequality for men. Note that the Doiron and Barrett (1994) estimates are based upon the non-recoded 1981 data, which may account for the difference in the results of the two studies. Doiron and Barrett recode the 1988 data, as do Morissette et al. (1993) to make them comparable to the 1981 data.

[182]. Karoly (1993), Figure 2.12, p. 66 and Figure 2.14, Panel 1, p. 69. Note also that, for the population of men and women combined, the Levy and Murnane (1992) review article concludes that earnings inequality continued to increase throughout the 1980s but this is based on the last year of observation being 1987. Karoly (1993), with more recent data, reports that earnings inequality declined substantially from 1987 to 1989, so that earnings inequality in 1989 was only slightly higher than in 1981.

given that the trends in wage inequality for men are similar in the two countries, and trends in wage inequality for the population are dissimilar, we interpret this to mean that wage inequality for women in the two countries differed. Specifically, it is likely that wage inequality for women increased in the U.S. and decreased in Canada.

In summary, the predictions of the model for changes in wage and hour inequality over the business cycle are supported by evidence for male workers. Over the business cycle, the changes in the hours distribution is particularly important for understanding the changes in earnings inequality. Over the entire period of the 1980s, in terms of the VLN indicator, there was an increase in hourly wage rate inequality and a decline in inequality of hours worked. Thus, the increase in earnings inequality for men is due to increases in wage inequality because hours inequality declined in the late 1980s, which is similar to the U.S. For women, the pattern in wage inequality is consistent with the model but hours inequality continued to decline despite fluctuations in the unemployment rate. The large declines in hours inequality, in terms of most inequality indicators, accounts for the overall decline in earnings inequality for women over the 1980s. While comparative U.S. studies for women are not available, inference from trends in wage inequality for the entire population in the two countries suggests that where wage inequality among women must have increased in the U.S. this was not the case for women in Canada. The increased covariance between wages and hours noted over the 1980s for both men and women is striking given the magnitude of the changes. It is particularly troubling given that it implies further economic insecurity of workers with low total earnings - lower-waged workers, working a smaller number of hours and experiencing more unemployment.

6.0 CONCLUDING NOTE

This chapter empirically distinguishes between cyclical and secular explanations of increased earnings inequality in Canada during the 1980s, within the context of a specific view of how firms adjust to macroeconomic fluctuations. The evidence indicates, firstly, that cyclical factors were important determinants of increased earnings inequality during the 1980s and that the recession in the early 1980s disadvantaged the poorest workers. Disaggregating by gender and estimating the equation in terms of levels rather than changes indicates that the relationship between macroeconomic conditions and earnings inequality did not weaken in the late 1980s. This result leads to the conclusion that, for men, while structural determinants of earnings inequality may have been important during the 1980s, structural change did not accelerate.

Secondly, the results also demonstrate that macroeconomic fluctuations had a differential impact on various groups. The regression results indicate that the relationship between macroeconomic fluctuations and earnings inequality is stronger for men than for women, as cyclical factors for women were dominated by secular changes, such as the increase in hours worked throughout the 1980s. The results of the decomposition of the Theil Entropy index demonstrated that between-age-group inequality moved counter-cyclically during the 1980s which was due primarily to changes in relative mean earnings of young workers. This finding suggests that young workers were particularly disadvantaged during the early 1980s. While both within- and between-age-group inequality increased during the early 1980s, the change in between-age-group inequality accounted for a larger share of the increase in overall earnings inequality. These results indicate that understanding the labour market experiences of young workers is critical for explaining the increase in earnings inequality for the population as a whole.

Thirdly, for the population of men and women combined, there was no evidence of increased hourly wage rate inequality (in terms of the VLN indicator) which contrasts with the U.S. situation; and the increase in earnings inequality over the 1980s was due to increased covariance between hours and wages. For men, the inequality in both hourly wage rates and annual hours worked moved counter-cyclically and the increase in the VLN of annual earnings over the 1980s was due to increases in the VLN of hourly wage rates and the covariance between the Ln of wage and the Ln of hours; whereas for women, over the 1980s both the VLN of hourly wage rates and VLN of annual hours worked declined.

Finally, the above results are consistent with a segmented labour market view and justify the labour adjustment mechanism proposed here. The specific mechanism is that firms actively respond to changes in economic incentives, for example, by increasing the proportion of casual jobs offered in response to an increase in the unemployment rate. However, the results are also consistent with other theoretical views of how labour markets adjust including efficiency wage and partial equilibrium market clearing models.

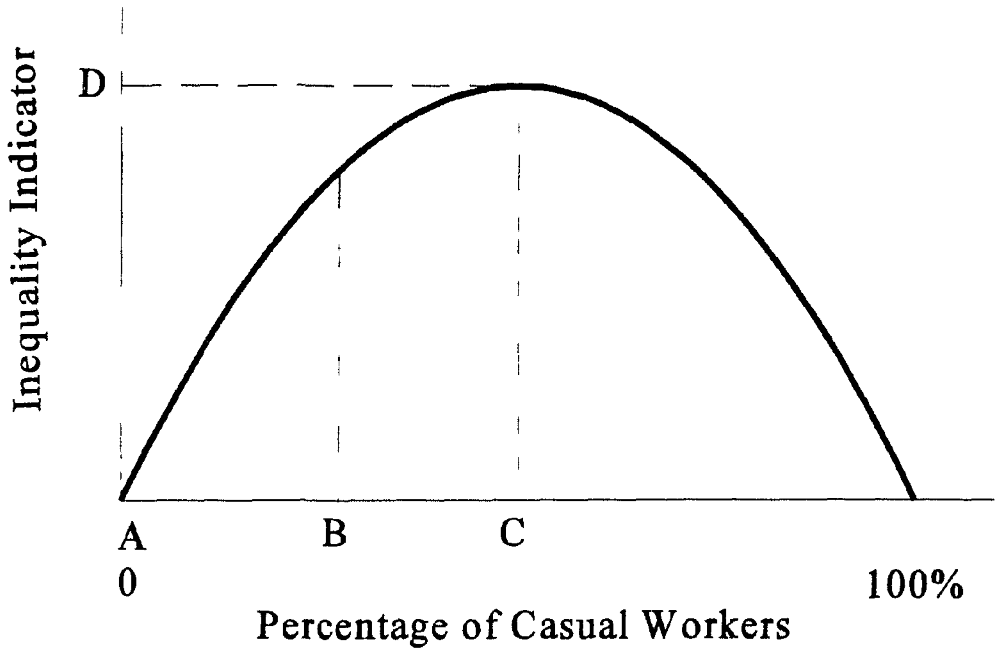
Two key implications of these conclusions are noted. Firstly, attempts to distinguish among various structural explanations of increased earnings inequality, a task which is pursued in chapter 4, must be placed within this broader macroeconomic context. Secondly, given that the unemployment rate has increased from 7.5 per cent in 1989 to 10.4 per cent in 1994, it is expected that earnings inequality has also increased. Thus, while policy interventions which emphasize microeconomic interventions, such as new skills acquisitions, retraining, and technological change, remain appropriate, these results indicate that macroeconomic policies designed to reduce unemployment are also an important component of any strategy aimed at reducing earnings inequality and improving the economic situation of the working poor. Given the current high rates of unemployment, such policies are of immediate concern.

Finally, these results further illustrate a methodological point advanced in chapter 2, that measurement choices are important determinants of facts about earnings inequality. Chapter 2 demonstrated that measurement choices about the definition of the reference population influenced facts about trends in earnings inequality and other measurement choices, such as the income concept, and treatment of outliers affected the magnitude of trends in earnings inequality. In terms of facts about trends in earnings inequality, chapter 3, demonstrates how the choice of reference years influences trends in earnings inequality, given that earnings inequality was observed to increase sharply between 1981 and 1986 and then decrease between 1986 and 1989. Further, our understanding of trends in earnings inequality was shown here to depend upon whether annual earnings or hourly wage rates is chosen as the income concept. The results also reinforce the point that stylized facts about trends in earnings inequality for the population, while important to establish for some purposes, mask the diversity of economic outcomes, as the differences in the trends for women, men and young workers indicate.

This chapter takes the issue of the influence of measurement choices on facts, beyond the level of documenting trends, to the consideration of stylized facts about the relationship between macroeconomic conditions and earnings inequality. The nature of this relationship was shown to depend upon measurement choices about the definition of the population, and particularly the decision to focus upon men, women, or the combined population, since cyclical impacts had a greater impact on male earning inequality. Further, positions on the debate about whether the relationship between macroeconomic conditions and earnings inequality weakened in the late 1980s contributing to increased earnings inequality was shown to depend upon measurement choices concerning the exact specification of the estimating equation. This finding supports the methodological position advanced in chapter 2, that facts about phenomena such as trends and causal relationships concerning earnings inequality are only represented by data and supported by reasoned statistical tests.

FIGURE 1

Changes in Earnings Inequality due to Changes in the Percentage of Casual Workers



Graph 1
Unemployment Rates and Earnings Inequality Estimates, 1981-1989

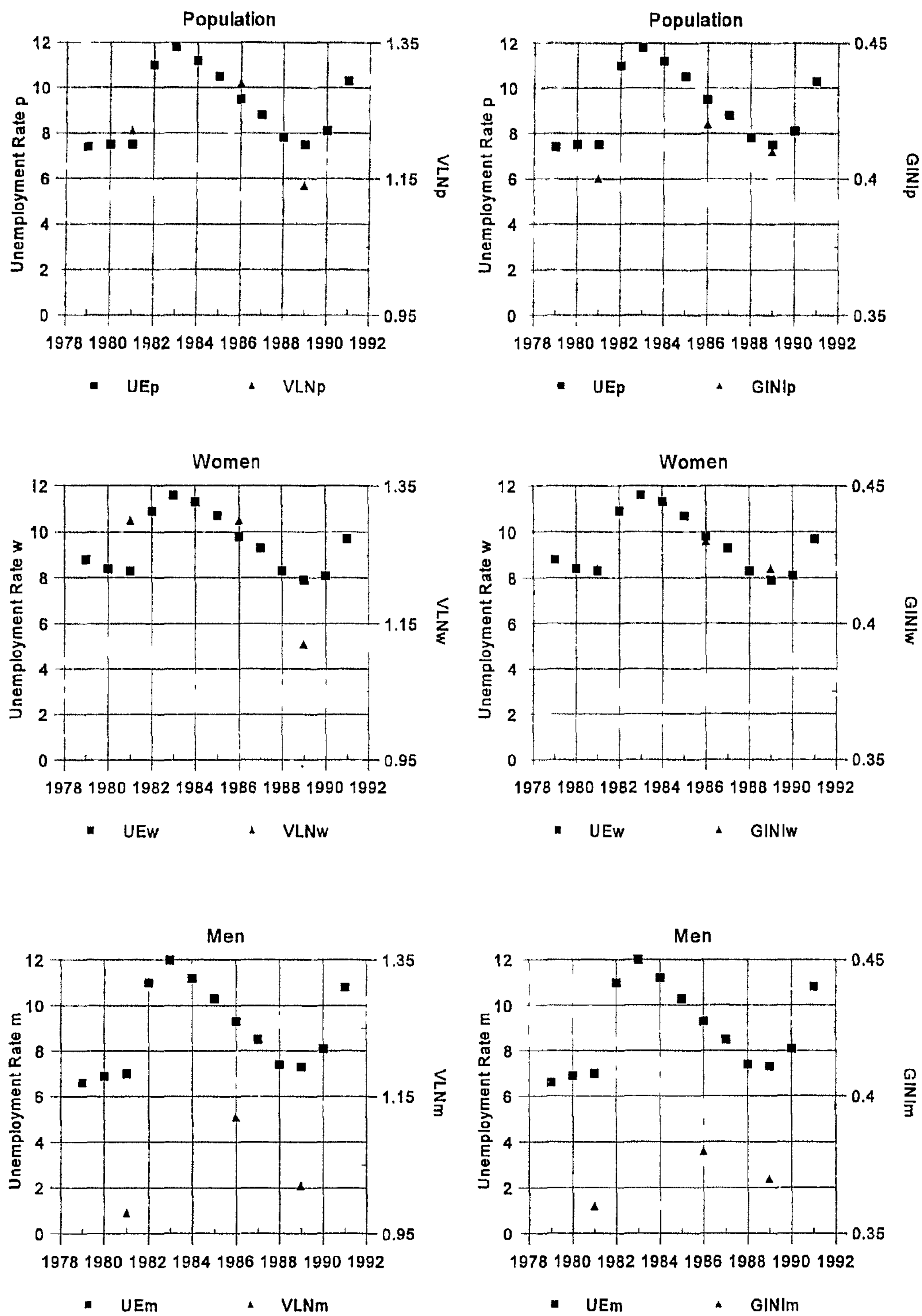


TABLE 1

Summary of Variable Definitions

J_c	= proportion of casual workers
J_p	= proportion of permanent workers
N	= number of firms
B	= proportion of firms that adopt a Just-in-time labour strategy
X	= the proportion of desired casual workers that firms are able to hire [$X=x(U)$]
A_c	= number of casual workers hired by a Just-in-time Firm
A_p	= number of permanent workers hired by a Just-in-time Firm
$\underline{L}_p$	= number of permanent workers hired by a Permanent Firm
$\underline{Y}$	= mean Ln annual earnings of all workers
$\underline{Y}_c$	= mean Ln annual earnings of casual workers
Y_p	= mean Ln annual earnings of permanent workers
W_c	= Ln hourly wage rate of casual workers
W_p	= Ln hourly wage rate of permanent workers
H_c	= Ln annual hours worked of casual workers
H_p	= Ln annual hours worked of permanent workers
σ^2_y	= variance of Ln annual earnings for all workers
σ^2_{yc}	= variance of Ln annual earnings for casual workers
σ^2_{yp}	= variance of Ln annual earnings for permanent workers

TABLE 2

Summary of Inequality Indicators, Annual Earnings, 1981, 1986, and 1989[1]

	Mean (1986 $)			VLN[2]			Sample Size[3]		
	1981	1986	1989	1981	1986	1989	1981	1986	1989
All Workers									
Women	13,394	13,676	14,446	1.301	1.295	1.117	18,630	19,934	19,691
				(.0231)	(0.231)	(.0190)	(4,869,926)	(5,424,582)	(5,722,973)
Men	22,060	22,782	23,374	.9838	1.1222	1.0238	23,635	23,403	22,080
				(.0180)	(.0213)	(.0187)	(6,307,586)	(6,559,967)	(6,465,659)
Population	18,284	18,653	19,182	1.2157	1.2862	1.1389	42,265	43,337	41,771
				(.0152)	(.0163)	(.0139)	(11,177,511)	(11,964,549)	(12,188,632)

Notes: 1. The unemployment rates (men and women, 15 years and over), in 1981, 1986 and 1989 were respectively 7.5, 9.5 and 7.5 percent. Source: Statistics Canada. Historical Labour Force Statistics. Catalogue 71-201.

2. Standard errors in parentheses.

3. Sample sizes for weighted cases are in parentheses.

TABLE 3

Impact of Changes in the Unemployment Rate on Changes in Annual Earnings, Population, OLS Regression Estimates

CGINEQ	CGUE	CGUE x TDUMMY	TDUMMY	Constant	$\overline{R}^2$
(1) Gini	.0053	-.0083	-.0062		.51
	(2.92)	(2.66)	(.714)		
(2) Theil	.0066	-.0114	-.0101	-.0061	.25
	(1.83)	(1.87)	(.59)	(.47)	
(3) Atk(-1.0)	.0113	-.0143	-.0818	.0165	.83
	(2.56)	(1.91)	(3.88)	(1.03)	
(4) VLN	.0457	-.0625	-.1257	-.0656	.78
	(3.83)	(3.09)	(2.21)	(1.51)	
(5) D1	-.0371	.0696	.0408	.1298	.50
	(3.03)	(3.35)	(.70)	(2.90)	
(6) D2	-.0679	.1126	.1964	.0708	.75
	(3.66)	(3.57)	(2.22)	(1.05)	
(7) D3	-.0682	.1261	.3867	-.0562	.73
	(2.52)	(2.74)	(2.99)	(.57)	
(8) D4	-.0632	.0356	.2839	-.1857	.52
	(1.47)	(.48)	(1.38)	(1.18)	
(9) D5	-.0545	.1024	.2837	-.1759	.28
	(1.15)	(1.27)	(1.25)	(1.02)	
(10) D6	-.0356	.0874	.0426	-.1009	.07
	(.67)	(.97)	(.17)	(.52)	
(11) D7	.0269	.0220	.0222	-.1238	.14
	(.61)	(.29)	(.10)	(.76)	
(12) D8	.0614	-.0070	-.1001	-.0306	.65
	(2.34)	(.157)	(.80)	(.32)	
(13) D9	.1407	-.2213	-.4898	.1121	.70
	(2.92)	(2.70)	(2.12)	(.64)	
(14) D10	.1016	-.3230	-.6008	.3200	.13
	(.57)	(1.07)	(.71)	(.49)	

Note: t-statistics are in parentheses

TABLE 4

Impact of Changes in the Unemployment Rate on Changes in Annual Earnings Inequality, Population, OLS Regression Estimates Without the Time Dummy

	CGUE	CGUE * TDUMMY	Constant	$\bar{R}^2$	DW
Gini	.006 (4.52)	-.008 (2.68)	-.009 (2.06)	.52	1.81
Theil	.008 (2.98)	-.011 (1.89)	-.012 (1.45)	.28	1.86
Atk (-1.0)	.022 (4.97)	-.013 (1.33)	-.031 (2.20)	.69	3.00
VLN	.063 (6 27)	-.061 (2.73)	-.139 (4.46)	.73	2.42
D1	-.043 (4.67)	.069 (3.38)	.154 (5.40)	.51	1.71
D2	-.095 (6.07)	.111 (3.17)	.185 (3.82)	.69	2.32
D3	-.121 (4.86)	.122 (2.19)	.169 (2.19)	.61	2.47
D4	-.102 (3.05)	.033 (.44)	-.020 (.20)	.49	1.93
D5	-.093 (2.56)	.100 (1.22)	-.011 (.09)	.25	1.71
D6	-.041 (1.06)	.087 (.99)	-.076 (.63)	-.05	2.16
D7	.024 (.73)	.022 (.30)	-.111 (1.09)	.03	2.62
D8	.075 (3.81)	-.006 (.14)	-.089 (1.45)	.65	1.66
D9	.207 (5.17)	- 216 (2.40)	-.173 (1.39)	.63	1.98
D10	.183 (1.39)	-.317 (1.07)	-.030 (.07)	-.004	2.02

Note: t-statistics are in parentheses

TABLE 5

Impact of the Unemployment Rate on Earnings Inequality (Levels)
OLS Regression Estimates, Population

	UE	UE *TDUM 86	UE *TDUM 89	UE *TDUM 86-89	Trend	Constant	$\bar{R}^2$	DW
Panel A								
Gini	.005 (4.65)	-.0002 (.25)	.0002 (.27)			.37 (37.76)	.54	2.35
Theil	.008 (4.53)	-.0008 (.64)	-.0001 (.10)			.23 (14.90)	.49	2.36
Atk (-1.0)	.001 (.48)	.004 (2.61)	-.001 (.75)			.765 (41.75)	.39	1.93
VLN	.020 (2.77)	.002 (.37)	-.011 (2.17)			1.10 (18.31)	.39	2.32
Panel B								
Gini	.005 (4.67)			$-6.3x10^{-8}$ (0)		.37 (39.01)	.55	2.39
Theil	.008 (4.54)			-.00005 (.43)		.230 (15.46)	.51	2.39
Atk (-1.0)	.002 (.90)			.002 (.93)		.75 (34.21)	.09	1.28
VLN	.023 (2.90)			-.004 (.82)		1.066 (16.03)	.22	1.73
Panel C								
Gini	.005 (3.60)			$7.9x10^{-5}$ (.06)	-1.27 (.07)	.37 (25.99)	.54	2.39
Theil	.008 (3.50)			$3.69x10^{-4}$ (.17)	-1.73 (.06)	.23 (10.33)	.49	2.39
Atk (-1.0)	-.002 (.57)			.007 (2.38)	-.009 (2.18)	.801 26.35	.20	1.51
VLN	.010 (1.04)			.014 (1.57)	-.028 (2.40)	1.23 (13.54)	.34	1.89

Note: t-statistics are in parentheses

TABLE 6

Impact of Changes in the Unemployment Rate on Changes in Annual Earnings Inequality, Men, OLS Regression Estimates

CGINEQ	CGUE	CGUE x TDUMMY	TDUMMY	Constant	$\bar{R}^2$
(1) Gini	.0034	.0019	-.0178	.0117	.48
	(1.29)	(.44)	(1.30)	(1.11)	
(2) Theil	.0056	-.0074	-.0179	.0082	.37
	(1.59)	(1.26)	(1.00)	(.59)	
(3) Atk(-1.0)	.0190	-.0139	-.1107	.0398	.76
	(2.21)	(.96)	(2.51)	(1.17)	
(4) VLN	.0505	-.0557	-.1681	.0080	.81
	(3.58)	(2.36)	(2.33)	(.14)	
(5) D1	-.0532	.0697	.0504	.0899	.63
	(3.53)	(2.76)	(.65)	(1.51)	
(6) D2	-.0781	.0846	.3503	-.1240	.80
	(3.05)	(1.97)	(2.67)	(1.22)	
(7) D3	-.0434	.0249	.5463	-.4005	.68
	(1.09)	(.38)	(2.69)	(2.54)	
(8) D4	-.0759	.0239	.1673	-.2123	.45
	(1.59)	(.30)	(.68)	(1.12)	
(9) D5	-.0777	.0833	.0311	-.0224	.004
	(1.07)	(.68)	(.084)	(.08)	
(10) D6	.0315	.0681	.3847	-.3086	-.012
	(.61)	(.79)	(1.45)	(1.5)	
(11) D7	.0522	-.0342	.1226	-.1785	-.07
	(1.09)	(.43)	(.50)	(.94)	
(12) D8	.0972	-.0161	.1094	-.0434	.39
	(2.16)	(.21)	(.48)	(.24)	
(13) D9	.0980	-.1565	-.8571	.3718	.67
	(1.61)	(1.53)	(2.74)	(1.54)	
(14) D10	.0547	-.0380	-.5373	.8190	-.04
	(.30)	(.13)	(.58)	(1.14)	

Note: t-statistics are in parentheses

TABLE 7

Impact of Changes in the Unemployment Rate on Changes in Annual Earnings Inequality, Men, OLS Regression Estimates

CGINEQ	CGUE	CGUE * TDUMMY	Constant	$\bar{R}^2$	DW
Gini	.006 (2.84)	-.002 (.42)	.001 (.16)	.46	1.67
Theil	.008 (3.04)	-.007 (1.26)	-.003 (.29)	.37	1.79
Atk(-1.0)	.033 (4.56)	-.014 (.84)	-.026 (1.07)	.68	2.23
VLN	.072 (6.14)	-.056 (2.10)	-.093 (2.33)	.75	1.50
D1	-.060 (5.43)	.070 (2.81)	.12 (3.23)	.64	0.98
D2	-.124 (5.56)	.084 (1.68)	.086 (1.14)	.73	1.51
D3	-.115 (3.32)	.025 (.32)	-.073 (.63)	.56	2.18
D4	-.098 (2.79)	.024 (.30)	-.112 (.95)	.46	2.05
D5	-.082 (1.56)	.083 (.71)	-.004 (0.21)	.06	2.16
D6	-.019 (.47)	.068 (.76)	-.078 (.58)	-.08	2.32
D7	.036 (1.04)	-.034 (.44)	-.105 (.90)	-.03	2.30
D8	.083 (2.54)	-.016 (.22)	.022 (.20)	.42	2.33
D9	.210 (3.93)	-.16 (1.30)	-.14 (.78)	.55	2.53
D10	.125 (.94)	-.038 (.13)	.50 (1.11)	.0003	2.13

Note: t - statistics are in parentheses.

TABLE 8

Impact of the Unemployment Rate on Annual Earnings Inequality, (Levels), OLS Regression Estimates, Men

	UE	UE* TDUM 86	UE* TDUM 89	UE* TDUM 86-89	Trend	Constant	$\bar{R}^2$	DW
Panel A								
Gini	.007 (4.99)	8.91×10^{-4} (.09)	9.04×10^{-4} (.93)			.31 (28.52)	.62	2.13
Theil	.009 (4.92)	9.33×10^{-5} (.08)	9.34×10^{-4} (.73)			.17 (11.44)	.60	2.12
Atk (-1.0)	.002 (.52)	.007 (3.35)	5.29×10^{-4} (.23)			.70 (26.79)	.46	1.72
VLN	.023 (3.90)	.009 (2.14)	-.002 (.38)			.83 (17.60)	.65	2.45
Panel B								
Gini	.007 (4.91)			4.68×10^{-4} (.54)		.32 (29.26)	.63	2.16
Theil	.009 (4.85)			3.84×10^{-4} (.34)		.17 (11.85)	.61	2.15
Atk (-1.0)	.004 (.92)			.004 (1.75)		.68 (22.33)	.24	1.20
VLN	.026 (3.92)			.004 (.94)		.80 (15.44)	.56	1.85
Panel C								
Gini	.007 (4.23)			-2.74×10^{-4} (.17)	.001 (.55)	.31 (19.42)	.61	2.17
Theil	.009 (4.13)			-4.54×10^{-4} (.21)	.001 (.47)	.16 (7.68)	.59	2.15
Atk (-1.0)	.0009 (.20)			.008 (1.72)	-.005 (.92)	.71 (15.95)	.23	1.24
VLN	.019 (2.38)			.013 (1.73)	-0.14 (1.44)	.88 (11.86)	.57	1.99

Note: t-statistics in parentheses

TABLE 9

Impact of the Unemployment Rate on Annu .l Earnings Inequality, Men and Women, 1969-1991, OLS Regression Estimates

INEQ	UE	UE * TDUMMY	Constant	$\bar{R}^2$
MEN				
Theil	.0072	.0028	.1637	.85
	(4.78)	(3.77)	(15.34)	
Gini	.0061	.0025	.3048	.90
	(5.69)	(4.71)	(40.22)	
WOMEN				
Theil	.0034	-3.5801×10^{-4}	.2556	.06
	(1.64)	(.45)	(15.09)	
Gini	.0026	-5.95×10^{-5}	.3890	.09
	(1.76)	(.11)	(32.35)	

Impact of the Unemployment Rate on Earnings Inequality, 1969-1991

	UE	UE*TDUMMY	TREND	Constant	$\bar{R}^2$	D.W.
MEN				.163		
Theil	.008	.0035	-5.8×10^{-4}	(14.79)	.84	1.78
	(3.98)	(2.61)	(.61)			
Gini	.006	.002	2.9×10^{-4}	.305	.89	1.80
	(3.97)	(2.26)	(.44)	38.51		
WOMEN						
Theil	.005	5.6×10^{-4}	-7.3×10^{-4}	.251	-.01	1.77
	(1.49)	(.31)	(.56)	(13.05)		
Gini	.003	3.8×10^{-4}	-3.5×10^{-4}	.387	.008	1.83
	(1.42)	(.29)	(.37)	(28.04)		

Note: t statistics in parentheses.

TABLE 10

Impact of Changes in the Unemployment Rate on Changes in Annual Earnings Inequality, Women, OLS Regression Estimates

CGINEQ	CGUE	CGUE x TDUMMY	TDUMMY	Constant	$\bar{R}^2$
(1) Gini	.0046	-.0113	-.0035	-.0149	.28
	(2.14)	(3.04)	(.38)	(2.14)	
(2) Theil	.0075	-.0212	.0005	-.0346	.15
	(1.55)	(2.53)	(.02)	(2.21)	
(3) Atk(-1.0)	.0082	-.0190	-.0806	.0078	.57
	(1.32)	(1.77)	(3.03)	(.39)	
(4) VLN	.0371	-.0628	-.0917	-.1164	.45
	(2.35)	(2.30)	(1.36)	(2.29)	
(5) D1	-.0248	.0582	.0260	.1516	.15
	(1.66)	(2.24)	(.41)	(3.13)	
(6) D2	-.0595	.1225	.0616	.2374	.30
	(2.28)	(2.71)	(.55)	(2.81)	
(7) D3	-.0951	.1671	.0776	.2834	.48
	(3.22)	(3.27)	(.61)	(2.97)	
(8) D4	-.1071	.2209	.1942	.2283	.40
	(2.45)	(2.89)	(1.03)	(1.60)	
(9) D5	-.0899	.1429	.1447	.1120	.19
	(1.71)	(1.57)	(.64)	(.66)	
(10) D6	-.0463	.1897	.2252	-.0354	.11
	(.88)	(2.09)	(1.00)	(.21)	
(11) D7	.0107	.1132	-.0524	-.0645	.10
	(.19)	(1.16)	(.22)	(.35)	
(12) D8	.1021	.0354	-.4202	.0287	.63
	(1.76)	(.35)	(1.69)	(.15)	
(13) D9	.1127	.2207	-.7466	.1394	.55
	(1.67)	(1.89)	(2.58)	(.64)	
(14) D10	.1926	-.8164	.4676	-1.0490	.18
	(.90)	(2.22)	(.51)	(1.53)	

Note: t-statistics are in parentheses.

TABLE 11

Impact of Changes in the Unemployment Rate on Changes in Annual Earnings Inequality, Women, OLS Regression Estimates

CGINEQ	CGUE	CGUE *TDUMMY	Constant	$\bar{R}^2$	DW
Gini	.005 (3.03)	-.011 (3.11)	-.017 (3.79)	.32	2.43
Theil	.007 (1.98)	-.021 (2.61)	-.034 (3.44)	.20	2.64
Atk(-1.0)	.019 (3.20)	-.018 (1.36)	-.038 (2.36)	.36	2.79
VLN	.050 (3.85)	-.061 (2.20)	-.169 (4.92)	.42	2.58
D1	-.028 (2.43)	.058 (2.29)	.166 (5.38)	.19	1.84
D2	-.068 (3.32)	.122 (2.75)	.272 (5.01)	.33	1.95
D3	-.106 (4.55)	.166 (3.31)	.327 (5.32)	.50	2.34
D4	-.134 (3.78)	.218 (2.85)	.339 (3.61)	.39	2.92
D5	-.110 (2.65)	.141 (1.57)	.194 (1.77)	.22	2.10
D6	-.078 (1.85)	.186 (2.05)	.093 (.83)	.11	1.68
D7	.018 (.41)	.114 (1.20)	-.094 (.81)	.15	2.12
D8	.161 (3.27)	.04 (.40)	-.210 (1.62)	.59	2.17
D9	.217 (3.47)	-.209 (1.55)	-.285 (1.729)	.40	2.74
D10	.127 (.76)	-.824 (2.29)	-.784 (1.77)	.22	2.49

Note: t - statistics are in parentheses.

TABLE 12

Impact of the Unemployment Rate on Annual Earnings Inequality (Levels), OLS Regression Estimates, Women

	UE	UE *TDUM 86	UE *TDUM 89	UE *TDUM 86-89	Trend	Constant	$\bar{R}^2$	DW
Panel A								
Gini	.007 (5.19)	-.002 (2.08)	-.002 (1.89)			.381 (32.78)	.47	2.59
Theil	.012 (4.96)	-.004 (2.54)	-.004 (2.31)			.234 (11.43)	.43	2.39
Atk (-1.0)	.003 (.99)	.002 (.92)	-.003 (1.57)			.762 (32.50)	.20	1.75
VLN	.024 (2.77)	-.007 (1.20)	-.020 (3.54)			1.158 (15.30)	.34	2.13
Panel B								
Gini	.007 (5.33)			-.002 (2.27)		.381 (33.97)	.49	2.60
Theil	.011 (5.08)			-.004 (2.77)		.234 (11.87)	.45	2.40
Atk (-1.0)	.004 (1.30)			-4.7×10^{-4} (.27)		.750 (29.15)	.01	1.36
VLN	.027 (2.92)			-.013 (2.34)		1.122 (13.61)	.19	1.65
Panel C								
Gini	.006 (3.81)			-.001 (.83)	-7.3×10^{-4} (.33)	.385 (22.18)	.48	2.62
Theil	.010 (3.49)			-.002 (.88)	-.002 (.56)	.247 (8.11)	.44	2.43
Atk (-1.0)	-.001 (.42)			.006 (1.87)	-.011 (2.33)	.814 (22.40)	.15	1.69
VLN	.010 (.86)			.009 (.87)	-.036 (2.48)	1.34 (11.62)	.32	2.07

TABLE 13

Measures of Earnings Inequality, Population,
All Workers by Age Group, 1981, 1986, and 1989

	Mean (i) (Current $)	Mean (i) / Mean (p)	Sample Size	CV^2	Gini	Th	VLN
17-24							
1981	8,335	.6038	3,130,904	.7987	.4609	.3583	1.3808
1986	8,894	.4768	2,857,283	.7947	.4686	.3634	1.3620
1989	10,697	.4892	2,594,679	.7664	.4562	.3437	1.1375
25-34							
1981	15,279	1.1069	3,179,834	.4122	.3509	.2122	.9704
1986	19,262	1.0326	3,591,336	.4250	.3539	.2154	.9580
1989	22,528	1.0302	3,680,710	.4388	.3533	.2142	.8784
35-44							
1981	17,029	1.2336	2,152,140	.4212	.3553	.2153	.9717
1986	23,850	1.2786	2,714,103	.4242	.3552	.2151	.9724
1989	26,801	1.2256	3,020,275	.4570	.3617	.2237	.9503
45-54							
1981	16,486	1.1943	1,567,483	.4494	.3544	.2152	.8683
1986	24,380	1.3070	1,683,010	.5036	.3715	.2357	.9438
1989	26,791	1.2252	1,840,018	.4992	.3715	.2345	.9035
55 - 64							
1981	15,428	1.1176	1,030,946	.4612	.3535	.2173	.9239
1986	21,151	1.1339	1,015,086	.5595	.3916	.2611	1.0698
1989	24,915	1.1394	951,491	.6423	.4067	.2841	1.0766
65-69							
1981	10,547	.7641	116,204	1.1374	.4760	.4053	1.3883
1986	13,111	.7029	103,730	.7392	.4617	.3560	1.6107
1989	18,838	.8615	101,460	.9744	.5018	.4244	1.6036
17-69							
1981	13,804	1.0000	11,177,511	.5634	.4025	.2757	1.2157
1986	18,653	1.0000	11,964,549	.6205	.4190	.2972	1.2862
1989	21,867	1.0000	12,188,632	.6118	.4116	.2867	1.1389

Note: i refers to each age group; p refers to the population of all workers

TABLE 14

Measures of Earnings Inequality, Women,
All Workers by Age Group, 1981, 1986 and 1989

	Mean(i) (Current $)	Mean(i) / Mean (w)	Sample Size	CV^2	Gini	Theil	VLN
17 - 24							
1981	7,168	.5193	1,452,244	.8048	.4572	.3555	1.3662
1986	7,787	.4175	1,360,969	.7896	.4659	.3592	1.3149
1989	9,359	.4280	1,234,129	.7584	.4500	.3362	1.1162
25 - 34							
1981	11,295	.8182	1,389,214	.5389	.3954	.2673	1.2173
1986	15,075	.8082	1,665,622	.4754	.3805	.2451	1.0949
1989	17,831	.8154	1,748,720	.5089	.3738	.2401	.9520
35 - 44							
1981	11,805	.8552	949,414	.5727	.4020	.2754	1.2052
1986	16,942	.9083	1,236,531	.5372	.3935	.2619	1.1805
1989	19,818	.9063	1,461,748	.5331	.3857	.2522	1.0006
45 - 54							
1981	11,252	.8151	659,311	.4992	.3814	.2458	1.0376
1986	16,015	.8586	738,724	.5178	.3827	.2486	1.0398
1989	18,377	.8404	858,639	.4904	.3825	.2438	.9769
55 - 64							
1981	11,086	.8031	376,282	.5526	.3955	.2662	1.1777
1986	13,785	.7390	387,985	.6331	.4074	.2838	1.1311
1989	16,769	.7669	377,606	.6337	.4119	.2877	1.0736
65 - 69							
1981	7,995	.5792	43,461	.7792	.4405	.3335	1.2781
1986	10,091	.5410	34,752	.9557	.4929	.4106	1.5118
1989	10,304	.4712	42,130	.7298	.4559	.3443	1.1454
17-69							
1981	10,112	.7325	4,869,926	.6413	.4237	.3049	1.301
1986	13,676	.7332	5,424,582	.6427	.4280	.3076	1.295
1989	16,468	.7531	5,722,973	.6253	.4158	.2913	1.117

Note: i refers to each age group; w refers to the population of all women workers

TABLE 15

Measures of Earnings Inequality, Men
All Workers by Age Group, 1981, 1986 and 1989

	Mean(i) (Current $)	Mean (i) / Mean (m)	Sample Size	CV^2	Gini	Theil	VLN
17-24							
1981	9,344	.6769	1,678,660	.7504	.4541	.3459	1.3587
1986	9,901	.5308	1,496,315	.7586	.4630	.3542	1.3789
1989	11,911	.5447	1,360,550	.7323	.4527	.3368	1.1305
25 - 34							
1981	18,369	1.3307	1,790,620	.2836	.2893	.1457	.5735
1986	22,883	1.2268	1,925,715	.3292	.3076	.1658	.7015
1989	26,779	1.2246	1,931,989	.3343	.3085	.1666	.6902
35 - 44							
1981	21,153	1.5324	1,202,726	.2615	.2791	.1333	.4999
1986	29,630	1.5885	1,477,573	.2743	.2828	.1393	.5395
1989	33,350	1.5251	1,558,527	.3157	.2979	.1574	.7023
45 - 54							
1981	20,286	1.4696	908,171	.3174	.2936	.1493	.5073
1986	30,924	1.6579	944,286	.3472	.3062	.1630	.5877
1989	34,154	1.5619	981,379	.3521	.3077	.1648	.5779
55 - 64							
1981	17,924	1.2985	654,664	.3635	.3081	.1675	.6248
1986	25,708	1.3782	627,101	.4182	.3399	.2004	.8235
1989	30,274	1.3845	573,884	.5143	.3636	.2322	.9036
65 - 69							
1981	12,073	.8746	72,743	1.1400	.4762	.4083	1.4089
1986	14,632	.7844	68,978	.6311	.4345	.3182	1.6003
1989	24,897	1.1386	59,330	.7225	.4553	.3464	1.6561
17 - 69							
1981	16,655	1.2065	6,307,586	.4361	.3568	.2202	.9838
1986	22,782	1.2214	6,539,967	.4965	.3784	.2466	1.1222
1989	26,646	1.2185	6,465,659	.4968	.3742	.2417	1.0238

Note: i refers to each age group; m refers to the population of all men workers

TABLE 16

Decomposition of the Theil Entropy Index by Age, All Workers, 1981, 1986 and 1989

	Decomposition of Inequality:		Theil Index	Absolute Change in:	
	Within	Between		Within	Between
POPULATION					
1981	.24022	.03558	.2757		
1986	.24116	.05608	.2972	+.0009	+.0205
1989	.24205	.04470	.2867	+.009	-.0114
WOMEN					
1981	.28493	.01997	.3049		
1986	.27027	.03730	.3076	-.0147	+.0173
1989	.25989	.03139	.2913	-.0104	-.0059
MEN					
1981	.17785	.04237	.2202		
1986	.18097	.06563	.2466	+.0031	+.0233
1989	.18764	.05405	.2417	+.0067	-.0116

TABLE 17

Summary Estimates of Inequality of Hourly Wage Rates, Annual Hours Worked, and Annual Earnings

	Mean			Variance of Ln		
	1981	1986	1989	1981	1986	1989
Hourly Wage Rates (1986$)						
Women	9.40	9.07	9.49	0.2580	0.2700	0.2505
				(.0040)	(.0044)	(.0041)
Men	12.16	12.13	12.47	0.2620	0.2878	0.2733
				(.0036)	(.0036)	(.0037)
Population	10.96	10.75	11.07	0.2777	0.3005	0.2801
				(.0027)	(.0029)	(.0028)
Annual Hours Worked						
Women	1,387	1,433	1,448	0.8865	0.8110	0.6821
				(.0179)	(.0180)	(.0145)
Men	1,761	1,781	1,791	0.5430	0.5712	0.5285
				(.0124)	(.0143)	(.0129)
Population	1,598	1,623	1,630	0.7231	0.7019	0.6187
				(.0109)	(.0115)	(.0098)
Annual Earnings (1986$)						
Women	13,394	13,676	14,446	1.3010	1.2950	1.1170
				(.0231)	(.0231)	(.0190)
Men	22,060	22,782	23,374	0.9838	1.1222	1.0238
				(.0180)	(.0213)	(.0187)
Population	18,284	18,653	19,182	1.2157	1.2862	1.1389
				(.0152)	(.0163)	(.0139)

Note: Standard errors are in parentheses

TABLE 18

Changes in Earnings, Wages, and Hours Inequality, 1981-86 and 1986-89, Selected Inequality Indicators, All Workers

	Change 1981-86			Change 1986-89			Change 1981-89		
	Wages	Hours	Earnings	Wages	Hours	Earnings	Wages	Hours	Earnings
WOMEN									
VLN	+.012	-.076	-.006	-.020	-.129	-.178	-.008	-.204	-.184
Gini	+.001	-.008	+.004	-.009	-.013	-.012	-.007	-.022	-.008
CV^2	+.105	-.014	+.001	-.198	-.026	-.017	-.093	-.040	-.016
Theil	+.001	-.012	+.003	-.019	-.015	-.016	-.018	-.027	-.014
MEN									
VLN	+.026	+.028	+.138	-.015	-.043	-.098	+.011	-.015	+.040
Gini	+.012	+.011	+.022	-.003	+.003	-.004	+.009	+.014	+.017
CV^2	+.018	+.013	+.060	+.039	+.002	+.000	+.056	+.014	+.061
Theil	+.009	+.005	+.026	+.000	-.001	-.005	+.009	+.004	+.022
POPULATION									
VLN	+.023	-.021	+.071	-.020	-.083	-.147	+.002	-.104	-.077
Gini	+.009	+.003	+.017	-.006	-.003	-.007	+.003	+.001	+.009
CV^2	+.052	+.004	+.057	-.041	-.007	-.009	+.012	-.003	+.048
Theil	+.008	-.002	+.022	-.008	-.006	-.011	+.000	-.008	+.011

TABLE 19

Decomposition of the VLN of Earnings, All Workers, 1981, 1986, and 1989

Year	Sample Size (w)	Var(e)	Components of Var (e)			Absolute Change		
			Var(w)	Var(h)	2Cov(w,h)	Var(w)	Var(h)	2Cov(w,h)
WOMEN								
1981	4,869,926	1.301	0.258	0.886	0.156			
1986	5,424,582	1.295	0.270	0.811	0.214	+0.012	-0.075	0.058
1989	5,722,973	1.117	0.250	0.682	0.184	-0.020	-0.129	-0.030
MEN								
1981	6,307,586	0.984	0.262	0.543	0.178			
1986	6,539,967	1.122	0.288	0.571	0.264	+0.026	+0.028	+0.086
1989	6,465,659	1.024	0.273	0.529	0.222	-0.015	-0.042	-0.042
POPULATION								
1981	11,177,511	1.216	0.278	0.723	0.216			
1986	11,964,549	1.286	0.300	0.702	0.284	+0.022	-0.021	+0.068
1989	12,188,632	1.139	0.280	0.619	0.240	-0.020	-0.083	-0.044

TABLE 20

Estimates of Earnings Inequality in 1989 Standardized for
1981 Hourly Wages and 1981 Annual Hours

	Gini	Theil	CV^2	Atkinson			
				r = 0.5	r = -025	r = -0.5	r = -1.0
Women Actual							
(1) 1981	.4237	.3049	.6413	.1637	.4646	.5762	.7763
(2) 1989	.4158	.2913	.6253	.1536	.4255	.5291	.7415
Standardized							
(3) Wages 1981 Hours 1989	.4251	.3144	.7616	.1606	.4323	.5345	.7438
(4) Hours 1981 Wages 1989	.4222	.3000	.6038	.1632	.4700	.5841	.7843
Men Actual							
(1) 1981	.3568	.2202	.4361	.1210	.3718	.4822	.7178
(2) 1989	.3742	.2417	.4968	.1308	.3883	.4979	.7325
Standardized							
(3) Wages 1981 Hours 1989	.3684	.2364	.4922	.1276	.3807	.4907	.7308
(4) Hours 1981 Wages 1989	.3689	.2334	.4667	.1275	.3836	.4925	.7192
Population Actual							
1981	.4026	.2758	.5634	.1497	.4387	.5527	.7664
1989	.4116	.2867	.6118	.1521	.4279	.5351	.7524
Standardized							
Wages 1981 Hours 1989	.4110	.2901	.6476	.1522	.4263	.5338	.7543
Hours 1981 Wages 1989	.4066	.2788	.5595	.1517	.4432	.5574	.7696

CHAPTER 4

THE POOR, THE YOUNG, AND THE LESS-EDUCATED: WHY HAVE THESE GROUPS FARED SO BADLY DURING THE 1980S?

1.0 INTRODUCTION

In the 1980s, the relative positions of low-income workers, less-educated workers and young workers deteriorated.[182] These three dimensions of increased inequality have been scrutinized in studies of increased inequality among individuals and increased inequality between-age and -education groups, and the general conclusion has been that the education premium and experience premium have risen.[183]

In the 1980s debate about trends in earnings inequality, it took several years before consensus emerged that inequality had increased. The debate about the causes of increased earnings inequality is still unfolding. There is still controversy regarding the contribution of supply side factors (e.g., changes in the relative size of a university-educated workforce) and demand side factors (e.g., deindustrialization and technological change), to increases in inequality of employment outcomes.

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[182]. In addition, the bottom 30 per cent of men were worse in 1989, compared to 1981, in absolute terms.

[183]. Chapters 2 and 3 document the rise in earnings inequality and contain references to the literature. Chapter 3 documents the deterioration in employment earnings of young workers and the increase in between-age group inequality. Studies on the rise of the education premium for Canada include Freeman and Needels (1993), Patrinos (1993a), Morissette et al. (1993), Bar-Or et al. (1995) and for the U.S., see Levy and Murnane (1992).

Many studies have tried to find <u>the</u> key explanation of increased inequality - to locate the "smoking gun" to use a metaphor now common in the literature. This preoccupation with the "smoking gun" has led researchers to conduct an in-depth empirical analysis of the relationship between one potential explanation and increased earnings inequality, rather than analyzing the relative contributions of plausible explanations within a comprehensive theoretical framework.[184] If the selected factor does not account for the majority of the rise in inequality, then the results are perceived to be disappointing.

Comparing studies is complicated by researchers' different choices of inequality dimension, income concepts, time periods, indicators, and reference population. The problem is compounded by the large number of alternative, though not necessarily mutually exclusive, explanations, different analytical techniques (decomposition techniques, shift-share exercises, simulation exercises, and regression analyses) and theoretical perspectives adopted by researchers.

The purpose of this chapter is to examine the relative importance of commonly cited explanations of increased inequality, namely deindustrialization, technological change, changes in trade patterns, demographic change, cyclical factors and changes in labour market institutions. The literature is reviewed in the following section. A theoretical framework in section 3 extends the model presented in chapter 3 of how firms

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[184]. Although, this observation more accurately applies to studies of earnings inequality rather than studies of the education premium since these studies have tended to be conducted with a partial equilibrium labour market framework which permits relative assessments of determinants.

respond to signals, such as changes in the unemployment rate, by rationally altering job structures. The extended model indicates how commonly cited explanations of increased inequality, such as deindustrialization and technological change, may also induce firms to change their job structures.

The determinants of inequality are empirically examined with a data set which is richer and larger than other data sets commonly used in this type of work. Section 4 describes the data and empirical approach. The data set, has been created from the Survey of Work History 1981 and Labour Market Activity Survey 1986 and 1989, and uses the regional variation in industrial, occupational, demographic and institutional structures within Canada for the years 1981, 1986 and 1989. The results are discussed in section 5 with attention paid to the impact of measurement choices on explanations of increased earnings inequality in Canada during the 1980s. Cyclical and institutional factors are found to strongly and consistently explain why the poor, the young and less-educated fared so badly during the 1980s.

2.0 CAUSES OF INCREASED INEQUALITY: A LITERATURE REVIEW OF THE EXPLANATIONS AND EVIDENCE

2.1 DIMENSIONS OF INEQUALITY: REVIEW OF THE TRENDS

Earnings inequality increased in Canada during the 1980s, as in other industrialized countries, as documented in chapters 2 and 3. For example, for the population as a whole, earnings inequality increased by 2.2 per cent during the 1980s in terms of the Gini coefficient, compared to a decline of 1.2 per cent over the previous decade.[185] This trend toward greater inequality in employment earnings was shown in chapters 2 and 3 to be robust to a variety of measurement choices concerning the income concept, inequality indicator, and treatment of outliers. However, the trend in earnings inequality does depend upon the reference population group and the increase in earnings inequality was particularly dramatic for all male workers and full-time/full-year female workers.

There were also changes in other dimensions of earnings inequality, namely the deterioration of the relative position of young and less-educated workers. Chapter 3 concluded that the rise in between-age-group inequality contributed to the increase in overall earnings inequality, and the increase in between-age-group inequality was relatively more important than the rise in within-age-group inequality. Further, the deterioration in labour market position of young workers is particularly striking. For example, in Canada, the mean earnings of young workers (aged 17-24 years) as a percentage of mean earnings of all workers, dropped from 60.4 per cent in 1981, to 48.9 per cent in 1989.[186] Similar findings on the decline in relative earnings of young workers have been reported by other studies in Canada [ECC (1991), Morissette et al. (1993)] and for the U.S. [Levy and Murnane (1992)].

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[185]. The estimate of a 2.2 per cent increase in the Gini Coefficient refers to the period 1981 and 1989 [$(Gini_{81}-Gini_{89})/ Gini_{81} * 100\%$]. The estimate of a decline of 1.2 per cent is for the period 1973 to 1981; and this is based upon estimates from ECC (1991). See Appendix D, Table D5(a).

[186]. See chapter 3, Tables 6 to 8.

The increase in inequality for between-education groups has figured prominently in the U.S. literature on earnings inequality, with the increase in the return to a university education relative to a high school diploma typically being the focus of the attention. For example, Katz and Revenga (1989) report that between 1979 and 1984, the college/high school wage ratio increased dramatically for males in all experience groups, and the education premium continued to rise through to 1987. See also Levy and Murnane (1992).

In Canada, evidence on the trends in the education premium is more ambiguous. Several studies indicate that the education premium has increased but to a smaller extent than in the U.S. Freeman and Needels (1993) report an annual percentage increase in the education premium of 1.3 for men and 0.6 for women (for the period 1979-1987). They conclude that the increase in the male education premium for Canada is about one-quarter the increase in the U.S.[187] An increase in the education premium in the 1980s is interesting given that the average years of education of the work force increased during this period, by 0.9 years for men and 0.8 years for women [Patrinos (1993a)] and because the trend contrasts with the previous decade during which time the education premium (for men) declined [Dooley (1986)]. Dooley (1986) reports that, between 1971 and 1981, the education differential for male full-time/full-year workers declined. He argued that the decline in the return to a university education cannot solely be explained

[187]. Freeman and Needels (1993) use the SCF 1979 and 1987 (household head file).

by the entry of a large well-educated baby boom cohort into the labour force, and that in the 1970s, further attention must be given to demand side factors.[188]

Other studies however, report no increase in the education premium and the difference may be due to measurement choices. Bar-Or et al. (1995) for example, controlling for labour market experience, argue that estimates of the education premium are dependent upon the year selected. Morissette et al. (1993) for the period 1975-1988 find only a slight increase in the education premium and indicate that the 1981 and 1989 data are not strictly comparable due to a recoding of the education variable in 1989 which inflates mean earnings of university graduates in 1989. Freeman and Needels (1993) who find an increase in the education premium use data only for household heads. Patrinos (1993a) examines trends over the 1981 to 1989 period, but the data for 1989 which potentially are biased .

2.2 EXPLANATIONS AND EVIDENCE OF INCREASED EARNINGS INEQUALITY

2.2.1 Introduction

Commonly examined explanations and evidence of increased earnings inequality and changes in the earnings structure are discussed below. We start by reviewing the business cycle hypothesis, albeit very briefly given that chapter 3 also reviews this literature. Secondly, institutional factors, such as trends in unionization and minimum wages are considered. Thirdly, three common demand side explanations are reviewed,

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188. Katz and Revenga (1989) report that for the United States, the education premium declined between 1973 and 1979 for most experience (age) groups.

these being shifts in industrial structure (deindustrialization), increased globalization of trade, and technological change. Finally, supply-side factors are considered, namely, the increase in the proportion of women in the labour force and the increase in the proportion of university-educated workers. Key findings from the literature are summarized in Figures 1 and 2.

2.2.2 The Business Cycle

For at least three decades, it has been hypothesized that a deterioration in macroeconomic conditions contributes to increased earnings inequality, as discussed in chapter 3. Although the empirical studies are by no means unambiguous, the weight of the evidence does support this hypothesis. To summarize one of the U.S. studies, Burtless (1990) reports that for the U.S. over the period 1954 to 1986, the change in the unemployment rate accounts for about one-fifth of the rise in the Gini coefficient for men and very little of the change in the Gini coefficient for women. These results are based upon the fairly common regression analysis method in which time series data of the unemployment rate and time dummies are regressed upon various measures of earnings inequality. In the late 1980s and 1990s, one U.S. study concluded that the relationship between macroeconomic conditions and household income inequality has weakened [Cutler and Katz (1992)]. The results from chapter 3, for Canada, indicate that cyclical factors continue to be an important determinant of increased earnings inequality and must be considered in any broader explanation of increased earnings inequality.[189]

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[189]. See also Erksoy (1994), Richardson (1994), and Johnson (1995).

Much of the literature[190], which has tended to focus upon the empirical relationship between macroeconomic conditions and inequality has not been well-grounded in a theoretical framework outlining the transmission mechanism through which changes in macroeconomic conditions actually influence an individual worker's earnings. Chapter 3 addresses this limitation by proposing a mechanism of how finns adjust to fluctuations in aggregate demand. Specifically, a decline in aggregate demand raises the unemployment rate which increases the relative cost of hiring permanent workers and, hence, some firms respond by reducing (increasing) the proportion of permanent (casual) workers hired. Chapter 3 also outlines the conditions under which such a change in workforce strategy results in an increase in earnings inequality.

Education and age premia (measured by relative annual earnings) may also change over the business cycle. A macroeconomic slowdown is hypothesized to affect the education premium if less-educated workers are disproportionately laid off. Implicitly, in a partial equilibrium labour market framework, this increases the excess supply of less-educated workers, and thereby depresses their mean hourly wage rate and/or annual hours of work, and raises the education premium in annual earnings.

There is mixed support for the hypothesis that macroeconomic conditions affect the education premium. Katz and Revenga (1989) for the U.S. find that the correlation coefficient between the change in the unemployment rate and the growth in earnings of young male high school entrants for the 1979-1987 period is equal to minus .085 [Katz

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[190]. See, for example, Blinder and Eskai (1978), Weill (1984), Cutler and Katz (1991), Brandolini and Sestito (1994) and the discussion in chapter 3.

and Revenga (1989), p. 548]. Freeman and Needels (1993) find that the log of real GNP has a negative impact on the university-high school earnings differential (for men in the U.S.). However, Mincer (1991), also for males in the U.S., found that the unemployment rate, as a proxy for macroeconomic conditions, is an insignificant determinant of the education premium. For Canada, Freeman and Needels (1993) found that the log of real GNP had a negative impact on the university-high school earnings differential but only when the degree of unionization is excluded.

2.2.3 Institutional Context

Two institutional features of labour markets often cited as determinants of inequality are the degree of unionization and minimum wage levels. Changes in unionization are likely to be a more important determinant of inequality in the U.S. than in Canada given the large decline in unionization in the U.S. Union density in the United States fell from 33.7 per cent in 1973, to 26.4 per cent in 1987 [Card (1992)].[191] In Canada, over the same period referred to by Card, 1973 to 1987, the unionization rate dropped from about 32.3 per cent to just under 30 per cent. During the 1980s, the rate of unionization declined primarily due to a decline in unionization for men, since the unionization rate for women remained quite stable.[192] For men, the

[191]. 1973 refers to union membership, 1987 refers to union coverage.

[192]. The unionization rate for women actually increased during the 1970s, in contrast to the decline among male workers.

unionization rate declined from about 38.2 per cent in 1981, to about 34.5 per cent in 1989.[193] For women, the unionization rate was just over 24 per cent in both years.

A decline in unionization can be expected to increase earnings inequality. For men in the U.S., Card (1992) reports that changes in the degree and nature of unionization can account for about 20 per cent of the increase in variance of wages of the adult male population. For men, not only did union density decrease but the distribution of union membership shifted from workers with wages in the lower and middle quintiles of the wage distribution towards workers in the upper quintile of the wage distribution between 1973 and 1987.[194] Thus, Card (1992) argues that while the impact of a change in overall union density on wage inequality may be quite small, the changes in union density by wage level is an important determinant of increased wage inequality [Card (1992), p. 42].[195]

The decrease in unionization is also expected to raise the average education premium, if less-educated workers experience a greater decline in unionization. The decline in the extent of unionization is expected to reduce the wages of less-educated union workers, with possible adverse impact on wages of less-educated, non-union workers. Several U.S. studies [Blackburn et al. (1990), Katz and Revenga (1989)] report

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[193]. CALURA. Labour Unions. 1989 Catalogue 71-202 (1989), Charts 1.26-1.28. Note that a new series was started in 1983 due to legislative changes to the Unionization Act which resulted in additional membership being reported from 1983 onwards.

[194]. He states that "the unionization rates of the 2 lower quintiles declined 15 percentage points between 1973 and 1987, while the unionization rate of the highest quintile actually increased" [Card (1992), p. 39].

[195]. See also Lemieux (1993).

a large decline in unionization of less-educated workers in the 1980s (of male workers), which is consistent with Card's (1992) finding that there was a decrease in union membership in the lower portion of the wage distribution. For example, Katz and Revenga (1989) report that "[b]etween 1979 and 1987, the extent of unionization fell by over 17 % for young high school males" [Katz and Revenga (1989), p.548]. Blackburn et al. (1990) estimate that deunionization can account for about 10 per cent of the increase in the education premium (college-high school graduates, 25-64 years, white males, United States 1979-87), although the affect for high school dropouts is considerably higher [Blackburn et al. (1990), Table 11].[196] Freeman and Needels (1993) for men in the U.S. find that the decline in unionization contributes to the rise in the education differential. However, contrary to the hypothesized inverse relationship between unionization and the education premium, Freeman and Needels (1993) found that changes in unionization were positively related to the education differential, for men in Canada.

The empirical work on the impact of minimum wages on various dimensions of inequality is more limited. For white men in the U.S., Blackburn et al. (1990) conclude that changes in minimum wages have had no impact on the education premium. In Canada, Morissette (1995) assesses the impact of minimum wage on relative weekly wages of young workers and concludes that the decline in the real minimum wage is

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[196]. Katz and Revenga (1989) estimate that deunionization reduces the earnings of the less-educated relative to college graduates by 0.5 to 2.0 per cent. This ignores the spillover effects of a weakened union threat in the 1980s on the earnings of less-educated, non-union workers. [Katz and Revenga (1989), p.549].

unlikely to explain a substantial fraction of the decrease in youth real wages, and thereby unlikely to affect the age premium. The result is based upon a simulation exercise in which young workers with wages below the highest provincial minimum wage are inflated by 20 per cent; then the hypothetical mean hourly wage resulting from this wage adjustment is calculated and compared to the pre-adjustment ("actual") value.

2.2.4 Supply Side Factors

Many economists[197] have focused upon supply-side factors, such as changes in demographics and school participation rates, to explain changes in the wage structure and, in particular, the relative wages of different education and age groups. If more- and less-educated workers or older and younger workers are imperfect substitutes in the production process, then changes in the educational attainment of the labour force and various age cohorts are likely to affect the structure of wages. For example, if the demand for university-educated workers relative to high school-educated workers is assumed to grow at a constant rate, then a decrease in the growth of supply of university-educated workers relative to high school-educated workers, will result in an increase in the ratio of their wages.[198]

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[197]. See, for example, Katz and Revenga (1989), Blackburn et al. (1990), Freeman and Needels (1993), Katz and Murphy (1992).

[198]. In a simple supply and demand model, the magnitude of the impact of changes in the relative supplies of more and less-educated workers on their relative earnings will depend inversely upon the elasticity of factor substitution between the two groups [Katz and Revenga (1989), p. 538, see also fn. 17].

The emphasis has been on the contribution of the supply of university-educated workers given a steady increase in the demand for university-educated workers and the problem has been analyzed in terms of both levels and growth rates. Since the relative supply of university- educated workers has continued to increase in terms of levels, several U.S. studies report that fluctuations in the rate of **growth** of supply of more-educated workers (relative to less-educated workers) during the 1970s and 1980s is a more important determinant of changes in the education premium than just the relative levels of more to less-educated workers. While there has been a long run increase in the relative supply of more-educated workers since the 1950s, as Katz and Murphy (1992) argued, the largest increase in the supply of college graduates occurred between 1971 and 1979 during which time the education premium declined; and the smallest growth in the supply of college graduates occurred between 1979 and 1987 during which time the education premium increased [Katz and Murphy (1992), p. 50]. Blackburn et al. (1990) also note that the decline in growth of supply of educated, male workers in the United States is an important determinant of the rise in the education premium. They report that supply side factors can explain about 50 per cent of the rise in the college-high school graduate premium (for white male workers, aged 25 to 64 years, between 1979-1987) [Blackburn et al. (1990), Table 12].[199]

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[199]. Blackburn et al. (1990) note that the supply and demand model is better at explaining the change in the rate of growth of the education premium between the two periods than the change in the levels of the education premium; the model is also better at explaining the growth in the education premium for white males aged 25-34 years than for the larger group of white males aged 25-64 years. [Blackburn et al. (1990), p. 65-66]

The inverse relationship between the education premium and rate of growth of supply of more-educated workers is thought to be particularly strong for young workers, in the U.S., during the 1980s. Freeman and Needels (1993) report that "among 25-34 year old men for whom the college-high school differential rose the most, the deceleration was so great that the ratio of college to high school graduates actual fell -- the lagged response to the decline in enrollments induced by the falling return to college of the 1970s" [Freeman and Needels (1993)].

Research aimed at assessing the empirical significance of demand and supply side factors to the increase in between (education) group inequality during the 1980s is much more limited for the Canadian situation, compared to that of the U.S. Freeman and Needels (1993) indicate the smaller growth in the education premium in Canada is due largely to the faster growth of supply of more-educated workers [Freeman and Needels (1993)].

2.2.5 Demand Side Factors

Several U.S. studies suggest that the fluctuations in the relative supply of the more-educated work force alone is an insufficient explanation of the rise in the education premium, and that it is also necessary to hypothesize an accelerated rate of growth of demand for more-educated workers [see for example Katz and Murphy (1992)]. In Canada, the findings of a slight increase in the education premium and continued growth of the university-educated workforce, suggest that there must have also been an increase in the demand for university-educated workers.

While it is generally agreed that the demand for more-educated workers has continued to grow, the debate over the relative importance of alternative (possibly complementary) demand-side mechanisms continues to evolve. Three mechanisms in particular have gained considerable attention: (a) the shift in industrial composition away from manufactured goods towards services (deindustrialization); (b) increased import-competition in the manufacturing sector due to increased world trade; and (c) technological change. The way in which each mechanism is purported to affect the education premium and earnings inequality and the evidence supporting each are discussed below.

(a) Deindustrialization: Shift in Industrial Output towards Services

The earliest and most frequently cited explanation of the rise in the education premium and rise in overall earnings inequality more generally is the shift in aggregate demand away from manufactured goods to services - often referred to as the deindustrialization hypothesis. Deindustrialization is viewed as a long run secular phenomenon which is driven by a combination of higher income elasticities of demand for services, rising per capita incomes, and lower productivity growth in the services sector. The deindustrialization hypothesis is distinguished from the more recent hypothesis which argues that the decline in the manufacturing sector is associated with change in composition of manufacturing goods production is caused by increased trade (discussed below).

This shift in composition of final product demand towards services implies a shift in between-industry demand for labour. Deindustrialization is defined here as the relative increase in labour demand in the service sector and it is thought to depress both wages and employment in the manufacturing sector.[200]

For shifts in industrial structure to affect the demand for different levels of educated labour, there must be differences among industries in the demand for different types of labour, differences in growth rates of employment (productivity and output) among industries, and limited substitution among types of labour. If, as has frequently been speculated, the shift is from relatively high-wage, low-education manufacturing to low-wage, low-education services, wages are depressed further in the low education service sector which contributes to increases in the education premium. For example, a relative decline in output in heavy manufacturing, such as automobiles and steel, means the loss of well-paying, blue collar jobs. If these unemployed workers then seek employment in the low wage service sector, this depresses the wages of less-educated workers in the service sector and contributes to the rise in the education premium.

Alternatively, deindustrialization can cause an increase in wage inequality even if there is no difference in the skill or education intensity of manufacturing and services if large rents accrue to workers in the manufacturing sector. In the presence of substantial inter-industry wage differentials and high rents to workers in manufacturing,

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[200]. In the U.S. the share of employment in manufacturing fell from about 23 per cent to 19 per cent of total employment between 1979 and 1987 [Katz and Revenga (1989), p. 543].

a shift in employment towards the service sector results in a relative increase in low wage jobs and an increase in wage inequality.

In terms of the relationship between deindustrialization and earnings inequality, the argument is that this shift in labour demand is not only from a high-wage to low-wage sector but this is also a shift from a low-wage variance to a high-wage variance sector [see, for example, Osberg (1989)]. Thus, an increase in the proportion of workers in the service sector (high-wage variance) will increase the overall wage variance, or wage inequality.[201]

Most of the empirical work assessing the impact of deindustrialization has focused upon the relationship between deindustrialization and the wage structure (specifically, the education premium), rather than directly upon earnings inequality. Katz and Revenga (1989) report that the share of less-educated workers in U.S. manufacturing fell dramatically in the 1980s. They argue that the shift in product demand away from heavy industries which intensively employ less-educated males[202] and toward service industries, which tend to employ high school and college females and male college graduates, may be an important factor in explaining the rise in the education premium

[201]. However, extending the principles outlined in chapter 3, the transfer of part of the population from one sector to the other, in a two-sector model, does not necessarily increase the overall variance. In terms of the Variance of the Natural Logarithm inequality indicator, it was demonstrated that an increase in the VLN does occur if the variance in the two sectors are similar, the means are different, and the sector receiving the population is less than 50 per cent.

[202]. In the U.S., less-educated young males have tended to be intensively employed in the durable goods manufacturing sector. Less-educated females have tended to be intensively employed in non-durable goods manufacturing.

for young men. [Katz and Revenga (1989), p. 543] Blackburn et al. (1990) conclude that the change in industrial composition of employment accounts for about one-third of the change in education premium (college-high school graduates) for white men aged 25-64 years, in the United States between 1979-1987 [Blackburn et al. (1990), Table 11]. However, they note that between-industry shifts may be more important for young males than for the whole male population together [see also Katz and Revenga (1989)]. Juhn et al. (1993) argue that there has been shift in demand to high-wage jobs and not to low-wage jobs, as the deindustrialization hypothesis would suggest, based upon analysis of weekly earnings data for U.S. males.

In terms of the impact of deindustrialization on earnings inequality, several Canadian studies conclude that deindustrialization is an important but not a dominant factor. Morissette (1995) concludes that deindustrialization and union status combined can account for between 28 and 30 per cent of the rise in weekly earnings inequality for men and only 7 to 14 per cent of the rise in inequality for women. These results are based upon a method of decomposing the Theil Entropy and Coefficient of Variation into the growth in inequality due to changes in the distribution of employment by sector (the changes in weights), within sectors and between sectors where the sectors are defined in terms of industry or union status. Picot et al. (1988, p. 21) report that, for the period 1981 to 1986, only a small change in the earnings distribution can be accounted for by the changing industrial mix of employment. Gera and Grenier (1991) find that the manufacturing sector pays slightly above the average wage after controlling for workers' human capital characteristics (although, certain manufacturing sub-sectors pay below the average). Hence, a decrease in relative employment in the manufacturing sector results in a rise in the proportion of low wage jobs and increased wage inequality.

The deindustrialization hypothesis should be distinguished from the more recent phenomenon of the 1980s, which is potentially a short run phenomenon, namely the decline in importance of selected manufacturing production, resulting from a shift in trade patterns. This alternative explanation, the trade hypothesis, is discussed below.

(b) Trade Hypothesis

The growth of world trade in the 1980s has been linked to the rise in the education premium, fall in employment of less-skilled workers and increased earnings inequality [Freeman (1995), for example]. Increased world trade may reduce wages of unskilled workers or increase unemployment of unskilled workers depending upon the degree of wage flexibility in a given country. The greater wage flexibility in the U.S., may, as has been hypothesized by Freeman (1995), to explain why wage inequality has increased to a greater extent in the U.S., relative to other countries. Conversely, he argues, the relative lack of wage flexibility in European countries explains their smaller increases in wage inequality but higher rates of unemployment [Freeman (1995)].

Trade in the Canadian economy did increase in importance both in terms of exports and imports during the 1980s. During the period 1970 to 1980, exports and imports grew at the annual rates of 4.5 and 5.1 per cent, respectively. Then, over the period 1980 to 1993, the per annum rates of growth were 5.6 per cent for both exports and imports.[203]

In analyzing the impact of trade on labour, the emphasis has tended to be on losses in employment and wage effects arising from increased imports rather than the impacts from increased exports. While global trade increased during the 1980s, certain manufacturing sub-sectors faced increased competition from the imports from developing countries, particularly those of East Asia. The manufacturing sub-sectors most affected included the textiles, clothing, leather goods, and footwear industries. Such industries tend to rely upon labour-intensive production processes and employ a greater proportion less-educated labour compared to other manufacturing sub-sectors.

An increase in import-competition is hypothesized to result in a decline in relative output and employment accounted for by the import-competing manufacturing sub-sector and cause downward pressure on wages [Freeman (1995) for example]. In particular, it is expected there will be a decrease in demand for less-educated labour in this group of manufacturing industries. The affect, as discussed above in the context of deindustrialization, is to implicitly increase the excess supply of less-educated labour which depresses the wages of this group, and raises the education premium.

As with the deindustrialization hypothesis, the impact of increased import-competition will vary by demographic group in accordance with the group's distribution within the industrial structure. Although women comprise a relatively small percentage

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[203]. Workers in an Integrating World. World Development Report 1995. World Bank.

of the total manufacturing labour force (25 per cent in 1983), women's employment is concentrated more in the import-competing manufacturing sector compared to men's manufacturing employment [see the discussion in section 5.2]. Thus, the group most adversely affected by increased import-competition in the area of labour intensive manufactures is likely to be women with little education. In particular, less-educated younger women are more likely to be affected than less-educated older women who may be protected by seniority clauses in union contracts or norms. Given the distribution of men and women within the industrial structure, it is plausible to hypothesize that men are more likely to be affected by the general trend toward deindustrialization, whereas women are more likely to be affected by increased import-competition.

The empirical evidence on the impact of increased trade, particularly increased imports of manufactured goods, on earnings inequality and the education premium is mixed. With respect to the education premium, in general, larger impacts are derived in studies using a factor content approach[204] compared to studies which focus upon price effects.[205] Using a factor content analysis approach, estimates of the percentage increase in the education premium in the U.S. due to trade range from about 10 per cent to over 50 per cent. Borjas, Freeman, and Katz (1991) conclude, for the U.S. between 1980 and 1985, that changes in the structure of labour demand arising from the increased

[204]. A factor content approach assesses the distribution of labour with different types of education within categories of manufacturing and then assesses how a change in imports affects the demand for different skills.

[205]. Lawrence and Slaughter (1993) for example, using the price effects approach argue that trade places pressure on relative prices but does not contribute significantly to increased wage inequality.

trade deficit implicitly increased the excess supply of less-educated workers and accounts for about 15-25 per cent of the rise in the education premium. Here the trade deficit is taken as an indicator of a shift in trade patterns, reflecting a decline in domestic manufacturing production and a rise in imports. Murphy and Welch (1992) report that the impact of trade deficits on women's employment are larger than those arising from the broader shift in employment away from manufacturing [Murphy and Welch (1992), p. 65]. Feenstra and Hanson (1995) argue that between 15 and 33 per cent of the increase in the shift towards non-production labour within U.S. manufacturing industries between 1979-85 can be accounted for by the increase in the share of imports. Mincer (1991), using regression analysis did not find support for the trade hypothesis, where the extent of trade is proxied by the ratio of net exports to GNP, for male workers in the U.S.

In general, increased import-competition is expected to play a larger role in explaining the rise in the education premium in the United States, compared to Canada, since trade deficits in the United States have been relatively larger. Finally, while many studies acknowledge that shifts in the composition of manufacturing output contribute to the increasing education premium in the United States, they conclude that other explanations which can account for increasing inequality within industry sectors are required.[206] Also the focus upon the impact of increased imports on manufacturing employment is a narrow view of trade impacts, compared to those studies such as Wood

[206]. See for example, Bound and Johnson (1989) and Katz and Revenga (1989).

(1994) who includes the impact of outsourcing in all industries on changes in employment and wage structures.

(c) Technological Change

A third demand side explanation focuses upon the role of technological change, particularly computer-based automation, in increasing inequality. In Canada, Baldwin et al. (1995) document an increased use of computer-based technology in the manufacturing sector throughout the 1980s. With reference to the manufacturing sector, Baldwin et al. (1995) indicate that computer based technology has transformed the nature of doing business - in design and engineering of products, making of inputs and assembly, planning and inventory of materials, and integration of all stages of the production process [p. 7]. Computer-based automation has influenced the production processes and organization of work throughout the economy and not just in the manufacturing sector.

Most writers have argued that technological change is non-neutral with respect to skill, and in particular that technological change results in a relative increase in the demand for more-educated workers. The arguments as to why technological change is education-intensive vary but include the following: decreased demand for skills such as manual dexterity, and physical strength [Bound and Johnson (1989), Katz and Murphy (1991)]; and the ability of the more-educated to more rapidly adapt to changing technology [Mincer (1989), Blackburn et al. (1990)]. While technological change is generally thought to increase the demand for highly-educated workers, it may also be associated with de-skilling of low skill jobs.

The argument that technological change is education-intensive has also been related to the observation that there has been a rise in outsourcing in industrial countries Outsourcing refers to the phenomenon in which the labour-intensive parts of the production process are moved from industrialized countries to other countries where low skill labour is cheaper. The more highly skilled parts of the manufacturing process, along with design and control functions, remain in industrialized countries. Advances in telecommunications and computers have facilitated the outsourcing process by making it, first, feasible and then, increasingly less costly

If technological change increases the relative demand for highly-educated workers then this raises the education premium directly. If technological change reduces the demand for less-educated workers, and/or deskills jobs, then low wages are depressed further, which also contributes towards an increased education premium

Three types of evidence have been used to support the technological change hypothesis The first approach has been to examine changes in the occupational mix within industrial sectors There is evidence of a declining proportion of production workers in manufacturing which supports this technological change hypothesis. For example, Katz and Revenga (1989) note that the proportion of total employment in the durable manufacturing sub-sector accounted for by young college-educated workers actually increased from 1979 to 1987 In a detailed study of employment shifts among demographic groups, Katz and Murphy (1992) note that the steady rate of growth of demand for educated workers arises from an accelerating rate of decline in the share of production jobs within industries [Katz and Murphy (1992), p. 72]. Berman, Bound and Griliches (1994) also report a shift towards non-production occupations in U.S. manufacturing; specifically, that the employment of production workers in U.S. manufacturing dropped by 15 per cent and non-production employment increased 3 per cent. They further argue that the shift to non-production workers must be an indicator of technological change rather than increased import-competition because it has occurred within all manufacturing sub-sectors.

Second, the technological change explanation is also supported by direct evidence on the relationship between computer usage, education level, and wages. For Canada, Lowe (1991) found that the degree of computer use rises rapidly with the level of schooling. For the U.S., Krueger (1993) finds that workers who use computers at their job earn roughly a 10 to 15 per cent higher rate than otherwise similar workers. In this study, Krueger (1993) concludes that "the expansion in computer use during the decade of the 1980s can account for between one-third and one-half of the observed increase in the rate of return to education" [Krueger (1993)].[207] Also for the U.S., Mincer (1991) examines the impact of technological change on the education premium, where technological change is measured by two alternative proxies: a total factor productivity variable and a research and development expenditures variable. Both proxies for technological change are found to exert a positive influence on the education premium.

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[207]. Krueger (1993), for example, shows that the percentage of workers who reported using a computer at work increased by over 50 per cent between 1984 and 1989.

Berman, Bound and Griliches (1994) find the share of computers in total investment to be a significant determinant of both non-production workers shares of wages and capital expenditures. While technological change is argued to be labour-saving, in general it had a greater impact on production workers relative to non-production workers [Berman, Bound and Griliches (1994), p. 388].

A Canadian study by Baldwin et al. (1995) report that firms using new technologies pay higher wages. They further argue that firms which have adopted new technologies have increased their market shares at the expense of non-users and have increased their labour productivity advantage [Baldwin et al. (1995), pp. 17-18]. The implication for the relative employment share of technology users is ambiguous since the two factors (technology and increased output share) have offsetting effects. They found that firms using advanced manufacturing technologies pay significantly higher wages than non-technology-using establishments for all technology groups in both 1981 and 1989. The highest difference between technology users and non-users occurs for white collar technologies (inspection and communications) rather than blue-collar technologies (fabrication and assembly) [Baldwin et al. (1995), p. 28].

Finally, the technological change explanation is also consistent with indirect evidence of many studies which document the increasing earnings inequality within industry sectors. For example, the ECC (1991) study reports that, for the goods sector, traditional services, and dynamic services there have been increases in inequality between 1981 and 1986 [ECC (1991), Table 8-19].

3.0 THEORETICAL FRAMEWORK

3.1 INTRODUCTION

The model of firms' choices of job structures and the link between unemployment and earnings inequality outlined in chapter 3 is extended here to take account of structural, demographic and institutional determinants of increased earnings inequality. Only the ideas underlying the model of job structure are reviewed below (in section 3.2) since the model was formally presented in chapter 3. The extension of the model to reflect the influence of non-cyclical determinants of earnings inequality is outlined in section 3.3.

3.2 REVIEW OF THE MODEL OF JOB STRUCTURE, UNEMPLOYMENT AND EARNINGS INEQUALITY

The model of the relationship between unemployment and annual earnings inequality outlined in chapter 3 consists of two parts: firstly, an adaptation of Osberg's (1995) model of labour market adjustment in which firms' responses to changes in incentives to hire permanent or casual workers causes a change in labour market segmentation; and, secondly, the conditions under which such labour market adjustments give rise to increased earnings inequality.

With respect to the first component of the model, the labour market adjustment mechanism, firms are hypothesized to alter their job structures in response to price signals. There are assumed to be two types of firms: Permanent Firms that hire only permanent workers; and Just-in-time Firms that hire a combination of permanent and casual workers. Permanent workers are hired by firms to work for the whole year and casual workers are hired to work only for the hours during the year when the firm expects large sales. The Just-in-time Firms find it profitable to hire a combination of permanent and casual workers because they experience greater variability in demand for their products relative to the Permanent Firms and/or lower costs of hiring casual workers.

In assessing the profitability of a Just-in-time labour strategy relative to a Permanent labour strategy, firms take account of the potential losses in output (revenue and profits) which may occur if they cannot hire the required number of casual workers to meet production targets during the busy sales periods. Critical to this argument is the assumption that when Just-in-time firms experience a surge in market demand, the proportion of the desired number of casual workers that the Just-in-time Firm will be able to hire depends upon the unemployment rate. The higher the unemployment rate, the larger the pool of available casual workers, and the more successful is the firm in hiring the desired number of casual workers. Consequently, the risk associated with moving to a Just-in-time labour strategy is smaller.

The equilibrium proportion of firms that adopt a Just-in-time labour strategy depends upon the critical values of three variables given other parameters of the model such as the productivities of casual and permanent workers and variability in product demand. These three variables are the ability to recruit casual workers (itself determined by the unemployment rate), the value of wages paid to permanent workers, and the value of wages paid to casual workers. Once a given proportion of firms choose a Just-in-time labour strategy this implies a given labour market structure and proportion of casual workers.

Changes in the proportion of Just-in-time firms were examined in terms of changes in the unemployment rate. An increase in the unemployment rate, for a given set of permanent and casual wages, results in an increase in the ability of firms to recruit casual workers, an increase in the proportion of firms that adopt a Just-in-time labour strategy, and an increase in the proportion of casual jobs in the economy.

The second component of the model presented in chapter 3 outlines the conditions under which a labour market adjustment, such as a rise in the proportion of casual workers, gives rise to increased earnings inequality. A given unemployment rate gives rise to a structure (distribution) of jobs which corresponds to a given distribution of individual annual employment earnings under certain simplifying assumptions.[208] An increase in the unemployment rate results in an increase in the proportion of casual workers given the behaviour of firms discussed above. The new percentage of casual workers is equivalent to a new distribution of individual earnings. It was argued in chapter 3 that, under plausible conditions, the new distribution is more unequal than the original one.

The argument that an increase in the proportion of casual workers results in increased earnings inequality was demonstrated with reference to the Variance of Log

[208]. A higher unemployment rate implies greater inequality under the assumptions that workers hold only one job at a time, a permanent worker holds his/her job for the period of a year, and a casual worker holds his/her job for part of the year, and workers accept any job offered.

inequality indicator, although the arguments can be generalized to several other indicators such as the Gini Coefficient and the CV^2. The idea underlying the argument is that inequality can be decomposed into within-group inequality of each labour market segment weighted by the proportion of casual and permanent workers (the population shares). Firstly, as long as the variances of earnings of the two groups remain constant over time, the change in overall earnings inequality is a function of the proportion of each type of job. Secondly, as long as mean earnings of casual and permanent workers differ and the variances are similar, then the inequality will increase, if the proportion of casual workers is less than half.

Thus, the main prediction from the model derived in chapter 3 is simply that earnings inequality (INEQ) depends positively upon the unemployment rate (UE), as summarized by equation (1), where the implicit adjustment mechanism is the impact of the unemployment rate on the proportion of firms that adopt a Just-in-time labour strategy:

(1) $\quad INEQ = f(UE), \quad \text{where } f' > 0.$

Equation (1) was estimated in chapter 3 assuming that all other factors affecting the proportion of Just-in-time firms remain constant. This assumption is relaxed below.

3.2.2 Extension of the Unemployment-Earnings Inequality Model

In the literature review presented in section 2, a variety of structural, demographic and institutional factors were advanced as likely explanations of increased earnings inequality, and these factors are incorporated into the model of changes in job structure and earnings inequality. Five factors namely, macroeconomic conditions proxied by the unemployment rate, the degree of unionization, the female proportion of the labour force, the university-educated proportion of the labour force, and technology are hypothesized to affect earnings inequality through their effects on the proportion of firms adopting a Just-in-time labour strategy. Each of the proposed mechanisms are discussed below. The remaining three factors, namely, minimum wages, deindustrialization, and trade are expected to affect the degree of inequality directly, as will be discussed.

In chapter 3, it was argued that, for a given unemployment rate, firms would only be able to hire a certain proportion of the casual workers that they need (X) in order to meet production targets. Consequently, the risk associated with adopting a Just-in-time labour strategy is due to the potential loss of output (sales, revenue, profits) from not meeting the production targets. An increase in the unemployment rate decreases the potential loss of sales since it results in an increase in the proportion of casual workers actually being hired, as summarized in equation (2).

(2) $X = x(UE, UNION, FEMALE, UNIV, TECH)$

where $0 < X < 1$

and $\partial X/\partial UE > 0$
$\partial X/\partial UNION < 0$
$\partial X/\partial FEMALE > 0$
$\partial X/\partial UNIV < 0$
$\partial X/\partial TECH > 0$

Starting with the institutional context, it is plausible to argue that in non-unionized or low union density firms, managements' decisions to hire casual workers is met with little resistance. In unionized firms, collective agreements may constrain the ability of management to use casual workers because unions may place priority on job security of its members, along with wages and benefits and actively resist management's attempt to lay off permanent workers. A decrease in union density, then would mean that the proportion of desired casual workers actually hired by the firm (X) increases [$\partial X/\partial UNION < 0$].

Turning to supply factors, the proportion of female workers and the proportion of university-educated workers have both increased during the 1980s and have been hypothesized to influence earnings inequality. In this model, an increase in the proportion of female workers is hypothesized to increase the ability of firms to hire casual workers on the grounds that women are more willing than men to work on a casual basis. Women, in general, are more likely to be working part-time. Part-time employment as a percentage of all employment is 26 per cent for women but only 10 per cent for men. More important than just women being more likely to work part-time is the evidence that about one-third of women working part-time (in 1993) stated that they did not want to work full-time, compared to 15 per cent of men working part-time.[209] As shown in (2), an increase in the proportion of women is expected to result in an increase in the ability of firms to hire casual workers [$\partial X/\partial FEMALE > 0$].

Also on the supply side, the literature has often argued that changes in the size of the group of highly-educated workers is a determinant of increased earnings inequality. The impact of an increase in the proportion of university-educated workers on the ability of firms to hire casual workers cannot be predicted a priori. One could argue that an increase in the proportion of university-educated workers decreases the ability of firms to hire casual workers, if university workers are more specialized than casual workers and/or have greater opportunity costs of accepting casual work [$\partial X/\partial UNIV < 0$]. Alternatively, one could argue that some university-educated workers acquire a general set of skills (for example, literacy, numeracy, critical thinking, and problem-solving). Consequently, an increase in the proportion of university-educated workers makes it easier for firms to contract-out parts of the production process and increases the ability of firms to hire casual workers [$\partial X/\partial UNIV > 0$].

In terms of one of the structural explanations, technological change, it is hypothesized here that computer-based technological change and telecommunications may increase the ability of firms to recruit casual workers if it affects the reliability and ease of contacting casual workers. Also technological change has increased the ability of

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[209]. This is not to say, however, that given changes in institutional and family arrangements for child care and changes in the organization of work, the same percentage of women would still want to work part-time. For the breakdown on reason for part-time work see, Statistics Canada (1994). Women in the Labour Force, 1994 Edition, Catalogue 75-507E Occasional.

firms to track fluctuations in product demand and thereby utilize workers more effectively [$\partial X/\partial TECH > 0$]. Alternatively, technological change could affect the relative productivities of casual and permanent workers (q_c and q_p, respectively) which will shift the profit maximization expression for the Just-in-time Firm, shown in Equation (3) below.

The above discussion has focused on how these five factors affect the ability of firms to recruit the desired number of casual workers. The factors affect the profitability of a Just-in-time labour strategy directly through the proportion of desired casual workers that are actually hired and, hence, affect profitability through the reduction in risk associated with such a labour strategy. An increase in the unemployment rate, a decline in unionization, an increase in the proportion of female workers, a decline in the proportion of university-educated workers, and an improvement in computer-based automation and telecommunications will increase the ability of firms to recruit the desired number of casual workers (X). An increase in X will increase the profitability of the Just-in-time labour strategy given the profit-maximizing expression in equation (3) below and as presented in chapter 3 and, consequently, will increase the proportion of firms choosing this strategy.

(3) Profit Just
in-Time Firm $= P[Q_1{*}H + X_1(Q_2-Q_1)H_2]-[W_p{*}A_p{*}H + W_c{*}X_1{*}A_c{*}H_2]$.

The manner in which the remaining three factors affect changes in earnings inequality are now discussed. A change in the level of minimum wages directly affects the profit-maximization expression for the Just-in-time labour strategy, shown in (3), if casual workers are paid the minimum wage. Thus, a decline in the minimum wage will increase prot given the equilibrium values of the proportion of casual workers that firms can realistically hire (X) and the average wage paid to permanent workers (W_p). Therefore, a decline in the minimum wage will increase the number of firms adopting a Just-in-time labour strategy.

Finally, deindustrialization and changes in trade patterns (increased import-competition) may also increase the number of firms adopting the Just-in-time labour strategy. Both deindustrialization and a change in trade patterns may result in an increase in the relative importance of the service sector.[210] If it is more likely that service sector firms find the Just-in-time labour strategy profitable, compared to manufacturing firms, then an increase in the relative size of the service sector will increase the number of Just-in-time firms. Service sector firms are more likely to find a Just-in-time labour strategy more profitable than the Permanent labour strategy if, for example, sales are more variable than in the manufacturing sector. In addition, manufacturing output can be stored more easily than service sector output.[211] Consequently, unexpected surges in market demand for their products can be met from inventory. Alternatively, one could argue that the production processes in the service and manufacturing sectors are quite different and that the service sector firms can operate

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210. Strictly, trade results in a relative decline in manufacturing output and employment in the import-competing manufacturing sector. It does also mean that the relative size of the manufacturing sector shrinks as a result of increased imports, although less than in the case of deindustrialization.

211. The ECC (1991) study for example, defines services as "non-storable".

with a higher proportion of casual workers.[212] For example, manufacturing production based upon assembly-line processes involves interrelated work roles and co-ordination in the use of linked equipment which make it more difficult to use casual workers for parts of the production process.

The above discussion demonstrates how each of the eight factors contribute to an increase in the number of firms adopting a Just-in-time labour strategy. The conditions underwhich firms switching to a just-in-time labour strategy results in an increase in earnings inequality and these conditions likewise apply here. Equation (4) illustrates in reduced form the relationship between each of the eight factors and earnings inequality.

$$\text{(4)} \quad INEQ = g(UE, UNION, TECH, FEMALE, UNIV, MWAGE, MANUF, TRADE)$$

where:

$$\begin{aligned} &\partial INEQ/\partial UE > 0 \\ &\partial INEQ/\partial UNION < 0 \\ &\partial INEQ/\partial TECH > 0 \\ &\partial INEQ/\partial FEMALE > 0 \\ &\partial INEQ/\partial UNIV < 0 \\ &\partial INEQ/\partial MWAGE < 0 \\ &\partial INEQ/\partial MANUF < 0 \\ &\partial INEQ/\partial TRADE < 0 \end{aligned}$$

The first five factors influence earnings inequality through the mechanisms of affecting the proportion of desired casual workers that can be hired and then the profit maximization expression for Just-in-time labour strategy. Cyclical factors, proxied by the unemployment rate, are expected to exert a positive influence on earnings inequality [$\partial INEQ/\partial UE > 0$]. Institutional factors, such as degree of unionization, are expected

[212]. In (3), A_p (A_c) in the service sector is less (greater) than A_p (A_c) in the manufacturing sector.

to be negatively related to earnings inequality $[\partial INEQ/\partial UNION < 0]$. Technological change is thought to increase earnings inequality $[\partial INEQ/\partial TECH > 0]$. On the supply-side, a rise in female labour force participation (proxied by the proportion of female workers) has a positive affect on earnings inequality $[\partial INEQ/\partial FEMALE > 0]$. The increase in the proportion of university-educated workers could have a negative or positive effect depending upon the relationship between the proportion of university-educated workers and the ability of firms to hire casual workers $[\partial INEQ/\partial UNIV <,< 0]$. The next three factors affect earnings inequality through the mechanism of directly affecting the profit maximization expression for the Just-in-time labour strategy (4). Minimum wages are inversely related to earnings inequality $[\partial INEQ/\partial MWAGE < 0]$. For the structural factors, deindustrialization, proxied by the proportion of manufacturing workers, is expected to be negatively related to earnings inequality $[\partial INEQ/\partial MANUF < 0]$; and changes in the pattern of trade, particularly the rise in imports of manufactured goods is expected to be negatively related to earnings inequality $[\partial INEQ/\partial TRADE < 0]$].

Equation (4) can be used to interpret not only increases in earnings inequality, but also increases in the education and age premia. The argument requires that more-educated workers and older workers to be less likely to be affected than less-educated and younger workers when firms change their labour strategy. For example, if a firm moves to a Just-in-Time labour strategy and lays off permanent workers, it is plausible that less-educated and younger workers will be laid off first. This argument holds for such reasons as more-educated workers embodied more firm-specific human capital or are more difficult to recruit and, secondly, younger workers are less protected by seniority clauses. Thus, an increase in the proportion of Just-in-Time firms means a shift in demand away from les-educated and younger workers which depresses the groups' mean earnings and raises the education and age premia. Consequently, the structural, demographic and institutional factors discussed above are expected to have the same relationship with the education and age premia as with earnings inequality (as summarized in Table 1). In this chapter, however, the age premium which is defined as the mean earnings of younger workers relative to prime age workers, rather than the reverse of this. Thus, the signs on each of the variables for the age premium are the reverse of what are expected for the education premium.

4.0 EMPIRICAL APPROACH

4.1 THE DATA

A special feature of this empirical investigation is the use of a unique cross-section/time series data set created for this project by Statistics Canada from the Survey of Work History (Person File) 1981 and Labour Market Activity Surveys (Cross-sectional Person Files) 1986 and 1989.[213] The three surveys have been described in chapters 2 and 3. The data set used in this part of the analysis aggregates the weighted individual data across economic regions. The weights are associated with each case (representing an individual) and are used to generate population estimates from the sample. Note that since the economic region variable is unavailable on the public micro data files, the data

[213]. S. Roller, Statistics Canada, created the data set.

set had to be created from the original Statistics Canada data tapes. To achieve consistency across the three years, 64 economic regions have been defined and, thus, the data set consists of 192 observations in total. The economic regions are described in Appendix F.

The data set includes all individuals 17 to 64 years of age with at least one paid worker job during the calendar year. It is available for all workers and full-time/full-year workers and both categories are available for the population of all workers and for men and women separately.

Two principles were used in creating the data set. Firstly, it is desirable that data be available at quite a disaggregated level in terms of both education and age categories, as well as industry and occupation categories. Secondly, indicators should be selected which permit the data to be aggregated into alternative categories, for example, combinations of age and education groups. The education, age, industry, and occupation categories available in the data set are presented in Appendix G.

The data set contains the following information for 25 education-age groups (5 education groups and 5 age groups): mean hourly wage rates; mean annual earnings; weighted and unweighted number of persons[214]; standard deviation of hourly wages and annual earnings; and hourly wage and annual earnings inequality indicators.

Three inequality indicators are calculated. These are the Generalized Entropy indicator (parameters $\epsilon=0$, 0.5, and 1) where the smaller the value of e, the more weight

[214]. The weighted cases are used to reflect the population derived from the sample.

is given to low earnings.[215] Note that $\epsilon=1$ is equivalent to the Theil Entropy indicator. The Generalized Entropy indicator for each economic region is calculated following Jenkins (1991) as:

$$GE(\epsilon)=[i/(e^2\text{-}e)]\{[(1/n)\ \Sigma\ (y_i/u)^e]\ \text{-}1\}$$

or

$$GE(\epsilon=0)=1/n\ \Sigma\ \log\ (u/y_i)$$
$$GE(\epsilon=0.5)=(\text{-}1/.25)\ \{[(1/n)\ \Sigma\ [(y_i/u)^{1/2}]\ \text{-}1\}$$
$$GE(\epsilon=1)=1/n\ \Sigma\ [(y_i/u)*\log(y_i/u)]$$

where n = number of weighted cases
u = mean annual earnings (weighted)
y_i = annual earnings of individual i

The Generalized Entropy indicator was selected because it has the attractive property of being additively decomposable by group. This means that the overall degree of inequality for a particular age-education group can be determined using information on the weighted number cases, mean income and inequality estimate for each of the sub-groups. Further, an increase in inequality of one age-education group would increase overall inequality. Given this decomposability property, it is possible to calculate an inequality indicator for more aggregate education and age groups.

The data set also contains variables on: the weighted number of workers in 60 industry-occupation groups (10 industry groups and 6 occupation groups); the weighted number of workers in 40 industry-employer size groups (10 industry and 4 employer size groups); the weighted number of persons covered by a collective agreement in each of

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[215]. Shorrocks (1980) discusses this additively decomposable property of the Generalized Entropy indicator.

the 10 industrial categories; and the weighted number of persons with pensions in 10 industry groups (except in 1981 when pension data are unavailable). The industrial categories are based upon the SIC 1980 2-digit classification scheme. The division into 10 industrial sectors is based upon categorization within manufacturing used by Gera et al. (1993) and the categorization within services modifies the one used by ECC (1991).

Data on the unemployment rates by economic region and minimum wages by province have been added.[216] The definitions of variables used in this analysis are discussed in the following section.

This data set offers a number of advantages. First, the data set consists of 192 observations (64 regions in each year, for three separate years) making it considerably greater than data sets used in comparable work. For example, Katz and Revenga's (1989) regression results are based upon between 17 and 25 observations; Freeman and Needels (1993) rely upon a data set with either 13 or 21 observations; and Mincer (1991) uses a data set with 25 observations. Second, as noted above, the variables were defined and created at quite a disaggregated level, in terms of industry and occupational categories, or age and educational categories, permitting considerable flexibility for re-grouping and re-definition which will be useful in other studies.

There are two problems with the data which give rise to bias in the dependent variables in one or more years. First, in the SWH 1981 data, individual estimates of earnings and hourly wages are biased due to the method of collecting earnings data in

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[216]. The regional unemployment rates are taken from published sources and are derived from the Labour Force Survey. The 1981 minimum wage data are from the Canada Year Book, 1981. The 1986 and 1989 data are from Akyeampong 1989), p. 18.

1981, as discussed in chapter 2. As discussed in chapter 2, mean annual earnings in 1981 are overestimated and the degree of annual earnings inequality is underestimated, if annual earnings for each individual is calculated using the method proposed in the microdocumentation for the SWH 1981.[217] Consequently, estimates of regional mean earnings and hourly wage rates and regional inequality estimates are, respectively, overestimated and underestimated. While chapters 2 and 3 use a simulation method to correct for the bias in the 1981 data, the 1981 data used in the regression analysis in this chapter are based upon the original data.

Second, given the biased estimates of individual earnings and wages, the education and age premia estimates may be biased in 1981 if the various age-education groups are differentially affected by the bias in the data collection method, although the bias here is likely to be less for the education and age premia than for inequality estimates.

Third, estimates of the education premium in 1989 may be biased because of a change in the coding of education which occurred after 1988. The education premium is defined as the mean annual earnings (or hourly wage rates) of workers with a university degree relative to mean earnings (or wages) or workers with a high school diploma or less. These two education groups are selected in order to have two distinct groups with different levels of education for which the categories remain consistent over time. While it may have been preferable to define the education premium as the earnings of workers with a university degree relative to earnings of workers with a high school

[217]. See Appendix C for the detailed discussion, and Table C2 for the estimates.

diploma, it is only in 1989 that information on high school graduation is available [see Lavoie (1990)]. Prior to 1989, post-secondary education was limited to education which requires a high school diploma. However, in 1989, post-secondary education includes trades and vocational programs which do not necessarily require high school graduation. Thus, focusing upon university graduates rather than a combined group of university graduates and workers with some post-secondary certificate or diploma ensures that all members of the group have a high school diploma (or its equivalent). In 1989, the change in coding of university eliminates some "false positives" and thus, in comparison to previous years, would inflate mean earnings of this group [Lavoie (1990), Morissette et al. (1993)].

The other data in the 1981 data set however are not subject to this bias because the variables used are calculated as proportions of the weighted number of cases in various categories such as industry and occupation.

The bias in these dependent variables does not pose a problem for the results of this chapter. Firstly, national trends in inequality and age premium are unbiased since they are documented using the LMAS 1986 and 1989 along with the SWH 1981 data in which the bias has been reduced using the method discussed in chapter 2. The problem of bias in the education premium in documenting trends at the national level does remain, however, since the change in the coding of education in 1989 implies the 1989 education premium estimated has been calculated on a different basis then the estimates for 1981 and 1986. When presenting the trends attention is paid to comparing these results with those of other studies which use the comparable 1988 data.

Secondly, the coefficients derived from the regression analysis with earnings inequality, the education premium and the age premium as the dependent variables will be unbiased since the errors-in-variables problem introduces a bias only if the independent variables are incorrectly measured.[218] While the education premium estimates in 1989 are not entirely consistent with the estimates in 1981 (and 1986), this problem does not mean that the regression estimates are biased unless the extent of the bias in the dependent variable differs across economic regions.

4.2 VARIABLE DEFINITIONS

Each of the dependent and independent variables are defined below and the definitions are summarized in the Table 2. The independent variables include inequality indicators, the education premium and the age premium. Measures of inequality are represented by the Generalized Entropy indicator (ϵ=0, 0.5 and 1.0) [GENTROPY ϵ=0, 0.5, 1]. These inequality indicators were calculated for both annual earnings and hourly wage rates.

The age premium is calculated here as the relative mean earnings and hourly wage rates of young workers, defined as workers aged 17 to 24 years, to prime age workers, defined as workers aged 35-54 years.

The education premium is calculated as the relative mean earnings and hourly wage rates of university-educated workers and workers with a high school diploma or

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[218]. The biases in the dependent variables are assumed to be roughly constant across regions.

less. The education premium is also calculated for young workers, where young workers are defined as being between the ages of 17 and 24 years.[219]

The independent variables are defined below. The unemployment rate [UE] in each economic region is taken from published sources as derived from the Labour Force Survey. This variable reflects the combined male and female unemployment rate for all individuals greater than 15 years of age. If the unemployment rate was unavailable for an economic region, then the provincial unemployment rate was substituted[220].

The minimum wage variable [MWAGE] is the legislated provincial minimum wage and each economic region in the province is assigned the provincial standard. If the minimum wage level changed during a year under consideration, the rate which was in effect for the largest number of months was used.

Union density [UNION] is proxied by the proportion of workers covered by a collective bargaining agreement in their first job by economic region.

The main indicator of industrial structure and the proxy for deindustrialization [MANUF] is the proportion of all workers employed in the manufacturing sector by economic region. The degree of import-competition is proxied by the proportion of

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219. Note that a university degree is reflected by category=5 in the education variable in 1981 and 1986 and category=6 in the education variable in 1989. A high school diploma or less is captured by categories=1 and 2 in 1981 and 1986, and categories=1, 2, 3, and 7 in 1989, to take account of the recoding in 1989.

220. In each of the three years, there were between 6 and 8 regions (out of 64 regions) that were missing the regional unemployment, and consequently, these regions were assigned the provincial unemployment rate.

manufacturing workers employed in the manufacturing sub-sectors of leather, textile, knitting, clothing, tobacco products, furniture and fixture [TRADE].

The degree of technological sophistication is proxied by occupational mix since a direct measure of technology usage is unavailable in this data set. Technology is proxied by the the proportion of the work force employed in managerial or professional occupations [TECH].

The proportion of workers with a university degree can be calculated from the data set using the definitions of university as for the education premium [UNIV].

The proportion of female workers is also calculated directly from the data set [FEMALE].

The data used in the regression analysis are the estimates of the various variables defined above for each of the 64 regions in Canada and for the three years, 1981, 1986 and 1989. The descriptive statistics of the data set are presented in Table 3(a-c).

4.3 ESTIMATING EQUATIONS

In estimating equation (2) there are two econometric issues to be considered relating to the use of pooled cross-section and time-series data. The first issue concerns the appropriate method for controlling for fixed cross-sectional and time-series effects. The second issue concerns the potential heteroscedasticity of errors given the use of regional data.

The use of pooled cross-section and time-series data means that a variety of models can potentially be estimated to control for various cross-sectional (regional) effects and time-series (national, secular) effects, as summarized below.[221] The model selected for estimation is described and justified and then placed in the context of the other potentially available estimating models.

MODEL	INTERCEPT	COEFFICIENTS	
1.	**Vary for t**	**Common for r,t**	**(Selected Model)**
2.	Common for all r,t	Common for r,t	
3.	Varies for r	Common for r,t	
4.	Vary for r,t	Common for r,t	
5.	Vary over r	Vary over r	

where r = individual (regional) observation
t = time period (year)

In the estimating model selected, as described by Model 1 above, the time-series effects reflecting national, secular changes which are fixed across the regions (reflecting secular shifts in the regression relationship over time which are uniform across the regions). The intercept can vary over time periods with the use of dummy variables for the time periods to capture changes over time. A common set of coefficients are estimated for all regional observations and time periods (r and t, respectively) reflecting the idea that the determinants work in a uniform manner across regions. This model is preferred, to the others, since it captures fixed time-series effects and uses regional variation in the data while assuming the same causal relationships are at work.

[221]. See Johnson (1984), pp. 396-407.

Alternatively, one could estimate Model 2 in which all the data are pooled and there are no fixed regional or secular effects. In this case it is assumed that there is a common intercept and common set of coefficients for all regions and time periods. Model 1 allows for secular change and hence is preferred to Model 2, which does not. In Model 3, it is assumed that there are permanent differences among regions. The model captures different regional effects through the separate intercept terms, one for each region, but there is still a common vector of slope coefficients. The results of this model would most closely resemble results from time-series data at the national level. Although Model 3 is potentially interesting it does not take account of secular changes and so Model 1 is still preferred. Model 4 reflects the combination of Models 1 and 3. Model 5 allows both the intercept and the coefficient vector to vary across cross-sectional units and can be estimated using Seemingly Unrelated Regression Equations, following Zellner (1962). Both Models 4 and 5 are more complex than what is required in the context of this chapter and, consequently, Model 1 still preferred.

The second econometric issue is the potential for heteroscedasticity given the use of regional data.[222] Heteroscedasticity arises if the variance of the error term differs across regions. Ordinary least squares estimates in the presence of heteroscedasticity means that the coefficients are unbiased and consistent. They are not, however, efficient. Since the variances of the regression coefficients are biased and inconsistent, significance tests may be misleading.

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[222]. The problem of heteroscedasticity is potentially a problem with many microdata sets.

The presence of heteroscedasticity in the data set will be tested for. A simple test is used in which the model's residuals are used as an estimator of the error variance and the residuals are regressed upon the predicted estimates. This procedure is chosen since SPSS, which is used to run the regressions, does not calculate the usual set of tests of heteroscedasticity such as the Breusch-Pagan, Goldfeld-Quandt, or White tests. If the assumption of homoscedasticity is rejected then alternative estimation procedures can be used. They all require, however, knowing the nature of the error term. Given the large number of variables used here, this procedure would be unreliable. A frequently used alternative is to run OLS and to calculate the standard errors corrected for heteroscedasticity which can then be used for hypothesis testing. SHAZAM, for example, uses White's (1980) heteroscedastic-consistent covariance matrix estimation to correct the standard error estimates given an unknown form of heteroscedasticity.

Equation (2) from the theoretical framework is estimated by equations (4a-c) below using OLS. Equation (4a) includes macroeconomic and institutional variables only; equations (4b and 4c) add to (4a) the structural and demographic variables. The difference between equations (4b) and (4c) is that deindustrialization is included in equation (4b) and this is replaced by the trade variable in equation (4c). Each of the variables were defined in the previous section (and summarized in Table 2). Two dummy variables have been added, DUM86 and DUM89, which, respectively, take the values 1 in 1986 and 1989 and 0 elsewhere. The dummy variables are intended to capture differences between the three years, 1981, 1986, and 1989 in the degree of bias in the dependent variable and unobserved influences not captured by the regression equation.

(4a) INEQ = $a_0+a_1UE+a_2MWAGE+a_3UNION+a_4DUM86+A_5DUM89+e_1$

where: $a_1 > 0$
$a_2, a_3 < 0$

(4b) INEQ = $b_0+b_1UE+b_2MWAGE+b_3UNION+b_4FEMALE+b_5UNIV+b_6MANUF+b_7TECH+b_8DUM86+b_9DUM89+e_2$

where: $b_1, b_4, b_7 > 0$
$b_2, b_3, b_5, b_6 < 0$

(4b) INEQ = $c_0+c_1UE+c_2MWAGE+c_3UNION+c_4FEMALE+c_5UNIV+c_6TRADE+c_7TECH+c_8DUM86+c_9DUM89+e_2$

where: $c_1, c_4, c_7 > 0$
$c_2, c_3, c_5, c_6 < 0$

In examining the relative contribution of cyclical, structural and demographic factors to inequality during the 1980s, attention is paid to the impact of researcher choices on the results. The choices pertain to:

(i) three dimensions of inequality: Generalized Entropy (ϵ=0, 0.5, 1.0), education premium (youth and all workers) and age premium (mean youth workers earnings/mean prime age workers' earnings;

(ii) three population groups: men, women and men/women combined;

(iii) two definitions of employment income: annual earnings and hourly wage rates;

(iv) two forms of equation specification: levels and changes; and

(v) three combinations of independent variables.

Thus, there are potentially a total of 216 regression equations if each of the three Generalized Entropy indicators and the education premium for both youth and all workers are considered. Only a selection of these results are discussed in the following section.

5.0 RESULTS

5.1 TRENDS IN THREE DIMENSIONS OF INEQUALITY

Inequality of employment earnings for the population of all workers increased in Canada during the 1980s in at least three dimensions. Inequality increased among individuals, as reflected by increased disparity between the richest and poorest workers in society. Further, inequality between different age and education groups increased, as reflected by the deterioration in the relative position of young workers and less-educated workers.

(a) Inequality in the Distribution of Income among Individuals

Trends in these three dimensions of inequality in Canada during the 1980s are briefly reviewed below, drawing upon the results in Tables 3 and 4. Individual earnings inequality increased as has been extensively documented in chapters 2 and 3. Annual earnings inequality among the population of all workers aged 17 to 64 years, increased from .2744 to .2856 between 1981 and 1989, as measured by the Generalized Entropy indicator $\epsilon=1.0$ (which is equivalent to the Theil Entropy indicator), (see Table 4).[223] Note also that earnings inequality for the population followed the business cycle with an increase between 1981 and 1986 and then a slight decline from 1986 to 1989.

The pattern of earnings inequality for men follows this pattern of an increase and decrease over the 1980s as for the population as a whole, and inequality is significantly and substantially higher in 1989 compared to 1981. Earnings inequality for women remained much more stable during the 1980s, as discussed in the preceding chapters. In terms of the Generalized Entropy indicator, inequality among all women workers was slightly lower in 1989 compared to 1981, although this is not the case for full-time/full-year women workers, as discussed previously.

The trend toward greater inequality in annual earnings is also observed when employment income is measured by hourly wage rates for the population as a whole and for men. Hourly wage rate inequality for women declined over the 1980s.

(b) Inequality between-education-groups

Inequality between-age-groups and between-education-groups also increased during the 1980s, as measured in terms of both annual earnings and hourly wage rates. Changes in between-education-group inequality is measured by changes in the education premium which is defined as the relative mean annual earnings (or hourly wage rates)

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[223]. Note that these estimates of inequality for the Generalized Entropy ($\epsilon=1.0$) differ slightly from the estimates for the Theil Entropy indicator presented in chapters 2 and 3 because these latter estimates refer to the population of workers aged 17 to 69 years rather than the age group 17 to 64 years as in this chapter.

of workers with a university degree to workers with a high school diploma or less. The education premium calculated for all workers aged 17-64 increased between 1981 and 1989 for each of the three population groups considered (namely, men, women, and men and women combined) and for both income concepts, hourly wage rates and annual earnings. Although the data are not shown in Table 4, the education premium rose due to the relative stability of mean earnings of university-educated workers and a decline in the mean earnings of workers with a high school education or less.

For the population, the education premium measured by relative mean annual earnings increased from 1.69 to 1.77 between 1981 and 1989. Measured by relative mean hourly wage rates, the education premium increased from 1.55 to 1.65 over the same period. Note that for women, the increase in the education premium, measured in terms of relative mean earnings, is substantial; the education premium increased from 1.81 in 1981 to 1.96 in 1989.

An increase in the education premium has also been reported by several other Canadian studies although, as noted in section 2, part of the increase may be due to the inflated value of mean earnings of university-educated workers in 1989 compared to 1981. Freeman and Needels (1993) report an increase in the education premium measured by annual earnings for women and men, respectively, of 0.6 and 1.3 per cent per annum over the period 1979 to 1987. The estimates presented in Table 4, which do not control for labour market experience, suggest slightly lower estimates of the increase in the education premium for men but higher estimates for women. From Table 4, the increase in the education premium for women and men, respectively, are 1.0 and 0.7 per cent per annum.[224] Patrinos (1993a) also reports a larger increase in the return to education for women compared to men over this period. Patrinos estimates the return to schooling, controlling for years of potential labour market experience and hours worked. Between 1981 and 1989, the return for men increased from 8.5 to 8.9 per cent, and for women, the increase was from 10.5 to 11.5 per cent. Morissette et al. (1993) however, caution against drawing definite conclusions about trends in the education premium over the 1981 to 1989 period due to a change in the method of coding education in 1989. However, there were increases in the education premium between 1981 and 1986, the period for which there is no bias in the educational coding.

For young workers (defined as workers aged 17-24 years), the education premium measured in terms of relative mean annual earnings increased for each of the three population groups. As for the group of all women workers, the increase in the education premium for young women is substantial; the education premium (relative mean annual earnings) increased from 1.56 to 1.95 between 1981 and 1989. However, for young workers in contrast to all workers, the education premium measured in terms of relative mean hourly wage rates remained quite stable during the 1980s (for men and the population) or declined (as for women). Patrinos (1993a) also reports larger increases in the rate of return to education for younger workers, defined as workers less than 25 years.

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[224]. The data and method of Freeman and Needels (1993) differ from those used in this chapter. Freeman and Needels (1993) use data on household heads only, individuals aged 25 to 64 years, and they compare the mean earnings of university educated workers to workers with 11 to 13 years of schooling.

(c) Inequality between-age-groups

Inequality between-age-groups increased during the 1980s, as documented in chapter 3, and particularly dramatic was the drop in relative mean earnings of young workers. An indicator of changes in the relative position of young workers is the age premium, which is measured as the relative mean annual earnings or hourly wage rates of young workers (defined as workers aged 17 to 24 years) and prime-aged workers (defined as workers aged 35 to 54 years). For each of the three population groups and for both income concepts, the age premium indicator declines between 1981 and 1989 illustrating a decline in the relative position of young workers. For example, for the population of all workers, the age premium decreased from .50 to .40 between 1981 and 1989.

The substantial deterioration in labour market outcome of young workers has also been documented in other Canadian studies. Morissette et al. (1993), for example, report that for male young workers aged 17-24 years, real mean earnings declined by 18 per cent and for workers aged 25 to 34 years, real mean earnings declined by 8 per cent. For female young workers aged 17-24 years real mean earnings declined by 11 per cent.

5.2 REGRESSION RESULTS: DETERMINANTS OF INEQUALITY

5.2.1 Trends in Determinants of Increased Inequality

Before examining the regression results, the national trends in variables used to proxy the various hypothesized determinants of increased inequality are reviewed. Firstly, the unemployment rate, adopted as a proxy for business cycle conditions, indicates that 1981 and 1989 were comparable points in the business cycle since the national unemployment rate was 7.5 per cent in each year. The pattern of unemployment rates over the two periods considered here was different, as indicated by the higher average unemployment rate of 9.9 per cent during the period 1981-1986, compared to an average of 8.3 per cent during 1986-1989. In general, the unemployment rate was higher during the entire decade of the 1980s compared to the previous decade when the unemployment rate averaged 6.7 per cent during the period 1970-1979.[225]

Secondly, the institutional context changed slightly during the 1980s. During the 1960s and 1970s, the unionization rate for the population fluctuated between about 31 and 33 per cent. However, between 1981 and 1989, the unionization rate for the population, dropped steadily from 32.3 per cent to just under 30 per cent. The drop in the unionization rate for the population is due to the decline in unionization among men. For men, the unionization rate dropped steadily from 38.2 per cent o 34.5 per cent. For women, the unionization rate between 1981 and 1989, declined and rose back to just over 24 per cent.[226] These trends in unionization are similar to the trends observed in the data used in this study. For men, the percentage of male paid workers covered by a

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[225]. Calculated from Statistics Canada. Historical Labour Force Statistics. Catalogue 71-201.

[226]. Statistics Canada. Catalogue 71-202 (1989), Chart - 1.26. Note that a new series is started in 1983 due to legislative changes to the Unionization Act which results in additional membership being reported from 1983 onwards. However, according to both series, the rates of unionization for the population and men separately, show sharp declines after 1983.

collective bargaining agreement fell from 40.1 per cent in 1981, to 37.2 per cent in 1989. For women, the percentage of female workers covered by a collective bargaining agreement increased slightly from 28.2 per cent in 1981, to 30 per cent in 1989[227] (see Appendix H, Table H1).

Minimum wage levels varied by province and declined in real terms during the 1980s. In 1981, 1986, and 1989 the average minimum wage levels in 1986 dollars were 4.73, 4.08 and 4.03.[228]

Relating to the deindustrialization hypothesis, there have been large shifts in employment away from the manufacturing sector during the 1980s (see Appendix H, Table H2). Female employment in the manufacturing sector dropped from 14.5 to 11.4 per cent between 1981 and 1989. Male employment in manufacturing dropped from 26.9 to 25.1 per cent over the same period.[229] Deindustrialization in Canada is also

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[227]. These trends in union coverage for men and women are derived from the SWH 1981 and LMAS 1986, 1989 and are based upon whether the worker was covered by a collective agreement in his/her first job.

[228]. In nominal terms, the average minimum wage level 1981 was $3.57 per hour, ranging from $3.30 (PEI, NS) to $4.00 (Que, Sask). In 1986, the average minimum wage rate was $4.08, ranging from $3.65 (BC) to $4.50 (Sask). In 1989, the average minimum wage rate was $4.60, ranging from $4.25 (Nfld) to $5.00 (Que, Ont).

[229]. This percentages are based upon Table H2 which are derived from the SWH 1981 and LMAS 1986, 1989 data. The numbers in the Table are calculated by taking the number of workers whose first paid job is in manufacturing, services, and primary industrial sectors. In comparison to the Labour Force Survey data, the data used here report a larger number of workers in the service sector and comparable numbers in the manufacturing sector. For example, in 1981 and 1989, the number of workers in the service sector is about 8.0 and 9.2 million according to the method and data used here. The numbers for 1981 and 1989 from the Labour Force Survey are 7.3 and 8.2 million. The discrepancy is likely due to the nature of the survey questions. The Labour Force Survey asks questions about employment in the previous week, whereas the SWH and LMAS are capture employment over the year. The Labour Force Survey data are taken

associated with a decline in the absolute size of the manufacturing sector, as the number of women and men employed in manufacturing dropped by almost 57,000 and 80,000, respectively.

Deindustrialization has disproportionately affected high school workers. The decline in the absolute and relative size of the manufacturing sector was associated with a decline in the number of workers with a high school education or less. The number of women workers with a high school education or less in the manufacturing sector declined from 559,861 to 433,217 during the 1980s; and the number of women employed in the sector with a university degree actually increased. Similarly, men with a high school education or less were disproportionately shifted away from manufacturing, with the numbers declining from about 1.2 million to 1.0 million; and the number of university-educated men employed in manufacturing increased.[230]

While the manufacturing sector shrank in relative size, there were also changes in the composition of manufacturing employment as the trade-related hypothesis would suggest. Employment in the trade, or import-competing[231], manufacturing sub-sector shrank in relative and absolute terms during the 1980s and women in particular were affected. The proportion of female manufacturing employment in the trade-related sector

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from Sta ..ics Canada. Labour Force Annual Averages. (1992). Catalogue 71-220.

[230]. This is important for less educated workers since the manufacturing sector is less education intensive than the service sector. That is, the manufacturing sector employs a higher percentage of high school- educated workers each year compared to the service sector.

[231]. The import-competing manufacturing sub-sector is defined as the leather, textile, knitting, clothing, tobaccor products, and furniture and fixture industrial categories.

shrank from about 30 per cent in 1981 to 24 per cent in 1989, whereas male employment remained roughly constant. The shift in employment out of the import-competing manufacturing sector disproportionately affected less-educated workers, with university-educated workers increasing their relative and absolute shares (see Appendix H, Table H3).

Another structural factor considered is the impact of technological change proxied by the proportion of workers in managerial and professional occupations.[232] There were increases in the percentages of the workforce accounted for by managerial and professional occupations within various industries for both women and men (see Appendix H, Table H5(a-b)), with the exception of government (non-market) services sector/ professional occupation category for women. For example, women in managerial occupations in the manufacturing sector accounted for 4.1 per cent of manufacturing employment in 1981 and 9.0 per cent in 1989.

On the supply-side, the relative supply of university-educated workers increased during the 1980s for both women and men (see Appendix H, Table H6). The increase

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[232]. The proportion of all workers in managerial and professional occupations is one proxy of technology usage which has been used in the literature [see for example, Berman, Bound and Griliches (1994)]. It is preferable to use a direct proxy of technology such as whether an individual worker used a computer at work [see for example, Krueger (1993)]; and an even better proxy would be the type of operation typically undertaken by an individual worker (for example, clerical, CAD/CAM, and software design, among others).

in the proportion of women with a university degree increased from 15 to 29 per cent between 1981 and 1989, and for men, the increase was from 18 to 27 per cent.[233]

The above trends indicate that the Canadian economy changed in a manner which is consistent with the observations about economic change discussed in the literature in the context of earnings inequality. We now turn to the regression analysis to examine directly the relative contributions of these changes to increased earnings inequality.

5.2.2 Regression Results

The regression results are presented in Tables 6(a-c) to 17(a-c). Given the large quantity of results, a summary and visual indication of the results (from the regressions estimated in terms of levels) is presented in Figures 3(a-b) to 5(a-b), where the cells shaded grey represent variables that are significant and correctly signed and the cells marked with an X indicate variables that are significant and incorrectly signed. Significance is determined using a two-tailed test, at the 10 per cent level, generating an absolute critical t-value =1.645.

What are the causes of increased inequality? Answering this question is overwhelming if each of the various measurement possibilities are considered. Thus, the question is asked in two stages. First, which determinants consistently affect inequality

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[233]. The rate of growth of university-educated workers (relative to high school educated workers) in the 1980s was faster than the growth during the 1970s. Using data from the Labour Force Survey, the rate of growth of university-educated female workers was 4.5 per cent per annum for the period 1976 to 1980, compared to 10.1 per cent per annum for the period 1981 to 1986. For men, the growth rates per annum for the two periods were 2.2 and 5.5 per cent respectively. Calculated from Statistics Canada. Labour Force Annual Averages. [Catalogue 71-220, Annual, 71-529 Occasional].

across measurement possibilities? The results of chapters 2 and 3 indicate that, while the measurement of trends in inequality are quite robust to certain measurement choices such as income concept and treatment of outliers, a key determinant of observed trends is the choice of the population group, and particularly the choice of men or women. Given this conclusion, the second question asked is: are there gender differences in the determinants of increased earnings inequality?

Before turning to these questions, the issue of heteroscedasticity is discussed. Three simple tests of heteroscedasticity were undertaken, which are forms of the Breusch-Pagan test.[234] The regression equation used for the basis of the test was equation 4(b) estimated for the population. Three test statistics were calculated from auxiliary regressions as follows: three regressions were estimated in which the predicted Y_t values, predicted Y_t^2 values, or log of the predicted Y_t^2 values, along with a constant were regressed on the residuals squared [e_t^2]; the test statistics were derived as the product of the number of observations and the adjusted R^2 from the auxiliary regression. The test statistics can be compared to the χ^2 distribution with 1 degree of freedom. The test statistics are 5.25, 5.79 and 4.75. Given a critical χ^2 value of 6.635 at the 1 per cent level of significance means that hypotheses of heteroscedasticity are rejected.

[234]. There are a wide variety of tests for heteroskedasticity. As discussed in Section 4.3, SPSS does not calculate the usual set of heteroscedasticity tests such as the Breusch-Pagan, Goldfel-Quandt, or White tests. However, the three test statistics described above can easily calculated using the residuals following the procedure outlined in the SHAZAM Manual, Version 7, p. 176.

(a) Which determinants consistently affect inequality across measurement choices?

The results indicate that macroeconomic conditions and unionization were strong and consistent determinants of increased inequality during the 1980s. The unemployment rate and unionization variables are significant and correctly signed across nearly all of the various measurement choices considered here (including inequality dimension, income concept, population reference group, and equation specification).[235] Equation (4a) focuses upon the cyclical and institutional determinants of inequality. The results from regressions estimated in terms of levels are presented in Tables 6(a-c) and 7(a-c) and summarized in Figure 3(a), and results from regressions estimated in terms of changes are presented in Tables 8(a-c) and 9(a-c) and summarized in Figure 3(b).

A slowdown in macroeconomic activity, proxied by a rise in the unemployment rate, is shown to significantly increase earnings inequality. For example, for the population, a one percent increase in the unemployment rate is shown to have a .007 point increase in the Generalized Entropy ($\epsilon=1.0$) indicator (see Table 6(a)). The magnitude of this impact is comparable to the result reported in chapter 3, even after controlling for institutional factors such as degree of unionization and minimum wages.

The unemployment rate has a strong and consistent impact on the education premium (measured by both annual earnings and hourly wage rates). This result contrasts with findings for the U.S. Freeman and Needels (1993) proxy the level of macroeconomic activity by (the logarithm of) real GDP and they find that for Canadian

[235]. The exception is the age premium.

men this variable is insignificant when the unionization variable is included, although significant if unionization is excluded. This result may occur because GDP is a less direct measure of labour market conditions than the unemployment rate, particularly given a decline in the correlation between GNP and the unemployment rate during the 1980s. Mincer (1991) for the U.S. does not find support for the role of unemployment in affecting the education premium, as the unemployment rate variable was insignificant in the various versions of the equations he estimated.

Macroeconomic conditions have a less consistent effect on the age premium compared to inequality and the education premium, as the unemployment rate is only significant for certain measurement choices. Specifically, the unemployment rate is a significant determinant of the age premium for the population and men, when income is defined in terms of annual earnings, and the regression estimated in terms of levels.

In summary, the relationship between macroeconomic conditions and inequality is quite robust to choice of: inequality dimension (inequality and education premium, and, to lesser extent, the age premium); population group (men, women, or both); and equation specification (levels or changes).[236] When equation (4a) is estimated in terms of hourly wage rate inequality, the unemployment rate has a smaller impact on inequality (compared to annual earnings) but is still significant for women. The unemployment rate is a significant determinant of the education premium when measured in terms of both

[236]. The first column of each table from Table 3(a-c) through Table 6(a-c) shows that the unemployment rate tends to be significant and where significant, it always has the correct sign.

annual earnings and hourly wage rates when the regression equation is estimated in terms of levels.

Turning now to institutional features, the results provide strong support for the hypothesis that changes in the degree of labour market unionization, like macroeconomic conditions, was a key determinant of increased inequality during the 1980s in Canada. While there is some support for the hypothesis that the decline in real minimum wages contributed to increased inequality during the 1980s, this support is not as unequivocal as for unionization.

The unionization variable is consistently significant and correctly signed for two dimensions of inequality, namely inequality among individuals and between-education groups. With respect to earnings inequality for the population, measured by the Generalized Entropy ($\epsilon=1.0$), a decrease in the proportion of workers covered by a collective bargaining agreement of .100 results in an increase in inequality by .219 basis points [Table 6(a)]. The impact of unionization on inequality is greater when inequality is measured by annual earnings compared to hourly wage rates, as was the case for the unemployment rate. Specifying the equation in terms of changes tends to generate larger estimates of the impact of unionization on earnings inequality compared to the case of levels. One notable exceptic- to the consistency of this variable is that for women, when inequality is measured by hourly wage rates rather than annual earnings, the union variable is insignificant (for both forms of equation specification).

Turning to the other inequality dimensions, the union variable is consistently significant and correctly signed for the education premium. In general, a decline in unionization results in an increase in the education premium. Unionization is more likely to be significant when the education premium is measured in terms of annual earnings compared to hourly wages, calculated for all workers rather than just young workers, and for women when the equation is specified in terms of levels rather than changes.

The impact of unionization on the age premium depends upon the form of equation specification. Unionization is only significant and correctly signed for the population and men (for either income concept), when the equation is estimated in terms of changes.

The other institutional feature considered is minimum wages. In general, this variable does not have a strong consistent impact on inequality. Minimum wages are shown to have a significant impact, in accordance with the hypothesized relationship for several measurement choices, but only when the regression equation is estimated in terms of changes. The minimum wage variable is a significant and correctly signed determinant of inequality and the age premium for women, when income is measured by annual earnings (and the regression estimated in terms of changes). For example, a \$0.10 decline in the minimum wage rate increases the degree of annual earnings inequality by .003 basis points (measured by the Generalized Entropy indicator ($\epsilon=1.0$)), and increases the education premium by .301 (see Table 8(b)). The minimum wage variable is significant and correctly signed determinant of inequality and the age premium for men when the income concept is hourly wage rates (when the regression is estimated in terms of changes). When the regression equation is estimated in terms of levels, the minimum wage variable is consistently significant but incorrectly signed for the education premium. Thus, there is only limited support for the minimum wage-education hypothesis as presented in this theoretical framework. However, this result may be due to the limited regional variation in the minimum wage level. The provincial minimum wage is assigned to all regions in the province which substantially reduces the amount of regional variation which will limit its impact in the regression analysis.

There is not strong evidence that a secular trend exists in addition to the independent variables (i.e. the variables other than the unemployment rate) included. This conclusion is drawn because the year dummy variables are not consistently significant. Whether the year dummy variables are significant depends upon the various researcher choices. For example, when the equation is estimated in terms of levels, the time dummies are significant for the population but not generally for men and women when inequality is measured by annual earnings; and the time dummies are significant for women and not for the population, when inequality is measured by hourly wage rates.

(b) Are there gender differences in the determinants of increased earnings inequality?

Equation 4(b) includes the structural and demographic variables along with the cyclical and institutional variables and 4(c) replaces the deindustrialization variable in 4(b) with the trade variable. The results from equation (4b) are presented in Tables 10(a-c) to 13(a-c) and summarized in Figure 4(a-b). The results from equation (4c) are presented in Tables 14(a-c) to 17(a-c) and summarized in Figure 5(a-b). Part (a) of the figures always refer to the results when the regression has been estimated in levels, and part (b) to the results where the regressions have been estimated in terms of changes.

The visual picture of Figure 4(a-b) indicates the general point that, apart from cyclical and unionization factors, the determinants of increased inequality depend upon the measurement choice of the inequality dimension (inequality, education premium, or age premium), the income concept used to measure the dimension, and the population reference group. As a group, the structural and demographic variables are not important determinants of inequality during the 1980s. The addition of this set of variables does little to increase the explanatory power of the regressions judging by the increase in the adjusted R^2.

Explanations of changes in each of the dimensions of inequality are specific and we cannot generalize from one dimension to another. Thus, we consider a narrower question which is for a given inequality dimension, do structural and demographic factors matter and do gender differences exist?

Inequality among Workers

Structural and demographic factors influence inequality among workers depending upon measurement choices and work in different ways for men and women. For men, in general, the results provide no support for the hypotheses that deindustrialization, greater import-competition, and increased supply of university-educated workers contributed towards increased earnings inequality during the 1980s and there is only limited support for the hypotheses of technological change. Thus, in order to explain increased inequality among male workers during the 1980s, it is necessary to turn to the macroeconomic and unionization explanations.

For men, neither the deindustrialization nor trade variables are significant determinants of inequality, regardless of the measurement choice such as income concept and equation specification. The one exception for men occurs when inequality is measured by hourly wage rates and the regression estimated in terms of levels. In this case, the trade variable is significant but incorrectly signed.

For men, the technology variable is significant (and correctly signed) when income is defined as hourly wage rates, and trade is included (rather than deindustrialization) (see Tables 15(b) and 17(b)). For example, an increase of .100 in the proportion of managerial and professional occupations increased hourly wage rate inequality by .096 basis points (as measured Generalized Entropy (ϵ=1.0)), see Table 17(b). On the supply side, the university variable is significant and negatively signed in only two cases.

For women, there is limited evidence to support the hypotheses that deindustrialization, technological change, and the increased relative supply of university-educated workers contributed to increased earnings inequality during the 1980s. Support for certain explanations is quite sensitive to measurement choice. Macroeconomic and unionization explanations remain, however, more robust to measurement choices. The deindustrialization hypothesis receives the least support, with the manufacturing variable being significant and correctly signed in only one case (out of four possibilities). This one case is characterized by the measurement choices of annual earnings and the regression equation estimated in terms of levels (see Table 10(c)). The trade variable is insignificant in all cases.

There is some evidence to indicate that technological change contributed to increased hourly wage rate inequality but notice that this result occurs only in equations when deindustrialization is replaced with the trade variable (see Tables 15(c) and 17(c)). Given the proxy for technological change used here, namely, the proportion of workers in managerial and professional occupations, this study is testing for a specific mechanism by which technological change affects inequality. Thus, the lack of support for the technological change variable does not imply that technological change did not influence earnings inequality among workers. Rather, there is no evidence to support the contention that increases in computer-based automation, resulting in increases in the proportion of workers in managerial and professional occupations, did not consistently contribute towards increased earnings inequality. Further, we cannot exclude other mechanisms by which computer-based technologies may affect earnings inequality.

The increased relative supply of university-educated workers served to dampen earnings inequality among women during the 1980s. The university variable is significant and negative when we choose to measure inequality using annual earnings as the income concept; the significance does not depend upon whether trade or deindustrialization are included or whether the equation is estimated in terms of levels or changes.

Education Premium

For the education premium dimension of inequality, supply-side factors do play an important role for both men and women, as has now been well-documented in the literature. Technological change contributes to the increased education premium for women but not for men. For men, the university variable is significant and positively signed when the equation is estimated in levels and income measured as annual earnings, and when either deindustrialization or trade variables are included. For example, an increase in the proportion of workers with a university degree of .100 depresses the education premium (measured by annual earnings) by 1.948 (see Table 10(b)).

While the education premium for men was affected only by the increased supply of university workers during the 1980s, the eduation premium for women was affected by both the increased relative supply of university-educated workers and technological change. For women, the university variable is significant and negative when the education premium is measured by annual earnings but not hourly wage rates, and the equation is estimated in terms of levels but not changes. For example, an increase in the proportion of workers with a university degree of .100 depresses the education premium by 2.578 (see Table 10(c)).

Technological change which results in an increase in the proportion of managerial and professional occupations had a positive impact on the education premium during the 1980s. The significance of the technological change variable is quite robust to measurement choices. The argument here is that technological change which increases the relative demand for managerial and professional occupations, increases the demand for university-educated workers.

Age Premium

For the age premium, there is support for the hypothesis that, for women, technological change contributed to the deterioration in the position of young workers during the 1980s. There is no support for the hypotheses that the increased import-competition, deindustrialization and increased relative supply of university-educated workers adversely affected young workers relative to older workers, during the 1980s. Thus, the deterioration in the relative position of young male workers can be attributed to macroeconomic conditions and the weakened relative position of young female workers can be attributed to the combination of macroeconomic conditions and technological change.

For men, the trade, manufacturing and technology variables are insignficant or incorrectly signed. The only exception is that, in one case, the technology variable is significant and correctly signed; and the characteristics of this case are that income is measured by earnings, the equation is estimated in terms of levels, and the deindustrialization variable is included. In this case, an increase of .100 in the proportion of managerial and professional occupations results in a decline in relative youth earnings by .339.

For women, the technology variable is quite robust to measurement choices and the impact of technological change on the decline in relative youth earnings is larger than for men. For example, an incrase of .100 in the proportion of managerial and professional occupations results in a decline in relative youth earnings by .833.

6.0 CONCLUSION

Changes in macroeconomic conditions and the degree of unionization reflecting changes in the institutional character of the labour market influenced labour market outcomes in Canada during the 1980s and contributed to the deterioration in the relative positions of poor, young and less-educated workers. These findings are consistent with the hypotheses that firms respond to a deterioration in macroeconomic conditions by increasing the proportion of casual workers they hire and that unions serve to dampen this tendency.

The finding that macroeconomic conditions and unionization are significant determinants of labour market outcomes is robust to various choices about inequality dimension, income concept, population, and equation specification in terms of changes and levels, for a given estimating model (Model 1), theoretical framework, and data set among other choices. The relationships among these dimensions of earnings inequality and two determinants as characterized by the theoretical framework represent socially-constructed facts about labour markets, just as facts about various dimensions of earnings inequality at a point in time or trends are socially constructed.[237] Here, not only are

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[237]. As discussed in chapter 2, facts are created by researchers as the outcome of numerous measurement choices which are influenced by personal preferences, norms of the discipline, and societal values. In contrast to the naive epistemology of positivist neoclassical economics, the alternative epistemological position adopted here assumes that there are only better and worse approximations of reality.

the estimates of dimensions of earnings inequality constructed but so, too, are estimates of the determinants (macroeconomic conditions and degree of unionization) and the mechanism by which the various determinants affect inequality.

The remaining results indicate that, while support can be found for several of the hypothesized relationships between the proposed determinants and various inequality dimensions (for example, technology and the education premium), such support is not robust to measurement choices. The structural and demographic determinants of increased earnings inequality during the 1980s are found to be sensitive to researcher choices about inequality dimension, population sub-group, income concept and regression specification. Within the set of structural and demographic determinants of increased inequality considered, technological change proxied by changes in the occupational structure is shown to be the most consistent determinant within this set. For both the education and age premia, technological change is significant and behaves in accordance with the theoretical framework. This finding supports the hypotheses that technological change, proxied by the proportion of managerial and professional workers, permits firms to use casual workers to a greater extent. However, this finding occurs only when specific measurement choices are made For example, with regard to the education premium, technological change is only significant for the population sub-group as women (for the education premium), when annual earnings is the income concept rather than hourly wage rates, and when the regression equation is estimated in terms of levels rather than changes Thus, there is evidence that apart from macroeconomic conditions and unionization, the explanations of increased inequality must be tailored to specific dimensions of inequality.

In conclusion, any explanations of increased inequality with the Canadian labour market during the 1980s need to place microeconomic explanations, such as technological change, within the broader macroeconomic and institutional context. While the relationships between inequality dimensions and the factors of macroeconomic and unionization are socially constructed, they are considered here to be a better approximation of the reality of labour market structures than any of the other hypothesized relationships.

FIGURE 1

Estimated Empirical Magnitudes of Various Determinants of Earnings Inequality

	United States	Canada
Business Cycle		
Burtless (1990) - men	20%	
- women	"very little"	
Richardson (1994) - population		✓
Institutional Context		
Unionization		
Card (1992) - wages - men	20%	
Supply Side Factors		
Between Age/Education Groups		
Morissette et al.(1993) - men		24-56%
Increase % Female Workers		
Richardson(1993) - population		6%
Demand Side Factors		
Deindustralization		
Picot et al. (1990)		"little"
Morissette (1995)* - weekly earnings		
- men		28-30%
- women		7-14%
Trade		
Technological Change		
Katz and Murphy (1992)	✓	
Berman, Bound and Griliches (1994)	✓	
Baldwin (1995)		✓

Notes: * deunionzation and deindustrialization combined
✓ finds support for the hypothesis but does not indicate the percentage of the change accounted for by the factor in question

FIGURE 2

Estimated Empirical Magnitudes of Various Determinants of the Education Premium

	United States	Canada
Business Cycle		
Mincer (1991) - white men	0	
Katz and Revenga (1989) - young men	r = -.085	
Freeman and Needels (1991) - men	✓	✓
Institutional Context		
Unionization		
Blackburn et al.(1990) - white men	10%	
Freeman and Needels (1991) - white men	✓	✓
Minimum Wage		
Blackburn et al.(1990) - white men	0%	
Supply Side		
Size/growth of highly educated labour force		
Blackburn et al.(1990) - white men	50%	
Mincer (1991) - white men	✓	
Freeman and Needels (1991) - men	✓	
Katz and Murphy (1992)	✓	
Demand Side		
Deindustrialization		
Blackburn et al.(1990) - white men	20-30%	
Katz and Revenga (1989) - men	25-33%	
Mincer (1991) - men	✓	
Trade		
Borjas, Freeman and Katz (1992)	15-25%	
Mincer (1991) - men	O	
Freeman and Needels (1991) - men	✓	O
Technological Change		
Mincer (1991)	✓	

Notes: ✓ finds support for the hypothesis but does not indicate the percentage of the change accounted for by the factor in question.
0 finds no support for the hypothesis.

FIGURE 3(a)

Macroeconomic and Institutional Determinants of Inequality: A Summary of Regression Results Estimated in Levels

	PREDICTION		EARNINGS									WAGES								
	Ineq. Educ.	Age	Inequality			Educ. Prem.			Age Prem.			Inequality			Educ. Prem.			Age Prem.		
			P	M	W	P	M	W	P	M	W	P	M	W	P	M	W	P	M	W
Unemploy-ment	+	-																	X	
Unionization	-	+							X									X		X
Minimum Wages	-	+				X	X	X							X	X				

Note: The shaded area indicates the variable is significant and correctly signed; the X indicates the variable is significant but incorrectly signed.
10% level of significance and absolute critical t-value = 1.645.
P = population, M = men, W = women.

Source: Summarized from Tables 6(a-c) and 7(a-c).

FIGURE 3(b)

Macroeconomic and Institutional Determinants of Changes in Inequality: A Summary of Regression Results Estimated in Terms of Changes 1981-86 and 1986-89

	PREDICTION		EARNINGS									WAGES								
	Ineq. Educ.	Age	Inequality			Educ. Prem.			Age Prem.			Inequality			Educ. Prem.			Age Prem.		
			P	M	W	P	M	W	P	M	W	P	M	W	P	M	W	P	M	W
Unemployment	+	-																		
Unionization	-	+									X									
Minimum Wages	-	+				X	X	X							X	X				

Note: The shaded area indicates the variable is significant and correctly signed; the X indicates the variable is significant but incorrectly signed.
10% level of significance and absolute critical t-value = 1.645.
P = population, M = men, W = women.

Source: Summarized from Tables 8(a-c) and 9(a-c).

FIGURE 4(a)

Macroeconomic, Institutional, Deindustralization, Technological and Demographic Determinants of Inequality: A Summary of Regression Results Estimated in Levels

	PREDICTION		EARNINGS									WAGES								
	Ineq. Educ.	Age	Inequality			Educ. Prem.			Age Prem.			Inequality			Educ. Prem.			Age Prem.		
			P	M	W	P	M	W	P	M	W	P	M	W	P	M	W	P	M	W
Unemploy-ment	+	-																		
Unionization	-	+																		
Minimum Wages	-	+				X	X	X							X	X				
Deindustrial-ization	-	+							X	X							X		X	
Technology	+	-																		
University	- , +	+ , -																		
Female	+	-										X								

Note: The shaded area indicates the variable is significant and correctly signed; the X indicates the variable is significant but incorrectly signed.
10% level of significance and absolute critical t-value = 1.645.
P = population, M = men, W = women.

Source: Summarized from Tables 10(a-c) to 11(a-c).

FIGURE 4(b)

Macroeconomic, Institutional, Deindustralization, Technological and Demographic Determinants of Changes in Inequality: A Summary of Regression Results Estimated in Terms of Changes 1981-86 and 1986-89

	PREDICTION		EARNINGS									WAGES								
	Ineq. Educ.	Age	Inequality			Educ. Prem.			Age Prem.			Inequality			Educ. Prem.			Age Prem.		
			P	M	W	P	M	W	P	M	W	P	M	W	P	M	W	P	M	W
Unemploy-ment	+	-																		
Unionization	-	+																		
Minimum Wages	-	+				X	X	X							X					
Deindustrial-ization	-	+																		
Technology	+	-	X																	
University	- , +	+ , -																		
Female	+	-																		

Note: The shaded area indicates the variable is significant and correctly signed; the X indicates the variable is significant but incorrectly signed.
10% level of significance and absolute critical t-value = 1.645.
P = population, M = men, W = women.

Source: Summarized from Tables 12(a-c) to 13(a-c).

FIGURE 5(a)

Macroeconomic, Institutional, Trade, Technological and Demographic Determinants of Inequality: A Summary of Regression Results Estimated in Levels

	PREDICTION		EARNINGS									WAGES								
	Ineq. Educ.	Age	Inequality			Educ. Prem			Age Prem.			Inequality			Educ. Prem			Age Prem.		
			P	M	W	P	M	W	P	M	W	P	M	W	P	M	W	P	M	W
Unemployment	+	-																		
Unionization	-	+																		
Minimum Wages	-	+				X	X	X							X	X				
Trade	-	+					X		X	X	X		X		X	X		X	X	X
Technology	+	-																		
University	-, +	+, -																		
Female	+	-										X								

Note: The shaded area indicates the variable is significant and correctly signed; the X indicates the variable is significant but incorrectly signed.
10% level of significance and absolute critical t-value = 1.645.
P = population, M = men, W = women.

Source: Summarized from Tables 14(a-c) to 15(a-c).

FIGURE 5(b)

Macroeconomic, Institutional, Trade, Technological and Demographic Determinants of Changes in Inequality: A Summary of Regression Results Estimated in Terms of Changes 1981-86 and 1986-89

	PREDICTION		EARNINGS									WAGES								
	Ineq. Educ.	Age	Inequality			Educ. Prem.			Age Prem.			Inequality			Educ. Prem.			Age Prem.		
			P	M	W	P	M	W	P	M	W	P	M	W	P	M	W	P	M	W
Unemploy-ment	+	-																		
Unionization	-	+																		
Minimum Wages	-	+				X	X	X							X					
Trade	-	+	X		X	X			X						X					
Technology	+	-																		
University	-, +	+, -																		
Female	+	-																		

Note: The shaded area indicates the variable is significant and correctly signed; the *X* indicates the variable is significant but incorrectly signed.
10% level of significance and absolute critical t-value = 1.645.
P = population, M = men, W = women.

Source: Summarized from Tables 16(a-c) to 17(a-c).

TABLE 1

Summary of the Expected Relationship
Between Inequality and Each Determinant

Determinant	Dimension of Inequality		
	Inequality	Education Premium	Age Premium
Unemployment Rate (UE)	+	+	–
Unionization (UNION)	–	–	+
Minimum Wage (MWAGE)	–	–	+
Deindustrialization (MANUF)	–	–	+
Trade (TRADE)	–	–	+
Technology (TECH)	+	+	–
University Labour Force (UNIV)	–, +	–, +	+, –
Female Labour Force (FEMALE)	+	+	–

TABLE 2

Summary of Variable Definitions

Dependent Variables	
GENTROPY	Generalized Entropy indicator of inequality (earnings or hourly wages)
EDUCP-all	education premium (all workers), the relative mean earnings or hourly wages of university educated workers and workers with a high school diploma or less
EDUCP-y	education premium, as above, but for young workers aged 17-24 years
AGEP	age premium, the relative mean earnings or hourly wages of young workers (17-24 years) and prime aged workers (35-54 years)
Independent Variables	
UE	macroeconomic conditions, proxied by the unemployment rate
UNION	union density, proportion of workers covered by a collective bargaining agreement
MWAGE	minimum wage
UNIV	supply of highly educated workers, proportion of workers with a university degree
FEMALE	supply of female workers, proportion of female workers
MANUF	industrial structure (deindustrialization), proportion of workers employed in the manufacturing sector
TRADE	trade, proportion of manufacturing workers employed in the import competing manufacturing sub-sector
TECH	technology, proportion of workers employed in managerial or professional occupations

TABLE 3(a)

Descriptive Statistics, Population

Variable	Mean[1]	Minimum	Maximum	Standard Deviation	Cases
Independent Variables					
Unemployment	9.83	3.00	22.20	4.00	192
Unionization	0.38	0.09	0.67	0.09	192
Minimum Wage	4.09	3.30	5.00	0.49	192
Deindustrialization	0.16	0.03	0.48	0.08	192
Trade	0.08	0.00	0.43	0.09	192
Technology	0.26	0.11	0.41	0.05	192
University	0.11	0.02	0.24	0.04	192
Female	0.45	0.29	0.55	0.04	192
Dependent Variables					
Annual Earnings					
G Entropy (ε=0)	0.42	0.21	0.65	0.07	192
G Entropy (ε=0.5)	0.33	0.18	0.52	0.05	192
G Entropy (ε=1)	0.42	0.21	0.65	0.07	192
Age Premium	0.46	0.24	0.86	0.11	192
Educ. Premium-all -young	1.78 1.54	0.95 0.16	3.76 5.04	0.36 0.69	192 166
Hourly Wage Rates					
G Entropy (ε=0)	0.13	0.06	0.21	0.02	192
G Entropy (ε=0.5)	0.13	0.06	0.21	0.02	192
G Entropy (ε=1)	0.13	0.05	0.23	0.02	192
Age Premium	0.62	0.44	0.94	0.10	192
Educ. Premium-all -young	1.60 1.44	1.16 0.50	2.17 3.15	0.22 0.41	192 166

TABLE 3(b)

Descriptive Statistics, Men

Variable	Mean[1]	Minimum	Maximum	Standard Deviation	Cases
Independent Variables					
Unemployment	9.83	3.00	22.20	4.00	192
Unionization	0.41	0.08	1.00	0.12	192
Minimum Wage	4.09	3.30	5.00	0.49	192
Deindustrialization	0.21	0.03	0.78	0.11	192
Trade	0.05	0.00	0.33	0.06	192
Technology	0.23	0.10	0.41	0.06	192
University	0.11	0.02	0.24	0.05	192
Female					
Dependent Variables					
<u>Annual Earnings</u>					
G Entropy (ε=0)	0.33	0.11	0.62	0.08	192
G Entropy (ε=0.5)	0.26	0.08	0.49	0.06	192
G Entropy (ε=1)	0.33	0.11	0.62	0.08	192
Age Premium	0.42	0.23	1.08	0.13	192
Educ. Premium-all -young	1.69 1.31	0.76 0.004	3.86 4.76	0.38 0.76	192 136
<u>Hourly Wage Rates</u>					
G Entropy (ε=0)	0.12	0.04	0.23	0.03	192
G Entropy (ε=0.5)	0.11	0.04	0.22	0.02	192
G Entropy (ε=1)	0.11	0.04	0.24	0.03	192
Age Premium	0.59	0.41	1.05	0.11	192
Educ. Premium-all -young	1.52 1.33	0.91 0.46	2.19 3.43	0.25 0.49	192 136

TABLE 3(c)

Descriptive Statistics, Women

Variable	Mean[1]	Minimum	Maximum	Standard Deviation	Cases
Independent Variables					
Unemployment	9.83	3.00	22.20	4.00	192
Unionization	0.33	0.11	0.59	0.08	192
Minimum Wage	4.09	3.30	5.00	0.49	192
Deindustrialization	0.09	0.00	0.40	0.07	192
Trade	0.15	0.00	1.00	0.18	192
Technology	0.29	0.12	0.45	0.06	192
University	0.10	0.02	0.24	0.04	192
Female					
Dependent Variables					
<u>Annual Earnings</u>					
G Entropy (ε=0)	0.45	0.21	0.74	0.08	192
G Entropy (ε=0.5)	0.36	0.18	0.53	0.06	192
G Entropy (ε=1)	0.45	0.21	0.74	0.08	192
Age Premium	0.56	0.24	1.24	0.17	192
Educ. Premium-all -young	2.09 1.97	0.87 0.34	3.92 5.12	0.54 1.03	192 154
<u>Hourly Wage Rates</u>					
G Entropy (ε=0)	0.13	0.05	0.26	0.03	192
G Entropy (ε=0.5)	0.13	0.05	0.28	0.03	192
G Entropy (ε=1)	0.13	0.04	0.35	0.03	192
Age Premium	0.68	0.41	1.06	11	192
Educ. Premium-all -young	1.80 1.66	0.90 0.66	3.30 6.60	0.32 0.65	192 154

Note: 1. Mean of regions which differs from national means (Tables 4 and 5).

Source: Calculated for the Regional Data Set derived from the SWH 1981 and LMAS 1986, 1989.

TABLE 4

Dimensions of Annual Earnings Inequality in the 1980s

POPULATION	**1981**	**1986**	**1989**
Inequality - G Entropy ($\varepsilon = 1.0$)	.2744	.2964	.2856
(S.E.)	(.0026)	(.0030)	(.0032)
Age Premium [1]	.50	.36	.40
Education Premium [2] - all	1.69	1.83	1.77
- youth	1.37	1.48	1.56
Mean (1986 $)	18,330	18,701	19,204
Median (1986 $)	16,515	16,513	16,933
MEN			
Inequality - G Entropy ($\varepsilon = 1.0$)	.2184	.2453	.2407
(S.E.)	(.0030)	(.0036)	(.0040)
Age Premium [1]	.45	.33	.35
Education Premium [2] - all	1.60	1.76	1.69
- youth	1.28	1.26	1.36
Mean (1986 $)	22,131	22,869	23,388
Median (1986 $)	20,892	21,231	21,958
WOMEN			
Inequality - G Entropy ($\varepsilon = 1.0$)	.3045	.3069	.2904
(S.E.)	(.0041)	(.0043)	(.0051)
Age Premium [1]	.62	.46	.48
Education Premium [2] - all	1.81	1.98	1.96
- youth	1.56	1.88	1.94
Mean (1986 $)	13,419	13,699	14,486
Median (1986 $)	11,907	11 561	12,479

Sample sizes are as follows:

	Unweighted Cases			**Weighted Cases**		
	1981	1986	1989	1981	1986	1989
Population	41,817	42,985	41,471	11,061,308	11,860,819	12,087,172
Men	23,343	23,191	21,904	6,234,843	6,470,989	6,406,329
Women	18,474	19,794	19,567	4,826,465	5,389,830	5,680,843

Source: Calculated from SWH 1981 and LMAS 1986, 1989.

1. The age premium is defined as the relative mean annual earnings (or hourly wage rates) of workers aged 17 to 24 years compared to workers aged 35 to 54 years.

2. The education premium - all is defined as the relative mean annual earnings (or hourly wage rates) of university-educated workers compared to workers with a high school diploma or less, for all workers aged 17 to 64 years. The education premium - youth is defined as above, but for all workers aged 17 to 24 years.

TABLE 5

Dimensions of Hourly Wage Rate Inequality in the 1980s

POPULATION	**1981**	**1986**	**1989**
Inequality G Entropy (ε = 1.0)	.1367	.1456	.1374
(S.E.)	(.0020)	(.0056)	(.0028)
Age Premium [1]	.69	.53	.54
Education Premium [2] - all	1.55	1.69	1.65
- youth	1.43	1.43	1.40
Mean (1986 $)	10.96	10.75	11.07
Median (1986 $)	9.74	9.58	9.82
MEN			
Inequality G Entropy (ε = 1.0)	.1204	.1302	.1305
(S.E.)	(.0022)	(.0027)	(.0040)
Age Premium [1]	.66	.48	.50
Education Premium [2] - all	1.45	1.61	1.57
- youth	1.31	1.24	1.37
Mean (1986 $)	12.16	12.15	12.47
Median (1986 $)	11.26	11.15	11.40
WOMEN			
Inequality G Entropy (ε = 1.0)	.1421	.1435	.1250
(S.E.)	(.0039)	(.0147)	(.0030)
Age Premium [1]	.75	.61	.62
Education Premium [2] - all	1.70	1.81	1.81
- youth	1.63	1.68	1.49
Mean (1986 $)	9.40	9.08	9.49
Median (1986 $)	8.20	8.00	8.49

Sample sizes are as follows:

	Unweighted Cases			Weighted Cases		
	1981	1986	1989	1981	1986	1989
Population	41,817	42,985	41,471	11,061,308	11,860,819	12,087,172
Men	23,343	23,191	21,904	6,234,843	6,470,989	6,406,329
Women	18,474	19,794	19,567	4,826,465	5,389,830	5,680,843

Source: Calculated from SWH 1981 and LMAS 1986, 1989.

1. The age premium is defined as the relative mean annual earnings (or hourly wage rates) of workers aged 17 to 24 years compared to workers aged 35 to 54 years.

2. The education premium - all is defined as the relative mean annual earnings (or hourly wage rates) of university-educated workers compared to workers with a high school diploma or less, for all workers aged 17 to 64 years. The education premium - youth is defined as above, but for all workers aged 17 to 24 years.

TABLE 6(a)

Determinants of Inequality, Age Premium and Education Premium, Measured by Annual Earnings, OLS Regression Estimates, Population (levels)

Dependent Variable	Unemployment Rate	Union	Minimum Wage	DUM86	DUM89	Constant	$\bar{R}^2$	DW
G Entropy (0)	.008* (6.50)	-.162* (3.20)	-.022 (1.19)	0.52* (4.08)	.044* (2.02)	.465* (6.95)	.37	1.87
G Entropy (.5)	.007* (8.27)	-.186* (5.31)	-.007 (.60)	.029* (3.31)	.030* (1.98)	.344* (7.42)	.44	1.72
G Entropy (1)	.007* (8.59)	-.219* (6.47)	-.001 (.10)	.021* (2.45)	.025* (1.69)	.301* (6.72)	.44	1.62
Age Premium	-.005* (3.22)	-.167* (2.26)	-.010 (.37)	-.144* (7.80)	-.140* (4.43)	.705* (7.24)	.56	1.70
Education Premium - all	.064* (9.87)	-1.450* (5.19)	.347* (3.47)	-.018 (.26)	-.192 (1.61)	.353 (.96)	.42	1.59
Education Premium - youth	.043* (2.65)	-.444 (.63)	.0129 (.05)	-.009 (.05)	-.031 (.10)	1.242 (1.34)	.03	1.78

Notes: t-statistics in parentheses
Pooled cross section/time series data n = 192; when the dependent variable is education premium - youth n = 166
*indicates statistically significant coefficient at the 10 percent level using a 2-tailed test and an absolute critical t-value = 1.645
Source: Calculated from the SWH 1981 and LMAS 1986, 1989.

TABLE 6(b)

Determinants of Inequality, Age Premium and Education Premium, Measured by Annual Earnings, OLS Regression Estimates, Men (levels)

Dependent Variable	Unemployment Rate	Union	Minimum Wage	DUM86	DUM89	Constant	$\bar{R}^2$	DW
G Entropy (0)	.011* (8.24)	-.190* (4.47)	.013 (.66)	.048* (3.27)	.026 (1.06)	.235* (3.17)	.54	1.86
G Entropy (.5)	.009* (9.25)	-.201* (6.48)	.017 (1.14)	.020* (1.89)	.012 (.69)	.183* (3.38)	.55	1.63
G Entropy (1)	.008* (9.04)	-.222* (7.32)	.018 (1.28)	.009 (.88)	.007 (.42)	.165* (3.11)	.52	1.53
Age Premium	-.004* (1.69)	-040 (.57)	-.012 (.38)	-.154* (6.33)	-.133* (3.29)	.608* (4.93)	.48	1.81
Education Premium - all	.065* (8.17)	-1.448* (5.55)	.328* (2.70)	.002 (.026)	-.192 (1.29)	.372 (.82)	.43	1.57
Education Premium - youth	.045* (2.20)	.359 (.53)	.055 (.18)	-.062 (.27)	-.142 (.37)	.574 (.49)	.03	2.15

Notes: t-statistics in parentheses
Pooled cross section/time series data n = 192; when the dependent variable is education premium - youth n = 136
* indicates statistically significant coefficient at the 10 percent level using a 2-tailed test and an absolute critical t-value = 1.645.

Source: Calculated from the SWH 1981 and LMAS 1986, 1989.

TABLE 6(c)

Determinants of Inequality, Age Premium and Education Premium, Measured by Annual Earnings, OLS Regression Estimates, Women (levels)

Dependent Variable	Unemployment Rate	Union	Minimum Wage	DUM86	DUM89	Constant	$\bar{R}^2$	DW
G Entropy (0)	.009* (6.47)	-.162* (2.17)	-.006 (.25)	.0006 (.04)	-.009 (.32)	.439* (5.14)	.26	1.75
G Entropy (.5)	.008* (7.85)	-.173* (3.19)	-.0007 (.04)	-.004 (.33)	-.002 (.11)	.337* (5.44)	.33	1.66
G Entropy (1)	.008* (8.15)	-.197* (3.71)	.003 (.16)	-.008 (.72)	-.002 (.12)	.298* (4.92)	.34	1.60
Age Premium	-.004 (1.18)	-.121 (.77)	.011 (.23)	.197* (5.83)	-.223* (3.86)	.733* (4.06)	.38	1.80
Education Premium - all	.084* (8.50)	-1.13* (2.15)	.397* (2.42)	-.101 (.90)	-.196 (1.02)	.106 (.18)	.34	1.69
Education Premium - youth	.054* (2.78)	-1.39 (1.10)	-.044 (.11)	.021 (.08)	.140 (.30)	2.03 (1.40)	.01	1.87

Notes: t-statistics in parentheses
Pooled cross section/time series data n=192; when the dependent variable is education premium - youth n = 154
* indicates statistically significant coefficient at the 10 percent level using a 2-tailed test and an absolute critical t-value = 1.645.

Source: Calculated from the SWH 1981 and LMAS 1986, 1989.

TABLE 7(a)

Determinants of Inequality, and Age Premium and Education Premium, Measured by Hourly Wage Rates
OLS Regression Estimates, Population (levels)

Dependent Variable	Unemployment Rate	Union	Minimum Wage	DUM86	DUM89	Constant	$\bar{R}^2$	DW
G Entropy (0)	.0002 (.46)	-.037* (2.10)	-.0004 (.06)	-.0003 (.08)	-.009 (1.16)	.151* (6.49)	.06	1.74
G Entropy (.5)	.0005 (1.24)	-.053* (3.18)	.0003 (.06)	-.001 (.28)	-.008 (1.10)	.146* (6.61)	.08	1.75
G Entropy (1)	.0008* (1.80)	-.007* (4.16)	.002 (.29)	-.004 (.88)	-.011 (1.32)	.149* (6.05)	.11	1.72
Age Premium	.002 (1.59)	-.127* (1.96)	-.013 (.58)	-.155* (9.57)	-.144* (5.18)	.796* (9.32)	.58	1.66
Education Premium - all	.028* (6.92)	-.647* (3.72)	.269* (4.32)	.011 (.25)	-.134* (1.80)	.518* (2.25)	.33	1.54
Education Premium - youth	.018* (1.82)	-.235 (.56)	.074 (.49)	-.016 (.15)	-.125 (.69)	1.105* (2.00)	.0007	1.78

Notes: t-statistics in parentheses
Pooled cross section/time series data n = 192; when the dependent variable is education premium - youth n = 166
* indicates statistically significant coefficient at the 10 percent level using a 2-tailed test and an absolute critical t-value = 1.645.

Source: Calculated from the SWH 1981 and LMAS 1986, 1989.

TABLE 7(b)

Determinants of Inequality, Age Premium and Education Premium, Measured by Hourly Wage Rates, OLS Regression Estimates, Men (levels)

Dependent Variable	Unemployment Rate	Union	Minimum Wage	DUM86	DUM89	Constant	$\bar{R}^2$	DW
G Entropy (0)	-.0004 (.77)	-.059* (3.79)	-.004 (.57)	.006 (1.16)	-.002 (.17)	.164* (6.02)	.14	1.76
G Entropy (.5)	.00003 (.06)	-.068* (4.57)	-.002 (.23)	.003 (.67)	-.003 (.36)	149* (5.74)	.15	1.69
G Entropy (1)	.0003 (.67)	-.081* (5.12)	-.0008 (.11)	.0006 (.10)	-.005 (.54)	.149* (5.38)	.17	1.61
Age Premium	.005* (2.66)	-.012 (.19)	.021 (.75)	-.197* (9.31)	-.202* (5.73)	.581* (5.40)	.58	1.80
Education Premium - all	.026* (5.15)	-.871* (5.24)	.244* (3.15)	.052 (.90)	.094 (.99)	.627* (2.16)	.36	1.65
Education Premium - youth	.020 (1.51)	-.090 (.21)	.257 (1.26)	-.136 (.91)	-.310 (1.24)	.272 (.36)	-.01	1.64

Notes: t-statistics in parentheses
Pooled cross section/time series data n = 192; when the dependent variable is education premium - youth n = 136
* indicates statistically significant coefficient at the 10 percent level using a 2-tailed test and an absolute critical t-value = 1.645.
Source: Calculated from the SWH 1981 and LMAS 1986, 1989.

TABLE 7(c)

Determinants of Inequality, Age Premium and Education Premium, Measured by Hourly Wage Rates, OLS Regression Estimates, Women (levels)

Dependent Variable	Unemployment Rate	Union	Minimum Wage	DUM86	DUM89	Constant	$\bar{R}^2$	DW
G Entropy (0)	.001* (2 00)	- 019 (61)	011 (1 18)	-.021* (3.21)	- 031* (2.81)	.095* (2.71)	09	1.67
G Entropy (5)	.001* (2.17)	-.036 (1.12)	010 (1 03)	-.021* (3 07)	- 030* (2 52)	100* (2 74)	09	1.68
G Entropy (1)	002* (2 01)	- 057 (1 43)	011 (87)	- 026* (3 06)	- 033* (2 30)	.111* (2.45)	.09	1.69
Age Premium	.003 (1 26)	- 195* (1.78)	-.022 (64)	- 131* (5 61)	- 122* (3 05)	905* (7 24)	38	1 71
Education Premium - all	031* (5.17)	097 (30)	156 (1 57)	004 (05)	- 025 (21)	813* (2 24)	.21	1.50
Education Premium - youth	036* (2 42)	- 482 (611)	- 163 (66)	056 (33)	.120 (42)	2.07* (2.30)	.03	2 25

Notes: t-statistics in parentheses
Pooled cross section/time series data n=192, when the dependent variable is education premium - youth n = 154
*indicates statistically significant coefficient at the 10 percent level using a 2-tailed test and an absolute critical t-value = 1 645

Source Calculated from the SWH 1981 and LMAS 1986, 1989

TABLE 8(a)

Determinants of Changes in Inequality, Age Premium and Education Premium Measured by Annual Earnings, OLS Regression Estimates, Population (changes)

Dependent Variable	UE	Union	Min Wage	DUM 86-89	Constant	$\bar{R}^2$	DW
G Entropy (0)	.006*	-.224*	-.021	-.064*	.011	.46	2.20
	(2.45)	(1.80)	(1.13)	(3.98)	(.72)		
G Entropy (.5)	.003*	-.194*	-.008	-.043*	.006	.40	2.05
	(1.85)	(2.28)	(.64)	(3.92)	(.60)		
G Entropy (1)	.002	-.169*	-.003	-.035*	.005	.28	1.97
	(1.35)	(2.02)	(.20)	(3.25)	(.47)		
Age Premium	-.004	.292*	.032	.156*	.014	.59	1.89
	(1.08)	(1.69)	(1.24)	(6.93)	(.67)		
Educ Prem - all	.056*	-1.95*	.362*	-.238*	.219*	.41	1.72
	(4.06)	(2.82)	(3.48)	(2.65)	(2.69)		
Educ Prem - youth	.044	-.452	.645*	-.067	.443*	.03	1.62
	(1.21)	(.25)	(2.36)	(.29)	(2.07)		

Notes: t - statistic in parentheses

Pooled cross section - time series data n = 128; when the dependent variable is education premium - youth n = 103

*indicates statistically significant coefficient at the 10 percent level using a 2-tailed test and an absolute critical t-value = 1.645

Source: Calculated from SWH 1981 and LMAS 1986, 1989

TABLE 8(b)

Determinants of Changes in Inequality, Age Premium and Education Premium, Measured in Annual Earnings, OLS Regression Estimates, Men (changes)

Dependent Variable	UE	Union	Min Wage	DUM 86-89	Constant	$\bar{R}^2$	DW
G Entropy (0)	.007*	-.321*	.002	-.069*	.015	.54	2.03
	(2.40)	(3.22)	(083)	(3.86)	(.88)		
G Entropy (.5)	.003*	-.210*	.003	-.044*	.008	.47	1.82
	(1.72)	(3.22)	(.18)	(3.74)	(.69)		
G Entropy (1)	.002	-.174*	.003	-.035*	.006	.37	1.73
	(1.00)	(2.98)	(.24)	(3.29)	(.58)		
Age Premium	-.004	.603*	.028	.170*	.002	.60	1.88
	(.79)	(3.64)	(.80)	(5.71)	(.06)		
Educ Prem - all	.049*	-1.182*	.301*	-.315*	.269*	.54	1.48
	(3.54)	(2.37)	(2.83)	(3.50)	(3.20)		
Educ Prem - youth	.097	-1.674	.230	.321	.084	.002	2.00
	(.81)	(.87)	(.50)	(.92)	(.26)		

Notes: t statistic in parentheses
Pooled cross-section time series, data n = 128; when the dependent variable is education premium - youth n = 76
*indicates statistically significant coefficient at the 10 percent level using a 2-tailed test and an absolute critical t-value = 1.645
Source: Calculated from SWH 1981 and LMAS 1986, 1989

TABLE 8(c)

Determinants of Changes in Inequality, Age Premium and Education Premium, Measured by Annual Earnings, OLS Regression Estimates, Women (changes)

Dependent Variable	UE	Union	Min Wage	DUM 86-89	Constant	$\bar{R}^2$	DW
G Entropy (0)	.008*	-.181	-.037	-.007	-.013	.20	1.79
	(2.60)	(1.49)	(.69)	(.34)	(.73)		
G Entropy (.5)	.005*	-.193*	-.025*	-.002	-.015	.18	1.66
	(2.47)	(2.30)	(1.66)	(.15)	(1.22)		
G Entropy (1)	.004*	-.204*	-.023	.003	-.017	.13	1.67
	(2.15)	(2.47)	(1.56)	(.24)	(1.49)		
Age Premium	-.006	-.620*	.124*	.106*	.107*	.35	1.84
	(.88)	(2.10)	(2.32)	(2.11)	(2.53)		
Educ Prem - all	.022	-.318	.351*	-.331*	.249*	.15	1.78
	(1.06)	(.37)	(2.25)	(2.26)	(2.03)		
Educ Prem - youth	-.078	1.17	.329	-.419	.319	-.02	1.79
	(1.21)	(.45)	(.69)	(.94)	(.85)		

Notes: t statistic in parentheses

Pooled cross-section/time series data n = 128; when the dependent variable is education premium - youth n = 92

*indicates statistically significant coefficient at the 10 percent level using a 2-tailed test and an absolute critical t-value = 1.645

Source: Calculated from SWH 1981 and LMAS 1986, 1989:

TABLE 9(a)

Determinants of Changes in Inequality, Age Premium and Education Premium, Measured in Hourly Wage Rates, OLS Regression Estimates, Population (changes)

Dependent Variable	UE	Union	Min Wage	DUM 86-89	Constant	$\bar{R}^2$	DW
G Entropy (0)	.0002	-.127*	-.013	-.006	.0004	.06	1.91
	(.19)	(2.38)	(1.64)	(.82)	(.06)		
G Entropy (.5)	.0005	-.129*	-.012	-.003	-.0007	.06	1.97
	(.48)	(2.46)	(1.48)	(.48)	(.12)		
G Entropy (1)	.001	-.147*	-.011	.001	-.002	.04	1.96
	(.88)	(2.51)	(1.24)	(.20)	(.30)		
Age Premium	-.001	.454*	.036	.145*	.028	.57	2.10
	(.47)	(2.89)	(1.53)	(7.12)	(1.51)		
Educ Prem - all	.027*	-.691	.232*	-.157*	.124*	.32	1.74
	(2.09)	(1.53)	(3.41)	(2.69)	(2.34)		
Educ Prem - youth	.049*	-.300	.347*	.024	.235	.03	1.59
	(1.97)	(.24)	(1.85)	(.15)	(1.61)		

Notes: t - statistic in parentheses

Pooled cross-section - time series data n = 128; when the dependent variables education premium - youth n = 103

*indicates statistically significant coefficient at the 10 percent level using a 2-tailed test and an absolute critical t-value = 1.645

Source: Calculated from SWH 1981 and LMAS 1986, 1989

TABLE 9(b)

Determinants of Changes in Inequality, Age Premium and Education Premium Measured by Hourly Wage Rates, OLS Regression Estimates, Men (changes)

Dependent Variable	UE	Union	Min Wage	DUM 86-89	Constant	$\bar{R}^2$	DW
G Entropy (0)	-.001	-.131*	-.023*	-.012*	-.005	.23	1.83
	(1.16)	(3.54)	(2.89)	(1.74)	(.85)		
G Entropy (.5)	-.001	-.108*	-.018*	-.011*	-.003	.20	1.86
	(1.24)	(3.22)	(2.51)	(1.82)	(.54)		
G Entropy (1)	-.001	-.100*	-.017*	-.010	-.003	.15	1.81
	(1.35)	(2.86)	(2.32)	(1.54)	(.44)		
Age Premium	-.00005	.611*	.079*	.165*	.052*	.63	1.96
	(.01)	(4.05)	(2.47)	(6.08)	(2.06)		
Educ Prem - all	.017	-1.274*	.133	-.256*	.132*	.43	1.70
	(1.51)	(3.24)	(1.60)	(3.62)	(2.00)		
Educ Prem - youth	.090*	-.078	.336	.354	.051	.02	1.79
	(2.24)	(.05)	(1.09)	(1.36)	(.21)		

Notes: t statistics in parentheses

Pooled cross-section/time series, data n = 128; when the dependent variable is education premium - youth n = 76

*indicates statistically significant coefficient at the 10 percent level using a 2-tailed test and an absolute critical t-value = 1.645

Source: Calculated from SWH 1981 and LMAS 1986, 1989

TABLE 9(c)

Determinants of Changes in Inequality, Age Premium and Education Premium, Measured by Hourly Wage Rates
OLS Regression Estimates, Women (changes)

Dependent Variable	UE	Union	Min Wage	DUM 86-89	Constant	$\bar{R}^2$	DW
G Entropy (0)	.002	.010	-.008	.020*	-.002	.01	1.86
	(1.28)	(.18)	(.78)	(2.11)	(.31)		
G Entropy (.5)	.002	-.007	-.006	.023*	-.003	.02	1.83
	(1.59)	(.13)	(.56)	(2.31)	(.42)		
G Entropy (1)	.003*	-.027	-.004	.031*	-.005	.04	1.81
	(1.77)	(.38)	(.30)	(2.55)	(.48)		
Age Premium	-.0007	-.259	.063	.094*	.056*	.27	2.02
	(.13)	(.25)	(.67)	(2.67)	(1.90)		
Educ Prem - all	.008	.945	.155	-.120	.087	.06	1.58
	(.49)	(1.47)	(1.33)	(1.09)	(.95)		
Educ Prem - youth	-.019	-.251	.070	-.357	.181	.01	1.76
	(.57)	(.19)	(.30)	(1.61)	(.97)		

Notes: t statistic in parentheses
Pooled cross-section/time series data n = 128; when the dependent variable is education premium - youth n = 92
*indicates statistically significant coefficient at the 10 percent level using a 2-tailed test and an absolute critical t-value = 1.645
Source: Calculated from SWH 1981 and LMAS 1986, 1989

TABLE 10(a)

Determinants of Inequality, Age Premium and Education Premium, Measured by Annual Earnings
OLS Regression Estimates, Population (levels)

Dependent Variable	UE	Union	Min Wage	Manuf	Tech.	Univ.	DUM 86	DUM 89	Female	Const	$\bar{R}^2$	DW
G Entropy (0)	.006*	-.116*	-0.025	-.172*	-.107	-.204	.062*	-.060*	.065	.573*	.42	1.98
	(4.74)	(2.16)	(1.40)	(3.05)	(.73)	(1.40)	(4.64)	(2.75)	(.45)	(5.99)		
G Entropy (.5)	.006*	-.146*	-.010	-.101*	-.061	-.147	.033*	.037*	.062	.363*	.47	1.83
	(6.75)	(3.90)	(.84)	(2.57)	(.60)	(1.44)	(3.52)	(2.40)	(.62)	(5.43)		
G Entropy (1)	.007*	-.174*	-.004	-.086*	-.055	-.137	.022*	.028*	.132	.280*	.47	1.74
	(7.38)	(4.83)	(.36)	(2.27)	(.55)	(1.40)	(2.45)	(1.90)	(1.35)	(4.35)		
Age Premium	-.011*	-.053	-.007	-.282*	-.638*	-.465*	-.100*	-.089*	-.074	.964*	.68	1.81
	(6.31)	(.77)	(.30)	(3.88)	(3.38)	(2.48)	(5.82)	(3.15)	(.39)	(7.82)		
Education	.071*	-1.45*	.355*	.357	.102	.704	-.071	-.268*	1.037	-.324	.43	1.63
Premium - all	(9.44)	(4.76)	(3.47)	(1.11)	(.12)	(.85)	(.93)	(2.14)	(1.25)	(.59)		
Education	.024	-.600	.045	-2.392*	-1.790	1.929	.126	.162	-5.240*	4.220*	.08	1.81
Premium-youth	(1.32)	(.80)	(.18)	(3.03)	(.88)	(.95)	(.67)	(.53)	(2.58)	(3.16)		

Notes: t - statistics are in parentheses
Pooled cross-section time series data n = 192; when the dependent variable is education premium, n = 136
*indicates statistically significant coefficient at the 10 percent level using a 2-tailed test and an absolute critical t-value = 1.645
Source: Calculated from SWH 1981 and LMAS 1986, 1989

TABLE 10(b)

Determinants of Inequality, Age Premium and Education Premium, Measured by Annual Earnings, OLS Regression Estimates, Men (levels)

Dependent Variable	UE	Union	Min Wage	Manuf	Tech.	Univ	DUM 86	DUM 89	Const	$\bar{R}^2$	DW
G Entropy (0)	.011*	-.179*	.012	-.030	.116	-.064	.043*	0.23	.221*	.54	1.90
	(7.69)	(3.95)	(.61)	(.61)	(.86)	(.38)	(2.82)	(.92)	(2.80)		
G Entropy (.5)	.009*	-.193*	.017	-.028	.046	.032	.016	.009	.169*	.55	1.65
	(8.78)	(5.83)	(1.15)	(.78)	(.46)	(.27)	(1.45)	(.48)	(2.94)		
G Entropy (1)	.009*	-.213*	.019	-.036	-.007	.096	.006	.004	.153*	.52	1.52
	(8.61)	(6.58)	(1.34)	(1.03)	(.07)	(.82)	(.52)	(.21)	(2.73)		
Age Premium	-.010*	.038	-.028	-.182*	-.339*	-.792*	-.111*	-.082*	.883*	.66	1.94
	(5.29)	(.63)	(1.04)	(2.78)	(1.85)	(3.55)	(5.37)	(2.45)	(8.29)		
Education Premium - all	.073*	-1.538*	.358*	.152	-.314	-1.948*	-.044	-.260*	.051	.45	1.58
	(8.56)	(5.62)	(2.98)	(.52)	(.38)	(1.96)	(.48)	(1.74)	(.11)		
Education Premium - youth	.043*	.699	.061	-1.119	-1.203	1.644	.071	-.150	.753	.02	2.16
	(1.93)	(.97)	(.19)	(1.46)	(.56)	(.63)	(.29)	(.38)	(.60)		

Notes: t - statistics are in parentheses
Pooled cross-section time series data n = 192; when the dependent variable is education premium n = 136
*indicates statistically significant coefficient at the 10 percent level using a 2-tailed test and an absolute critical t-value = 1.645

Source: Calculated from SWH 1981 and LMAS 1986, 1989

TABLE 10(c)

Determinants of Inequality, Age Premium and Education Premium, Measured by Annual Earnings, OLS Regression Estimates, Women (levels)

Dependent Variable	UE	Union	Min Wage	Manuf	Tech.	Univ	DUM 86	DUM 89	Const	$\bar{R}^2$	DW
G Entropy (0)	.009*	-.151*	-.010	-.176*	-.055	-.198	.008	.005	.504*	.28	1.80
	(5.72)	(1.94)	(.43)	(2.12)	(.39)	(1.26)	(.48)	(.18)	(5.63)		
G Entropy (.5)	.008*	-.172*	-.006	-.090	.026	-.190*	.001	.008	.376*	.34	1.72
	(7.02)	(3.03)	(.33)	(1.48)	(.25)	(1.65)	(.09)	(.38)	(5.76)		
G Entropy (1)	.008*	-.202*	-.004	-.057	.085	-.226*	-.004	.007	.327*	.35	1.67
	(7.38)	(3.66)	(.22)	(.96)	(.85)	(2.01)	(.35)	(.36)	(5.14)		
Age Premium	-.009*	.075	.025	-.138	-.833*	-.281	-.147*	-.174*	.929*	.42	1.94
	(2.71)	(.47)	(.52)	(.80)	(3.04)	(.87)	(4.18)	(2.99)	(5.04)		
Education	.085	-1.33*	.314*	.434	.207*	-2.578*	-.092	-.135	.107	.36	1.69
Premium - all	(7.91)	(2.44)	(1.91)	(.74)	(2.09)	(2.33)	(.77)	(.68)	(.17)		
Education	.051*	-1.210	-.057	-1.684	-1.202	-0.985	.092	.249	2.62	.004	1.88
Premium-youth	(1.91)	(.90)	(.14)	(1.17)	(.49)	(.36)	(.31)	(.51)	(1.70)		

Notes: t - statistics are in parentheses
Pooled cross-section time series data n = 192; for the dependent variable education premium, youth n = 166
*indicates statistically significant coefficient at the 10 percent level using a 2-tailed test and an absolute critical t-value = 1.645

Source: Calculated from SWH 1981 and LMAS 1986, 1989

TABLE 11(a)

Determinants of Inequality, Age Premium and Education Premium, Measured by Wage Rates,
OLS Regression Estimates, Population (levels)

Dependent Variable	UE	Union	Min Wage	Manuf	Tech.	Univ.	DUM 86	DUM 89	Female	Const	$\bar{R}^2$	DW
G Entropy (0)	.0006	-.053*	-.002	-.011	.105*	.041	-.004	-.011	-.091*	.173*	.14	1.73
	(1.27)	(2.91)	(.31)	(.58)	(2.08)	(.83)	(.93)	(1.52)	(1.82)	(5.25)		
G Entropy (.5)	.001*	-.068*	-.0007	-.008	.089*	.068	-.006	-.012*	-.062	.152*	.17	1.73
	(2.35)	(3.91)	(.12)	(.43)	(1.87)	(1.43)	(1.40)	(1.72)	(1.30)	(4.90)		
G Entropy (1)	.001*	-.091*	.001	-.008	.084	.086	-.010*	-.016*	-.046	-.146*	.19	1.71
	(2.95)	(4.70)	(.16)	(.38)	(1.59)	(1.62)	(2.03)	(2.02)	(.87)	(4.20)		
Age Premium	-.001	-.042	-.010	-.083	-.470*	-.437*	-.122*	-.109*	.122	.894*	.67	1.62
	(.85)	(.66)	(.50)	(1.26)	(2.73)	(2.56)	(7.89)	(4.24)	(.72)	(7.96)		
Education Premium - all	.031*	-.774*	.258*	.325	.891*	-.097	-.017	-.161*	-.187	.412	.34	1.59
	(6.67)	(4.07)	(4.06)	(1.62)	(1.71)	(.19)	(.36)	(2.07)	(.36)	(1.21)		
Education Premium - youth	.008	-.253	.107	-1.045*	-1.572	1.207	.061	-.034	-2.016	2.360*	.02	1.79
	(.68)	(.56)	(.70)	(2.18)	(1.26)	(.98)	(.56)	(.18)	(1.63)	(2.91)		

Notes: t - statistics are in parentheses
Pooled cross-section time series data n = 192; when the dependent variable is education premium n = 166
*indicates statistically significant coefficient at the 10 percent level using a 2-tailed test and an absolute critical t-value = 1.645

Source: Calculated from SWH 1981 and LMAS 1986, 1989

TABLE 11(b)

Determinants of Inequality, Age Premium and Education Premium, Measured by Hourly Wage Rates, OLS Regression Estimates, Men (levels)

Dependent Variable	UE	Union	Min Wage	Manuf	Tech.	Univ	DUM 86	DUM 89	Const	$\overline{R}^2$	DW
G Entropy (0)	.0008	-.064*	-.002	.006	.069	.134*	-.002	-.011	.118*	.34	1.83
	(1.64)	(4.42)	(.27)	(.41)	(1.59)	(2.52)	(.43)	(1.34)	(4.65)		
G Entropy (.5)	.001*	-.074*	.001	.005	.047	.171*	-.005	-.013*	.102*	.39	1.74
	(2.85)	(5.47)	(.20)	(.34)	(1.17)	(3.50)	(1.09)	(1.73)	(4.37)		
G Entropy (1)	.002*	-.087*	.002	.005	.040	.198*	-.008*	-.015*	.099*	.42	1.53
	(3.58)	(6.15)	(.39)	(.31)	(.95)	(3.84)	(1.75)	(1.99)	(4.00)		
Age Premium	.0002	.038	.010	-.106*	-.202	-.646*	-.166*	-.164*	.779*	.68	1.89
	(.12)	(.66)	(.38)	(1.74)	(1.18)	(3.10)	(8.59)	(5.25)	(7.81)		
Education	.032*	-.956*	.253*	.233	.790	.197	.005	-.142	.339	.38	1.66
Premium - all	(5.94)	(5.51)	(3.31)	(1.26)	(1.53)	(.31)	(.09)	(1.50)	(1.12)		
Education	.017	.010	.239	-.529	.367		-.137	-.293	.415	-.02	1.67
Premium - youth	(1.15)	(.21)	(1.16)	(1.06)	(.26)		(.87)	(1.15)	(.51)		

Notes: t - statistics are in parentheses
Pooled cross-section time series data n = 192; for the dependent variable education premium, youth n = 136
* indicates statistically significant coefficient at the 10 percent level using a 2-tailed test and an absolute critical t-value = 1.645

Source: Calculated from SWH 1981 and LMAS 1986, 1989

TABLE 11(c)

Determinants of Inequality, Age Premium and Education Premium, Measured by Hourly Wage Rates, OLS Regression Estimates, Women (levels)

Dependent Variable	UE	Union	Min Wage	Trade	Tech.	Univ	DUM 86	DUM 89	Const	$\bar{R}^2$	DW
G Entropy (0)	.002*	-.036*	.009	-.008	.082	-.012	-.025*	-.034*	.085*	.09	1.73
	(2.47)	(3.46)	(.93)	(.22)	(1.41)	(.18)	(3.46)	(2.89)	(2.29)		
G Entropy (.5)	.002*	-.054	.008	-.009	.087	-.016	-.025*	-.032*	.091*	.09	1.74
	(2.62)	(1.60)	(.78)	(.26)	(1.43)	(.23)	(3.32)	(2.61)	(2.34)		
G Entropy (1)	.002*	-.075*	.008	-.012	.094	-.036	-.029*	-.035*	.104*	.09	1.75
	(2.32)	(1.79)	(.62)	(.27)	(1.24)	(.43)	(3.16)	(2.30)	(2.16)		
Age Premium	-.0008	-.077	-.019	-.0005	-.411*	-.405*	-.097*	-.084*	1.03*	.42	1.73
	(.38)	(.69)	(.56)	(.004)	(2.03)	(1.80)	(3.95)	(2.09)	(8.01)		
Education Premium - all	.036*	-.172	.114	.690*	1.80*	-.662	-.045	-.060	.532	.24	1.56
	(5.56)	(.53)	(1.15)	(1.97)	(3.02)	(1.00)	(.63)	(.51)	(1.41)		
Education Premium - youth	.032	-.315	-.122	.611	-.835	.839	.071	.102	1.978*	.02	2.24
	(1.96)	(.38)	(.48)	(.68)	(.55)	(.50)	(.39)	(.34)	(2.06)		

Notes: t - statistics are in parentheses
Pooled cross-section time series data n=192; when the dependent variable is education premium, n = 154
* indicates statistically significant coefficient at the 10 percent level using a w-tailed test and an absolute critical t-value = 1.645

Source: Calculated from SWH 1981 and LMAS 1986, 1989

TABLE 12(a)

Determinants of Changes in Inequality, Age Premium and Education Premium Measured by Annual Earnings, OLS Regression Estimates, Population (changes)

Dependent Variable	UE	Union	Min Wage	Manuf	Tech.	Univ	DUM 86-89	Female	Const	$\bar{R}^2$	DW
G Entropy (0)	.006*	-.196	-.026	-.155	-.298*	.325	-.064*	.053	.007	.46	2.11
	(2.37)	(1.54)	(1.33)	(.94)	(1.73)	(1.43)	(3.55)	(.24)	(.48)		
G Entropy (.5)	.003*	-.171*	-.012	-.112	-.181	.208	-.041*	.124	.004	.39	1.92
	(1.89)	(1.97)	(.90)	(1.00)	(1.54)	(1.34)	(3.30)	(.82)	(.42)		
G Entropy (1)	.002	-.145*	-.007	-.146	-.172	.156	-.031*	.172	.002	.29	1.86
	(1.41)	(1.71)	(.57)	(1.33)	(1.49)	(1.02)	(2.61)	(1.17)	(.24)		
Age Premium	-.006*	.221	.041	.338	-.217	-.555*	.122*	.002	.017	.64	1.87
	(1.66)	(1.34)	(1.63)	(1.58)	(.97)	(1.87)	(5.22)	(.01)	(.85)		
Education Premium - all	.062*	-1.699*	.354*	.632	-.460	1.093	-.184*	3.80*	.266*	.45	1.80
	(4.58)	(2.50)	(3.45)	(.72)	(.50)	(.89)	(1.91)	(3.23)	(3.22)		
Education Premium - youth	.048	-.346	.601*	-1.71	1.652	-.809	.055	.694	.416	.003	1.71
	(1.27)	(.19)	(2.12)	(.70)	(.65)	(.24)	(.21)	(.21)	(1.82)		

Notes: t - statistics are in parentheses
Pooled cross-section time series data n = 128; when the dependent variable is education premium - youth n = 103
*indicates statistically significant coefficient at the 10 percent level using a 2-tailed test and an absolute critical t-value = 1.645
Source: Calculated from SWH 1981 and LMAS 1986, 1989

TABLE 12(b)

Determinants of Changes in Inequality, Age Premium and Education Premium Measured by Annual Earnings, OLS Regression Estimates, Men (changes)

Dependent Variable	UE	Union	Min Wage	Manuf	Tech	Univ	DUM 86-89	Const	$\bar{R}^2$	DW
G Entropy (0)	.007*	-.272*	.011	.050	.134	.227	-.066*	.024	.54	2.02
	(2.57)	(2.40)	(.51)	(.36)	(.84)	(.96)	(3.50)	(1.38)		
G Entropy (.5)	.003*	-.159*	.008	-.008	.118	.120	-.040*	.013	.49	1.83
	(1.92)	(2.16)	(.59)	(.09)	(1.14)	(.78)	(3.23)	(1.13)		
G Entropy (1)	.002	-.116*	.007	-.056	.115	.055	-.029*	.008	.38	1.74
	(1.18)	(1.76)	(.53)	(.71)	(1.24)	(.40)	(2.63)	(.81)		
Age Premium	-.005	.480*	.009	.051	.023	-.94*	.160*	-.016	.63	1.95
	(1.23)	(2.65)	(.27)	(.23)	(.09)	(2.49)	(5.31)	(.58)		
Education Premium - all	.049*	-.984*	.322*	.086	.910	-.267	-.299*	.289*	.53	1.48
	(3.49)	(1.70)	(2.92)	(.12)	(1.12)	(.22)	(3.11)	(3.21)		
Education Premium - youth	.097*	-1.714	.132	-2.05	-2.55	.067	.348	-.032	-.02	1.97
	(1.78)	(.77)	(.31)	(.76)	(.82)	(.01)	(.94)	(.09)		

Notes: t - statistics are in parentheses
Pooled cross-section time series data n = 128; when the dependent variable is education premium youth n = 76
*indicates statistically significant coefficient at the 10 percent level using a 2-tailed test and an absolute critical t-value = 1.645
Source: Calculated from SWH 1981 and LMAS 1986, 1989

TABLE 12(c)

Determinants of Changes in Inequality, Age Premium and Education Premium, Measured by Annual Earnings, OLS Regression Estimates, Women (changes)

Dependent Variable	UE	Union	Min Wage	Manuf	Tech.	Univ	DUM 86-89	Const	$\bar{R}^2$	DW
G Entropy (0)	.008*	-.148	-.039*	-.071	-.182	.30	-.008	-.011	.19	1.72
	(2.35)	(1.09)	(1.72)	(.38)	(1.06)	(1.35)	(.36)	(.62)		
G Entropy (.5)	.005*	-.184*	-.027*	-.067	-.061	.100	-.002	-.014	.15	1.61
	(2.18)	(1.96)	(1.70)	(.52)	(.51)	(.64)	(.15)	(1.18)		
G Entropy (1)	.004*	-.205*	-.026*	-.131	-.010	-.013	.003	-.019	.11	1.66
	(1.78)	(2.23)	(1.69)	(1.02)	(.09)	(.09)	(.19)	(1.57)		
Age Premium	-.009	-.443	.131*	-.018	-.352	-.278	-.081	.110*	.34	1.88
	(1.19)	(1.35)	(2.40)	(.04)	(.85)	(.51)	(1.50)	(2.57)		
Education	.027	-.725	.333*	-.221	.994	-.092	-.283*	.235*	.13	1.84
Premium - all	(1.18)	(.75)	(2.08)	(.17)	(.82)	(.06)	(1.79)	(1.88)		
Education	-.071	.016	.281	-.956	3.571	-2.918	-.312	.264	-.04	1.80
Premium - youth	(1.00)	(.01)	(.58)	(.24)	(.96)	(.60)	(.65)	(.69)		

Note: t - statistics are in parentheses
Pooled cross-section time series data n = 128, when the dependent variable is education premium - youth n = 92
*indicates statistically significant coefficient at the 10 percent level using a 2-tailed test and an absolute critical t-value = 1.645
Source: Calculated from SWH 1981 and LMAS 1986, 1989

TABLE 13(a)

Determinants of Changes in Inequality, Age Premium and Education Premium Measured by Hourly Wage Rates, OLS Regression Estimates, Population (changes)

Dependent Variable	UE	Union	Min Wage	Manuf	Tech.	Univ	DUM 86-89	Female	Const	$\bar{R}^2$	DW
G Entropy (0)	.0006	-.109*	-.013*	-.025	.021	.250*	.0001	-.094	.0006	.18	1.69
	(.63)	(2.13)	(1.73)	(.37)	(.30)	(2.73)	(.02)	(1.06)	(.09)		
G Entropy (.5)	.001	-.107*	-.012	-.026	.011	.270*	.003	-.059	-.0003	.18	1.74
	(1.02)	(2.15)	(1.61)	(.40)	(.16)	(3.04)	(.47)	(.68)	(.04)		
G Entropy (1)	.002	-.121*	-.011	-.017	.003	.307*	.009	-.035	-.001	.15	1.75
	(1.45)	(2.16)	(1.33)	(.23)	(.04)	(3.05)	(1.09)	(.36)	(.15)		
Age Premium	-.003	.401*	.046*	.452*	-.322*	-.349	.111*	.194	.036*	.66	1.99
	(.99)	(2.82)	(2.13)	(2.45)	(1.66)	(1.37)	(5.49)	(.79)	(2.07)		
Education	.027*	-.727	.216*	-.547	.997	-1.555*	-.119*	.698	.115*	.34	1.73
Premium - all	(3.02)	(1.61)	(3.16)	(.93)	(1.62)	(1.92)	(1.85)	(.89)	(2.10)		
Education	.041*	-.303	.252	-4.123*	-1.695	-1.165	.043	-.719	.120	.06	1.56
Premium - youth	(1.66)	(.24)	(1.33)	(2.55)	(1.00)	(.52)	(.24)	(.33)	(.79)		

Notes: t - statistics are in parentheses
Pooled cross-section time series data n = 128; when the dependent variable is education premium - youth n = 103
*indicates statistically significant coefficient at the 10 percent level using a 2-tailed test and an absolute critical t-value = 1.645
Source: Calculated from SWH 1981 and LMAS 1986, 1989

TABLE 13(b)

Determinants of Changes in Inequality, Age Premium and Education Premium Measured by Hourly Wage Rates, OLS Regression Estimates, Men (changes)

Dependent Variable	UE	Union	Min Wage	Manuf	Tech.	Univ	DUM 86-89	Const	$\bar{R}^2$	DW
G Entropy (0)	-.0008	-.074*	-.018*	-.042	.122*	.067	-.006	-.002	.33	1.72
	(.91)	(1.88)	(2.44)	(.89)	(2.20)	(.81)	(.96)	(.29)		
G Entropy (.5)	-.0008	-.050	-.014*	-.062	.098*	.082	-.005	-.0004	.32	1.72
	(.93)	(1.42)	(2.10)	(1.45)	(1.99)	(1.10)	(.91)	(.07)		
G Entropy (1)	-.0009	-.041	-.013*	-.063	.089*	.112	-.004	.0004	.29	1.66
	(1.02)	(1.11)	(1.88)	(1.41)	(1.72)	(1.46)	(.65)	(.08)		
Age Premium	-.002	.461*	.067*	.215	.020	-.707*	.150*	.045*	.65	1.90
	(.41)	(2.77)	(2.12)	(1.07)	(.08)	(2.03)	(5.41)	(1.67)		
Education	.015	-1.193*	.124	-.118	.679	-1.272	-.246*	.120*	.42	1.66
Premium - all	(1.35)	(2.63)	(1.43)	(.22)	(1.07)	(1.34)	(3.26)	(1.69)		
Education	.082*	-.520	.192	-1.193	-.955	-4.732	.341	-.103	.04	1.89
Premium - youth	(2.04)	(.32)	(.61)	(.60)	(.41)	(1.38)	(1.25)	(.40)		

Notes: t - statistics are in parentheses
Pooled cross-section time series data n = 128; when the dependent variable is education premium - youth n = 76
*indicates statistically significant coefficient at the 10 percent level using a 2-tailed test and an absolute critical t-value = 1.645
Source: Calculated from SWH 1981 and LMAS 1986, 1989

TABLE 13(c)

Determinants of Changes in Inequality, Age Premium and Education Premium Measured by Hourly Wage Rates
OLS Regression Estimates, Women (changes)

Dependent Variable	UE	Union	Min Wage	Manuf	Tech.	Univ	DUM 86-89	Const	$\bar{R}^2$	DW
G Entropy (0)	.002	-.036	-.011	-.078	.084	.060	.026*	-.004	.04	1.88
	(1.53)	(.61)	(1.13)	(.94)	(1.11)	(.61)	(2.64)	(.53)		
G Entropy (.5)	.003*	-0.054	-.010	-.095	.089	.043	.028*	-.005	.05	1.87
	(1.77)	(.87)	(.92)	(1.10)	(1.13)	(.41)	(2.78)	(.66)		
G Entropy (1)	.003*	-.074	-.008	-.117	.097	.008	.036*	-.007	.05	1.86
	(1.79)	(.95)	(.61)	(1.08)	(.99)	(.06)	(2.84)	(.71)		
Age Premium	-.005	-.046	.065*	-.300	-.496*	-.224	.064*	.058*	.29	1.99
	(.93)	(.20)	(1.74)	(.95)	(1.73)	(.60)	(1.72)	(1.98)		
Education	.015	.326	.118	-.607	1.251	.601	-.038	.068	.09	1.60
Premium - all	(.90)	(.47)	(1.02)	(.62)	(1.41)	(.52)	(.33)	(.74)		
Education	.011*	.045	.034	-.316	.059	.189	.041	.025	.04	1.61
Premium - youth	(2.29)	(.23)	(1.05)	(1.18)	(.24)	(.59)	(1.29)	(1.01)		

Note: t - statistics are in parentheses
Pooled cross-section time series data n = 128; when the dependent variable is education premium - youth n = 92
*indicates statistically significant coefficient at the 10 percent level using a 2-tailed test and an absolute critical t-value = 1.645
Source: Calculated from SWH 1981 and LMAS 1986, 1989

TABLE 14(a)

Determinants of Inequality, Age Premium, and Education Premium, Measured by Annual Earnings
OLS Regression Estimates, Population (levels)

Dependent Variable	UE	Union	Min Wage	Trade	Tech.	Univ.	DUM 86	DUM 89	Female	Const	$\bar{R}^2$	DW
G Entropy (0)	.007*	-.142*	-.020	-.088*	.094	-.284*	.054*	.045*	-. 006	.475*	.40	1.97
	(5.10)	(2.65)	(1.08)	(1.84)	(.73)	(1.96)	(3.95)	(1.99)	(.04)	(5.00)		
G Entropy (.5)	.006*	-.160*	-.007	-.060*	.054	-.188*	.028*	.027*	.098	.303*	.46	1.85
	(7.08)	(4.33)	(.53)	(1.82)	(.61)	(1.88)	(2.94)	(1.72)	(.96)	(4.60)		
G Entropy (1)	.007*	1.87*	-.001	-.051	.044	-.173*	.018*	.020	.163*	.229*	.46	1.76
	(7.69)	(5.23)	(.10)	(1.60)	(.51)	(1.79)	1.95	(1.31)	(1.65)	(3.62)		
Age Premium	-.010*	-.094	.004	-.180*	-.321*	-.572*	-.115*	-.117*	.027	.794*	.66	1.71
	(5.79)	(1.35)	(.18)	(2.93)	(1.93)	(3.07)	(6.53)	(3.99)	(.14)	(6.47)		
Education Premium - all	.070*	-1.416*	.324*	.422	-.233	.713	-.045	-.212*	.888	-.058	.43	1.62
	(9.49)	(4.73)	(3.11)	(1.59)	(.32)	(.88)	(.59)	(1.67)	(1.08)	(.11)		
Education Premium-youth	.031*	-.963	.116	-1.238*	.993	.883	.012	-.046	-4.42*	2.859*	.05	1.85
	(1.70)	(1.29)	(.44)	(1.86)	(.55)	(.41)	(.06)	(.146)	(2.15)	(2.16)		

Notes: t - statistics are in parentheses
Pooled cross-section time series data n=192; when the dependent variable is education premium-youth, n = 166
*indicates statistically significant coefficient at the 10 percent level using a 2-tailed test and an absolute critical t-value = 1.645
Source: Calculated from SWH 1981 and LMAS 1986, 1989

TABLE 14 (b)

Determinants of Inequality, Age Premium, and Education Premium, Measured by Annual Earnings
OLS Regression Estimates, Men (levels)

Dependent Variable	UE	Union	Min Wage	Trade	Tech.	Univ.	DUM 86	DUM 89	Const	$\bar{R}^2$	DW
G Entropy (0)	.001*	-.188*	.015	-.040	.148	-.070	.041*	.019	.204*	.54	1.90
	(7.94)	(4.40)	(.71)	(.54)	(1.21)	(.43)	(2.65)	(.76)	(2.59)		
G Entropy (.5)	.009*	-.201*	.018	-.013	.078	.015	.015	.007	.157*	.55	1.66
	(9.06)	(6.46)	(1.19)	(.24)	(.88)	(.12)	(1.33)	(.38)	(2.74)		
G Entropy (1)	.009*	-.224*	.020	-.013	.035	.072	.004	.002	.139*	.52	1.53
	(8.92)	(7.33)	(1.36)	(.24)	(.41)	(.62)	(.40)	(.10)	(2.48)		
Age Premium	-.009*	-.013	-.009	-.316*	-.147	-.796*	-.126*	-.109*	.763*	.66	1.92
	(4.87)	(.22)	(.32)	(3.20)	(.90)	(3.63)	(6.11)	(3.22)	(7.25)		
Education Premium - all	.072*	-1.507*	.312*	.787*	-.422	1.704*	-.012	-.200	.253	.47	1.59
	(8.69)	(5.92)	(2.56)	(1.79)	(.58)	(1.75)	(.13)	(1.34)	(.54)		
Education Premium-youth	.050*	.368	.132	-1.13	.050	1.239	-.137	-.259	.173	.01	2.16
	(2.24)	(.54)	(.41)	(.97)	(0.3)	(.48)	(.56)	(.65)	(.14)		

Notes: t - statistics are in parentheses
Pooled cross-section time series data n=192; when the dependent variable is education premium-youth, n=136
*indicates statistically significant coefficient at the 10 percent level using a 2-tailed test and an absolute critical t-value = 1.645
Source: Calculated from SWH 1981 and LMAS 1986, 1989

TABLE 14(c)

Determinants of Inequality, Age Premium, and Education Premium, Measured by Annual Earnings
OLS Regression Estimates, Women (levels)

Dependent Variable	UE	Union	Min Wage	Trade	Tech.	Univ.	DUM 86	DUM 89	Const	$\bar{R}^2$	DW
G Entropy (0)	.009*	-.157*	-.011	-.005	.073	-.239	.006	.0007	.461*	.26	1.79
	(5.54)	(1.94)	(.44)	(.16)	(.57)	(1.50)	(.34)	(.03)	(5.17)		
G Entropy (.5)	.008*	-.171*	-.005	-.009	.087	-.206*	-.0005	.004	.352*	.33	1.73
	(6.85)	(2.93)	(.29)	(.43)	(.93)	(1.79)	(.04)	(.20)	(5.45)		
G Entropy (1)	.008*	-200*	-.003	-.009	.123	-.234*	-.005	.004	.311*	.35	1.69
	(7.23)	(2.09)	(.17)	(.43)	(1.34)	(2.09)	(.45)	(.22)	(4.96)		
Age Premium	-.070*	.153	.043	-.145*	-.865*	-.227	-.158*	-203*	.849*	.44	2.00
	(3.05)	(.95)	(.89)	(2.39)	(3.34)	(.71)	(4.54)	(3.49)	(4.77)		
Education Premium - all	.086*	-1.372*	.304*	.102	1.810*	-2.332*	-.081	-.108	.241	.36	1.67
	(7.91)	(2.45)	(1.82)	(.48)	(2.01)	(2.29)	(.67)	(.54)	(.39)		
Education Premium-youth	.047*	-1.014	-.005	-.483	-.226	-1.110	.041	.129	2.069	.001	1.91
	(1.76)	(.74)	(.01)	(.93)	(.10)	(.41)	(.14)	(.26)	(1.36)		

Notes: t - statistics are in parentheses
Pooled cross-section time series data n = 192; when the dependent variable is education premium-youth, n = 154
*indicates statistically significant coefficient at the 10 percent level using a 2-tailed test and an absolute critical 5-value = 1.645
Source: Calculated from SWH 1981 and LMAS 1986, 1989

TABLE 15(a)

Determinants of Inequality, Age Premium, and Education Premium, Measured by Hourly Wage Rates
OLS Regression Estimates, Population (levels)

Dependent Variable	UE	Union	Min Wage	Trade	Tech.	Univ.	DUM 86	DUM 89	Female	Const	$\bar{R}^2$	DW
G Entropy (0)	.001	-.056*	-.002	.003	.121*	.031	-.004	.012	-.088*	.168*	.14	1.76
	(1.39)	(3.08)	(.37)	(.18)	(2.77)	(.63)	(.97)	(1.50)	(1.77)	(5.25)		
G Entropy (.5)	.001*	-.070*	-.002	.010	.103*	.055	-.006	-.011	-.061	.152*	.17	1.78
	(2.47)	(4.10)	(.28)	(.66)	(2.51)	(1.19)	(1.35)	(1.58)	(1.29)	(5.00)		
G Entropy (1)	.001*	-.094*	-.0004	.016	.100*	.069	-.009*	-.015*	-.046	.147*	.20	1.76
	(3.09)	(4.92)	(.061)	(.93)	(2.18)	(1.34)	(1.94)	(1.82)	(.87)	(4.33)		
Age Premium	-.001	-.048	.001	-.151*	-.409*	-.405*	-.131*	-.127*	.163	.817*	.68	1.66
	(.80)	(.78)	(.06)	(2.80)	(2.81)	(2.48)	(8.45)	(4.95)	(.98)	(7.60)		
Education Premium - all	.031*	-.750*	.215*	.552*	.644	-.199	.014	-.093	-.341	.699*	.38	1.66
	(6.83)	(4.13)	(3.41)	(3.42)	(1.48)	(.41)	(.30)	(1.20)	(.68)	(2.17)		
Education Premium-youth	.011	-.418	.129	-.442	-.322	.664	.016	-.115	-1.670	1.791*	-.004	1.78
	(.98)	(.93)	(.82)	(1.10)	(.30)	(.55)	(.14)	(.60)	(1.34)	(2.24)		

Notes: t - statistics are in parentheses
Pooled cross-section time series data n=192; when the dependent variable is education premium-youth, n=166
*indicates statistically significant coefficient at the 10 percent level using a 2-tailed test and an absolute critical t-value = 1.645
Source: Calculated from SWH 1981 and LMAS 1986, 1989

TABLE 15 (b)

Determinants of Inequality, Age Premium. and Education Premium, Measured by Hourly Wage Rates
OLS Regression Estimates, Men (levels)

Dependent Variable	UE	Union	Min Wage	Trade	Tech.	Univ.	DUM 86	DUM 89	Const	$\bar{R}^2$	DW
G Entropy (0)	.0007	-.063*	-.004	.035	.065*	.123*	-.0006	-.008	.127*	.35	1.87
	(1.60)	(4.64)	(.59)	(1.48)	(1.67)	(2.35)	(.14)	(1.00)	(5.05)		
G Entropy (.5)	.001*	-.073*	-.001	.043*	.045	.155*	-.003	-.010	.112*	.41	1.79
	(2.86)	(5.86)	(.22)	(2.00)	(1.27)	(3.25)	(.72)	(1.29)	(4.89)		
G Entropy (1)	.002*	-.087*	-.0005	.050*	.039	.179*	-.006	-.012	.110*	.44	1.70
	(3.62)	(6.63)	(.08)	(2.19)	(1.04)	(3.56)	(1.35)	(1.52)	4.55		
Age Premium	.0008	.011	.028	-.312*	-.102	-.588*	-.179*	-.189*	.684*	.70	1.90
	(.50)	(.21)	(1.14)	(3.47)	(.69)	(2.94)	(9.50)	(6.12)	(7.11)		
Education	.031*	-.901*	.201*	.873*	.591	-.019	.042	.075	.584*	.42	1.76
Premium - all	(5.96)	(5.70)	(2.65)	(3.20)	(1.31)	(.031)	(.73)	(.80)	(2.0)		
Education	.020	-.047	.300	-.991	.916	-.785	-.185	-.376	.052	-.02	1.66
Premium-youth	(1.38)	(.11)	(1.42)	(1.30)	(.73)	(.46)	(1.16)	(1.45)	(.07)		

Notes: - t statistics are in parentheses

Pooled cross-section time series data n = 192; when the dependent variable is education premium-youth, n = 136

*indicates statistically significant coefficient at the 10 percent level using a 2-tailed test and an absolute critical 5-value = 1.64

Source: Calculated from SWH 1981 and LMAS 1986, 1989

TABLE 15(c)

Determinants of Inequality, Age Premium, and Education Premium, Measured by Hourly Wage Rates
OLS Regression Estimates, Men (levels)

Dependent Variable	UE	Union	Min Wage	Trade	Tech.	Univ.	DUM 86	DUM 89	Const	$\bar{R}^2$	DW
G Entropy (0)	.002*	-.046	.007	.017	.098*	-.024	-.023*	-.031*	.089*	.10	1.78
	(2.64)	(1.41)	(.69)	(1.40)	(1.86)	(.37)	(3.32)	(2.62)	(2.46)		
G Entropy (.5)	.002*	-.066*	.005	.019	.106*	-.030	-.024*	-.029*	.095*	.10	1.80
	(2.80)	(1.91)	(.52)	(1.49)	(1.92)	(.44)	(3.17)	(2.32)	(2.50)		
G Entropy (1)	.002*	-.089*	.004	.023	.116*	-.053	-.028*	-.031*	.109*	.10	1.79
	(2.49)	(2.09)	(.38)	(1.42)	(1.70)	(.63)	(3.02)	(2.31)	(2.31)		
Age Premium	-.002	-.012	-.004	-.111*	-.475*	-.337	-.104*	-.104*	.990*	.45	1.82
	(.72)	(.11)	(.13)	(2.64)	(2.66)	(1.53)	(4.32)	(2.60)	(8.05)		
Education	.038*	-.257	.092	.205	1.402*	-.615	-.024	-.010*	.760*	.24	1.52
Premium - all	(5.72)	(.76)	(.91)	(1.61)	(2.59)	(.92)	(.33)	(2.04)	(2.04)		
Education	.033*	-.372	-.138	.151	-1.20	.899	.088	.142	2.17*	.02	2.25
Premium-youth	(2.01)	(.43)	(.54)	(.47)	(.88)	(.53)	(.47)	(.46)	(2.29)		

Notes: t - statistics are in parentheses
Pooled cross-section time series data n - 192; when the dependent variable is education premium-youth, n = 154
* indicates statistically significant coefficient at the 10 percent level using a 2-tailed test and an absolute critical t-value = 1.645
Source: Calculated from SWH 1981 and LMAS 1986, 1989

TABLE 16(a)

Determinants of Changes in Inequality, Age Premium, and Education Premium, Measured by Annual Earnings
OLS Regression Estimates, Population (changes)

Dependent Variable	UE	Union	Min Wage	Trade	Tech	Univ.	DUM 86-89	Female	Const.	$\bar{R}^2$	DW
G Entropy (0)	.006* (2.54)	-.185 (1.49)	-.014 (.74)	.196* (2.09)	-.216 (1.38)	.266 (1.19)	-.069* (3.93)	.011 (.05)	.015 (1.04)	.48	2.09
G Entropy (.5)	.003* (2.02)	-.165* (1.92)	-.005 (.37)	.110* (1.70)	-.126 (1.16)	.173 (1.12)	-.044* (3.62)	.104 (.70)	.009 (.94)	.41	1.93
G Entropy (1)	.003 (1.53)	-.143* (1.68)	-.0002 (.01)	.091 (1.42)	-.105 (.98)	.123 (.81)	-.035* (2.91)	.165 (1.12)	.008 (.80)	.29	1.87
Age Premium	-.006* (1.83)	.212 (1.29)	.023 (.91)	-.247* (2.01)	-.377* (1.83)	-.471 (1.60)	.131* (5.65)	.031 (.11)	.004 (.18)	.64	1.91
Education Premium - all	.062* (4.65)	-1.61* (2.40)	.376* (3.71)	.897* (1.78)	-.622 (.74)	.907 (.75)	-.190* (2.01)	3.38* (2.91)	.267* (3.39)	.47	1.78
Education Premium-youth	.049 (1.31)	-.414 (.22)	.632* (2.23)	-.228 (.16)	2.31 (.98)	-.861 (.26)	.037 (.14)	1.06 (.33)	.455* (2.06)	-.001	1.70

Notes: t - statistics are in parentheses

Pooled cross-section time series data n = 128; when the dependent variable is education premium youth, n=103

*indicates statistically significant coefficient at the 10 percent level using a 2-tailed test and an absolute critical t-value = 1.645

Source: Calculated from SWH 1981 and LMAS 1986, 1989

TABLE 16(b)

Determinants of Changes in Inequality, Age Premium, and Education Premium, Measured by Annual Earnings
OLS Regression Estimates, Men (changes)

Dependent Variable	UE	Union	Min Wage	Trade	Tech	Univ.	DUM 86-89	Const.	$\bar{R}^2$	DW
G Entropy (0)	.007* (2.62)	-.249* (2.33)	.011 (.50)	.051 (.44)	.146 (.91)	.187 (.78)	-.064* (3.52	.023 (1.33)	.54	2.03
G Entropy (.5)	.004* (1.97)	-.154* (2.21)	.009 (.64)	.048 (.64)	.127 (1.22)	.099 (.64)	-.040* (3.38)	.013 (1.18)	.49	1.83
G Entropy (1)	.002 (1.20)	-.126* (2.02)	.008 (.65)	.045 (.67)	.122 (1.30)	.050 (.36)	-.031* (2.93)	.010 (1.00)	.38	1.73
Age Premium	-.006 (1.29)	.471* (2.77)	.007 (.20)	-.155 (.84)	-.007 (.03)	-.883* (2.31)	.161* (5.60)	-.018 (.65)	.64	1.97
Education Premium - all	.051* (3.59)	-.866 (1.60)	.326* (2.99)	.577 (.99)	1.03 (1.27)	-.575 (.47)	-.291* (3.18)	.286* (3.29)	.54	1.45
Education Premium-youth	.089* (1.65)	-2.88 (1.38)	.136 (.33)	-3.416 (1.52)	-3.345 (1.07)	2.362 (.51)	.237 (.67)	.035 (.10)	.01	1.96

Notes: t - statistics are in parentheses
Pooled cross-section time series data n = 128; when the dependent variable is education premium - youth, n = 76
* indicates statistically significant coefficient at the 10 percent level using a 2-tailed test and an absolute critical t-value = 1.645

Source: Calculated from SWH 1981 and LMAS 1986, 1989

TABLE 16(c)

Determinants of Inequality Changes, Age Premium, and Education Premium, Measured by Annual Earnings
OLS Regression Estimates, Women (changes)

Dependent Variable	UE	Union	Min Wage	Trade	Tech	Univ.	DUM 86-89	Const.	$\bar{R}^2$	DW
G Entropy (0)	.009* (2.88)	-.221 (1.62)	-.024 (1.05)	.077* (2.00)	-.109 (.69)	.284 (1.29)	-.006 (.27)	-.006 (.36)	.23	1.77
G Entropy (.5)	.006* (2.55)	-.214* (2.23)	-.020 (1.27)	.028 (1.03)	-.020 (.18)	.091 (.59)	-.001 (.07)	-.012 (1.01)	.16	1.66
G Entropy (1)	.005* (2.14)	-.225* (2.37)	-.022 (1.36)	.011 (.41)	.041 (.38)	-.021 (.14)	.005 (.31)	-.017 (1.43)	.10	1.70
Age Premium	-.011 (1.45)	-.327 (.98)	.107* (1.92)	-.136 (1.44)	-.432 (1.12)	-.251 (.47)	.079 (1.49)	.103* (2.41)	.35	1.96
Education Premium - all	.030 (1.34)	-.878 (.89)	.364* (2.20)	.158 (.56)	1.169 (1.02)	-.133 (.08)	-.277 (1.77)	.245* (1.95)	.13	1.85
Education Premium-youth	-.067 (.97)	-.032 (.01)	.293 (.58)	-.028 (.03)	3.878 (1.11)	-2.954 (.61)	-.300 (.63)	,269 (.70)	.04	1.80

Notes: t - statistics are in parentheses
Pooled cross-section time series data n = 128; when the dependent variable is education premium - youth, n = 92
* indicates statistically significant coefficient at the 10 percent level using a 2-tailed test and an absolute critical t-value = 1.645
Source: Calculated from SWH 1981 and LMAS 1986, 1989

TABLE 17(a)

Determinants of Inequality Changes, Age Premium, and Education Premium, Measured by Hourly Wage Rates
OLS Regression Estimates, Population (changes)

Dependent Variable	UE	Union	Min Wage	Trade	Tech	Univ.	DUM 86-89	Female	Const.	$\bar{R}^2$	DW
G Entropy (0)	.0006 (.66)	-.109* (2.14)	-.013 (1.63)	.005 (.12)	.031 (.48)	.247* (2.68)	-.0003 (.04)	-.091 (1.03)	.001 (.21)	.18	1.71
G Entropy (.5)	.001 (1.05)	-.108* (2.17)	-.011 (1.53)	.0001 (.003)	.021 (.34)	.269* (3.00)	.003 (.42)	-.054 (.63)	.0004 (.07)	.18	1.75
G Entropy (1)	.002 (1.46)	-.122* (2.17)	-.011 (1.31)	-.004 (.10)	.009 (.13)	.307* (3.03)	.009 (1.07)	-.031 (.31)	-.0007 (.10)	.15	1.76
Age Premium	-.003 (1.15)	.406* (2.78)	.031 (1.39)	-.110 (1.00)	-.513* (2.79)	-.292 (1.11)	.119 (1.28)	.156 (.61)	.022 (1.28)	.64	2.06
Education Premium - all	.028* (3.18)	-.692 (1.56)	.255* (3.80)	.655* (1.96)	1.281* (2.29)	-1.756* (2.19)	-.137* (2.18)	.562 (.73)	.142* (2.71)	.36	1.80
Education Premium-youth	.045* (1.75)	-.528 (.41)	.295 (1.53)	-1.301 (1.36)	-.182 (.11)	-1.10 (.48)	.010 (.06)	.421 (.19)	.202 (1.34)	.02	1.57

Notes: t - statistics are in parentheses
Pooled cross-section time series data n = 128; when the dependent variable is education premium - youth, n = 103
* indicates statistically significant coefficient at the 10 percent level using a 2-tailed test and an absolute critical t-value = 1.645
Source: Calculated from SWH 1981 and LMAS 1986, 1989

TABLE 17(b)

Determinants of Changes in Inequality, Age Premium, and Education Premium, Measured by Hourly Wage Rates
OLS Regression Estimates, Men (changes)

Dependent Variable	UE	Union	Min Wage	Trade	Tech	Univ.	DUM 86-89	Const.	$\bar{R}^2$	DW
G Entropy (0)	-.0008 (.84)	-.077* (2.09)	-.017* (2.29)	.063 (1.58)	.134* (2.41)	.050 (.60)	-.008 (1.21)	-.0005 (.10)	.35	1.79
G Entropy (.5)	-.0007 (.88)	-.061* (1.82)	-.012* (1.86)	.051 (1.43)	.107* (2.13)	.075 (1.01)	-.007 (1.32)	.001 (.28)	.32	1.80
G Entropy (1)	-.0009 (.98)	-.053 (1.52)	-.012* (1.65)	.045 (1.20)	.096* (1.83)	.109 (1.39)	-.006 (1.04)	.002 (.42)	.28	1.72
Age Premium	-.002 (.42)	.507* (3.21)	.063* (1.96)	-.126 (.74)	.002 (.01)	-.711* (2.01)	.158* (5.92)	.037 (1.45)	.65	1.97
Education Premium - all	.016 (1.47)	-1.121* (2.66)	.133 (1.57)	.682 (1.50)	.816 (1.29)	-1.570* (1.66)	-.246* (3.44)	.123* (1.82)	.44	1.70
Education Premium-youth	.080* (1.98)	-.0954 (.61)	.210 (.67)	-.446 (.27)	-1.094 (.47)	-4.150 (1.19)	.289 (1.10)	-.066 (.27)	.03	1.88

Notes: t - statistics are in parentheses
Pooled cross-section time series data n = 128; when the dependent variable is education premium - youth, n = 76
* indicates statistically significant coefficient at the 10 percent level using a 2-tailed test and an absolute critical t-value = 1.645

Source: Calculated from SWH 1981 and LMAS 1986, 1989

TABLE 17(c)

Determinants of Changes in Inequality, Age Premium, and Education Premium, Measured by Hourly Wage Rates
OLS Regression Estimates, Women (changes)

Dependent Variable	UE	Union	Min Wage	Trade	Tech	Univ.	DUM 86-89	Const.	$\bar{R}^2$	DW
G Entropy (0)	.003* (1.80)	-.042 (.68)	-.010 (.96)	-.0006 (.04)	.110 (1.54)	.057 (.57)	.027* (2.75)	-.004 (.46)	.03	1.88
G Entropy (.5)	.003* (2.13)	-.066 (1.02)	-.007 (.65)	.005 (.26)	.125* (1.67)	.038 (.36)	.030* (2.91)	-.005 (.55)	.04	1.88
G Entropy (1)	.004* (2.18)	-.092 (1.15)	-.004 (.30)	.010 (.46)	.143 (1.55)	.0005 (.004)	.038* (2.97)	-.005 (.57)	.04	1.88
Age Premium	-.005 (.86)	-.013 (.06)	.059 (1.52)	-.065 (.98)	-.435 (1.62)	-.224 (.60)	.067* (1.81)	.057* (1.92)	.29	2.00
Education Premium - all	.022 (1.37)	-.005 (.01)	.187 (1.57)	.329 (1.63)	1.666* (2.03)	.508 (.44)	-.025 (.22)	.090 (1.00)	.11	1.60
Education Premium-youth	-.008 (.23)	-.936 (.62)	.067 (.27)	..18 (.28)	1.298 (.75)	.658 (.27)	-.275 (1.16)	.175 (.92)	-.03	1.79

Notes: t - statistics are in parentheses
Pooled cross-section time series data n = 128; when the dependent variable is education premium - youth, n = 92
* indicates statistically significant coefficient at the 10 percent level using a 2-tailed test and an absolute critical t-value = 1.645
Source: Calculated from SWH 1981 and LMAS 1986, 1989

CHAPTER 5

CONCLUSIONS: SUMMARY OF RESULTS

This thesis is concerned with understanding changes in individual employment earnings inequality in Canada during the 1980s. It is motivated by the following considerations. First, the finding by some studies of increased earnings inequality during the 1980s, represents a sharp departure from the decline in earnings inequality observed during the 1970s. Second, increased earnings inequality around a stable mean earnings level implies that the poorest workers in Canadian society have been made worse-off, in both relative and absolute terms, during the 1980s. Third, in addition to the implications for working poverty, the trend toward increased earnings inequality may reflect a transformation of the labour market, characterized by an increase in part-time and casual work. Fourth, the recent literature indicates that a consensus does not exist about the trends in, and causes of, changes in earnings inequality. With regard to trends, Morissette et al. (1993) for example, report that earnings inequality increased for men during the 1980s, whereas, Doiron and Barrett (1994) report that earnings inequality declined for both men and women between 1981 and 1988. Further, studies focusing upon explaining changes in earnings inequality have not found strong evidence to support plausible explanations of increased earnings inequality, such as deindustrialization [see for example, ECC (1991) for Canada and Levy and Murnane (1992) for the U.S.].

Each of the three essays comprising this thesis focus upon a separate broad question. The first essay, presented in chapter 2, asks: "Do researchers' measurement choices affect estimates of trends in earnings inequality?" The second essay, chapter 3, focuses upon the question: "Can cyclical macroeconomic conditions explain the observed changes in earnings inequality during the 1980s?" The third essay, chapter 4, distinguishes among various microeconomic explanations of changes in earnings inequality, such as deindustrialization, increased import-competition, technological change, decline in real minimum wages, deunionization, increased relative supply of university-educated workers, and increased relative supply of female workers.

A large body of empirical evidence has been generated in addressing these issues, and consequently, the purpose of this concluding chapter is summarize the more striking results. The main task of this chapter, therefore, is to generate a summary set of facts about earnings inequality in Canada during the 1980s. In this summary, attention is paid to how robust these facts are to measurement choices, in keeping with the secondary theme of this thesis which has been concerned with how our understanding of a phenomenon is influenced by methodological considerations. While the main task of this chapter is to identify facts about earnings inequality, we conclude this chapter by noting possible areas for future research.

As a prelude to these tasks, the notion of facts at an epistemological level is briefly reviewed. Facts exist in the sense of having been created by researchers, and generally accepted within the discipline or society as correct representations of reality.[238] This acceptance by the discipline (and society) however, does not by itself imply that the facts are necessarily the best representation of reality. Disciplines tend

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[238]. Facts, as defined in chapter 2, are taken to be "data of direct observation...which are so firmly established that they cannot reasonably be questioned" [Machlup (1978), pp. 448-450].

to shape the questions, concepts, and the data which is available, and thereby, influence the nature of facts which are generated.

Recognizing that facts are social constructions, rather than objective, independent entities as represented by the positivist epistemology of neoclassical economics, does not necessarily entail the rejection of the use of an empirical method, nor the validity of trying to discriminate between alternative views (both of which are rejected by the "relativist" epistemology). This alternative - the "realist" - epistemology, does however, require that researchers recognize their measurement choices, acknowledge the potential biases of these choices, and place empirical findings in a qualified context.

Facts can exist at different levels. At a basic level, facts can be quantitative descriptions of a phenomenon, such as trends in earnings inequality. At a more complex level, facts can refer to generally perceived casual relationships, such as those advanced between earnings inequality and cyclical, structural, and demographic factors.

The rise in earnings inequality during the 1980s warrants the definition of a fact given the attention and seeming acceptance by popular media and the discipline. The extent to which it is a good approximation of reality and in this sense, an "accurate" fact, is examined in Chapter 2. While trends in earnings inequality likely qualify as facts, given their general acceptance, there is less consensus about the causes of increased earnings inequality. Chapters 3 and 4 contribute to this debate.

In Chapter 2, it was argued that the potential and empirical variation in estimates of trends in earnings inequality depend upon researchers' measurement choices. Even after deciding to focus upon changes in the distribution of individual employment earnings, (as opposed to the distribution of total household economic welfare, or the distribution of the returns to jobs), there are numerous decisions made by researchers which are affected by personal preferences, norms of the discipline and societal values. Thus, the main question addressed in this chapter is: do researchers' measurement choices influence trends in earnings inequality?

This essay offers three unique features. First, trends in earnings inequality in Canada during the 1980s are compared to trends in the 1970s and to changes in earnings inequality experienced in other countries during the 1980s. Second, the question of whether these changes in earnings inequality are statistically significant changes in earnings inequality is assessed. Consequently, the standard errors associated with each of the inequality indicators are calculated, including the standard errors for the Gini Coefficient which are not usually estimated due to their computational difficulty. This first essay compares trends in earnings inequality using two Statistics Canada data sets, the combination of the SWH 1981 and LMAS 1989 and the SCF 1981 and 1989. Third, this essay provides a method for revising the SWH 1981 which improves the accuracy of estimates of earnings inequality in 1981 and the trends between 1981 and 1989. This method is argued to be an improvement over methods which have been used in previous studies.

Results of the first essay indicate that changes in earnings inequality during the 1980s depend critically upon the definition of the population. Comparisons of estimates of earnings inequality from different studies within and across countries which use even slightly different definitions of the population, in terms of age/sex and work status dimensions, will be misleading.[239] For example, earnings inequality increased for all male workers and full-time/full-year female workers, but declined for all female workers and for young workers (aged 17-24 years). A few examples follow.

For men:

. the increase in earnings inequality is significant for each of the inequality indicators considered;

. earnings inequality increased between 17 and 26 basis points (in terms of the Gini Coefficient), according respectively, to the SWH/LMAS and SCF data;

. this increase in earnings inequality of 0.9 per cent per annum (1981 to 1989, using the SCF data) in Canada is smaller than the increase of 1.2 per cent annum (1981 to 1987) for the U.S[240];

. the bottom 70 per cent of workers were worse-off in relative terms in 1989 compared to 1981 (i.e., received a smaller share of total earnings) and the top decline gained an additional 1.4 percentage points of total earnings; and the bottom 30 per cent were worse-off in absolute terms;

. for full-time/full-year workers, earnings inequality increased but by a smaller amount than for all workers and prime age workers; the Gini Coefficient increased by 10, 17, and 22 basis points, respectively, for the three groups;

For women working full-time/full-year:

. earnings inequality increased according to each of the inequality indicators: for example, it increased by 18 basis points (according to the Gini Coefficient) between 1981 and 1989, or about 0.2 per cent per year;

. the bottom 20 per cent of full-time/full-year workers were made worse-off in absolute terms and the bottom 70 per cent were worse-off in relative terms (in comparison, there was no such deterioration in the absolute and relative positions, of male full-time/full-year workers).

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[239]. Comparison between studies across countries at a given point in time are likely to misrepresent the actual ranking of inequality among countries.

[240]. Calculated from Karoly (1988) in Levy and Murnane (1992).

For a given population definition, trends in earnings inequality are quite robust to measurement choices, such as exclusion of a certain percentage of top or bottom observations, top-income coding, income definition, and inequality indicator. Such measurement choices tend, however, to influence the magnitude of the change, rather than the direction. Some of these findings are highlighted below.

Excluding a percentage of the top earnings observations serves to substantially underestimate the increase in earnings inequality. The underestimation is particularly large for men, and when the CV^2 inequality indicator is selected.

- For example, for men, excluding 2 per cent of the top earnings observations reduces the increase in earnings inequality of .061 basis points to .034 basis points (according to the CV^2).

Excluding a certain percentage of the bottom earnings observations also underestimates the change in earnings inequality, particularly for women and when the CV^2 is selected.

The implementation of top-income coding results in the underestimation of the increase in earnings inequality, particularly for men, and for the CV^2. While top-income coding was not implemented in the either of the SWH/LMAS or SCF data sets, it is implemented in other countries, for example, in the CPS, in the U.S. The main problem with top-income coding is that the upward revision of the top-income in a step-like fashion by unequal increments, and unevenly over the years, makes it extremely difficult to assess changes in the degree of underestimation. As an indication of the severity of this issue:

- if top-income coding is implemented at a level five times the median annual earnings (a level comparable to that used in the U.S.), this results in underestimation of the increase in earnings inequality, for men, by 19 basis points according to the CV^2.[241]

The choice of data sets can influence the magnitude of the observed change in earnings inequality. While SCF and SWH/LMAS generated similar trends, the SCF data gave rise to substantially larger increases in earnings inequality. The difference in the magnitude of the changes demonstrates the importance of differences between data sets in the capture of earnings observations at different points in the earnings distribution. More specifically, even the difference in capture of 0.1 per cent of the observations in the upper tail can result in quite substantial differences in the magnitude of changes in earnings inequality.

- For example, for men, the SCF and SWH/LMAS data generated increases in earnings inequality, respectively, of 26 and 17 basis points (in terms of the Gini Coefficient); and a substantial part of this difference is due to the greater capture of high earnings observations in the SCF data.

Most studies define earnings as wages and salaries, rather than, the sum of wages, salaries and self-employment earnings. Excluding self-employment earnings underestimates the trend in earnings inequality, particularly if the Theil Entropy or CV^2 inequality indicators are used.

- For example, the increase in earnings inequality (in terms of the CV^2) for men was .173 basis points when earnings were defined as wages and salaries only, and .387 basis points when earnings were defined as wages, salaries and self-employment earnings.

241. Note that in the CPS, the real value of the top-income code almost doubled between 1981 and 1988 (see footnote number 62) which implies that the degree of bias in an estimate of earnings inequality changes over time.

In summary, whether earnings inequality increased during the 1980s depends critically upon the reference population. How a researcher defines the population is influenced by social norms of what is appropriate and this also has historical bounds. Researchers' choices about the treatment of outliers, data set, definition of earnings, and inequality indicator are also shown to potentially and empirically affect estimates of the magnitude of the change in earnings inequality. Thus, comparing trends in earnings inequality in different countries based upon different measurement choices can be quite misleading.

Having examined trends in earnings inequality, chapter 3 explores the relationship between macroeconomic conditions and earnings inequality, within a specific model of labour market adjustment. The micro-optimizing model of firms' behaviours exhibits segmented labour market and efficiency wage features. It has two components. The first component, adapts Osberg's (1995) model, to show the conditions under which firms, responding to a rise in the unemployment rate, switch to a just-in-time labour strategy and increase the proportion of casual workers. The second component, demonstrates the conditions under which an increase in the proportion of casual workers results in an increase in earnings inequality. Discussing the evidence concerning the relationship between macroeconomic conditions and earnings inequality with explicit reference to a specific model of labour market adjustment is the novel feature of this chapter.

Three main questions are addressed in chapter 4. Given that, the period 1981 to 1989 represents a business cycle[242], and the predictions from the labour market model, the first question asked is: "Did earnings inequality among all workers (men and women combined) change counter-cyclically in the 1980s?" To address this question, the unemployment rate was regressed on various inequality indicators and decile shares using a variety of different equation specifications. Two of the results are noted below.

- The hypothesized positive unemployment rate-inequality relationship is strongly supported for the period 1981 to 1986: for example, a one percentage point increase in the unemployment rate results in a loss of .037 and .068 percentage points in the shares of earnings accruing to the first and second deciles of workers and an increase of .05 basis points in the VLN indicator.

- The nature of the unemployment rate-earnings inequality relationship in the latter part of the 1980s is less robust to measurement choices, although the weight of the evidence suggests that there was a continued negative relationship, albeit weakened.[243]

The second question addressed (in chapter 4) is: "Were some groups of workers affected by cyclical factors to a greater extent than others?" Regressions of the unemployment rate on estimates of earnings inequality are estimated separately for men and women. The key results of these regressions are as follows.

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[242]. The unemployment rate rose from 7.5 per cent in 1981, to almost 12 per cent in 1983, and fell back to 7.5 per cent in 1989.

[243]. This result occurs if the equation is estimated in terms of levels, and generally, for the Gini and Theil inequality indicators. It can be argued that estimating the equation in levels is actually better than estimating the equation in terms of changes since the pattern of unemployment between 1981 and 1986 differed than that for 1986 to 1989. A weakened unemployment rate-earnings inequality relationship for the late 1980s is also reported by Cutler and Katz (1991) and is consistent with the labour market adjustment mechanism proposed here, since firms labour adjustment strategies are likely to be hysteretic.

- For the period 1981 to 1986, a one percentage point rise in the unemployment rate results in losses in shares of total earnings: for men, of .05 and .08 percentage points accruing to the first and second deciles, respectively; and for women, of .060, 095 and .107 percentage points to deciles two, three and four, respectively.

- The weight of the evidence indicates that the negative unemployment rate-earnings inequality relationship in the late 1980s did not weaken for men, but is more likely to have weakened for women.[244]

The labour market outcomes of young workers has been observed in the literature to have deteriorated during the 1980s [for example, by Myles et al. (1988)]. Thus, two questions, related to the broad question above, were asked: "Did between-age-group inequality follow a counter-cyclical pattern? and were changes in overall earnings inequality due to change in between-age-group inequality, or to changes in within-age-group inequality?" Evidence on these questions is advanced by decomposing the Theil Entropy index into between- and within-age-group inequality, following Shorrocks (1980). The key results are as follows.

- Between-age-group inequality followed a counter-cyclical pattern (for men and women separately, and men and women combined).[245]

- Given that between-age-group inequality is driven by changes in the relative mean earnings of young workers, this result is consistent with the model's predictions that young workers are particularly adversely affected by a deterioration in macroeconomic conditions.[246]

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[244]. This result is based upon regressions estimated in terms of levels. In general, the unemployment rate-earnings inequality relationship is less robust to measurement choices for women.

[245]. Within-age-group inequality increased throughout the 1980s.

[246]. Specifically, in the context of this model, the mechanism by which a deterioration in macroeconomic conditions affects mean earnings of young workers is that the resulting decline in permanent jobs offered by firms, disproportionately reduces

- Changes in earnings inequality during the 1980s were influenced to a greater extent by changes in between-age-group inequality than by within-age group inequality.

Finally in this chapter, the counter-cyclical predictions related to annual earnings is extended to the inequality of hourly wage rates and annual hours worked (the components of annual earnings). The third question asked in chapter 4 is: "Did the inequality of both hourly wage rates and annual hours worked follow a counter-cyclical pattern? and were changes in inequality of annual hours worked larger than changes in inequality of hourly wage rates?" Answering this question in the affirmative is what is expected in the context of a segmented labour market model. To assess the relative contributions of these two components to changes in overall annual earnings inequality, the VLN indicator of annual earnings is decomposed into the VLN of hourly wages, the VLN of annual hours worked, and the Covariance of Ln wages and Ln hours. The following results are particularly interesting.

- Inequality in hourly wage rates moved counter-cyclically for men and women.

- Inequality in annual hours worked moved counter-cyclically for men but steadily declined for women. It is possible that, for women, the counter-cyclical changes in inequality in annual hours worked existed but were overrided by secular increases in work-time.

- Over the business cycle, changes in annual earnings inequality are driven to a greater extent by changes in inequality of annual hours worked relative to hourly wages rates, confirming a result of Morissette et al. (1993).

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firms' demand for young workers. These results are particularly interesting since the proportion of young workers entering the labour market declined over the 1980s.

. For men, while both inequality of hourly wage rates and annual hours worked moved counter-cyclically, the rise in earnings inequality over the period 1981 to 1989 was due to the rise in inequality of hourly wage rates and the rise in covariance between wages and hours. A finding, not unlike the movements in inequality of "prices" and "quantity" for the U.S. [see Juhn at al (1993)].[247]

In the final essay, presented in chapter 4, the relationship between earnings inequality and macroeconomic conditions is extended to take account of structural, institutional, and demographic factors and other dimensions of inequality. The model of how firms may alter their job structure in response to changes in the unemployment rate, presented in the previous essay, is extended to incorporate frequently discussed microeconomic explanations of changes in earnings inequality. The microeconomic explanations considered here are: the institutional factors of deunionization and decline in real minimum wages; demand side factors which are deindustrialization, increased import-competition, and technological change; and the supply side factors of the increased relative supply of university-educated workers and the increased relative supply of female workers. These factors affect firms' decisions to increase the proportion of casual jobs offered, either through changing the ability of firms to recruit casual labour, or by directly changing the relative cost of permanent and casual labour. The second extension in this essay is to consider not only the determinants of changes in earning inequality, but also, the determinants of changes in the age and education premia. The education premium is defined as mean earnings of workers with a university degree

[247]. This conclusion must be qualified since it is based upon only one inequality indicator, that of the VLN. However, based upon a standardization exercise (which cannot take account of changes in covariance between wages and hours), this result is supported.

relative to mean earnings of workers with a high school diploma or less. The age premium is defined as the mean earnings of workers aged 17 to 24 years relative to mean earnings of workers aged 25 to 54 years.

This essay departs from the literature in three ways. First, it assesses the relative empirical contribution of various explanations of increased inequality within a comprehensive empirical framework, whereas, previous studies have tended to focus upon the relationship between increased inequality and a single explanation [see for example, Card (1992) and Lemieux (1993) on unionization, Krueger (1993) on technological change, and Picot et al. (1990) on deindustrialization]. Second, the segmented labour market model of adjustment is also used to interpret the empirical findings on the determinants of the education premium, which have typically been examined within a partial equilibrium labour market model [see for example, Freeman and Needels (1993), Patrinos (1993a), and Burtless (1990). Third, this essay is based upon a unique regional data set which is larger and richer than data sets used in similar studies.

Given the three inequality dimensions, eight independent variables, and various other measurement choices (such as income concept, population definition, and equation specification in levels or changes), the set of empirical results is very large. Consequently, the results are organized to address two broad questions. The first question is: which determinants consistently affect inequality across measurement choices? In answering this question, the following results are particularly striking.

- Macroeconomic activity and unionization have strong, consistent, and significant impacts on the two dimensions of inequality, in accordance with the model's predictions, and the impacts are very robust to measurement choices (the exception is the age premium).

- The impact of macroeconomic conditions is similar to that reported in the previous chapter, despite the inclusion of microeconomic explanations.

- As a group, the structural and demographic variables are not important determinants of changes in these three dimensions of inequality during the 1980s.

The second question addressed is two-fold: are certain determinants more likely to affect particular dimensions of inequality? and are these patterns gender-specific? In general, while there is some support for selected determinants in the context of a given dimension of inequality, in comparison to macroeconomic conditions and unionization, these relationships are much less robust to measurement choices. Key results pertaining to each dimension are noted below.

Results pertaining to determinants of inequality among workers are noted first. In general, variables which are significant and correctly signed are sensitive to measurement choices about equation specification and income concept.

- For men, there is limited support that technological change and the decline in real minimum wages contributed toward increased earnings inequality. There is no support for the hypotheses that deindustrialization, greater import-competition, and increased supply of university-educated workers contributed towards changes in earnings inequality.

- For women, there is limited support for the hypotheses that technological change, the decline in real minimum wages, along with deindustrialization, and the increased relative supply of university-educated workers affected changes in earnings inequality.

With respect to changes in the education premium, the following results are noted.

- For both men and women, there is a strong and consistent impact of the unemployment rate on dampening the education premium; and this contrasts with findings for the U.S. [see Mincer (1991), for example].
- For both men and women, increases in the relative supplies of university-educated workers dampened the education premium which supports the results of other studies such as Freeman and Needels (1993).
- For women, technological change contributed to increases in the education premium.
- For both men and women, the minimum wage variable is consistently significant but incorrectly signed.

In general, assessing the relative empirical contribution of the various factors to changes in the age premium met with less success than explaining changes in the other two dimensions of inequality.

- While limited support for the macroeconomic conditions hypothesis is found, the unemployment rate is not consistently a significant determinant of the age premium, which contrasts with the role played by the unemployment rate in explaining the other two dimensions of inequality, almost regardless of measurement choices.
- For women and men, there is only limited support that macroeconomic conditions, technological change, and minimum wages contributed towards the deterioration in the position of young workers. For men, deunionization may also have played a role.

Having reviewed the key results, several areas for future research are outlined. First, as a general observation, the empirical findings indicate that we have been better at explaining the labour market outcomes of men compared to women during the 1980s. Further work on understanding changes in earnings inequality among women might want to consider questions such as the following:

- Why did the unemployment rate-earnings inequality relationship weaken to a greater extent for women than men? and, how did changes in the quantity of market work performed by women affect this relationship?

- Why did within-age group inequality for men continue to rise throughout the 1980s, and decline for women?

Second, the findings from chapters 3 and 4 strongly indicate that further attempts to distinguish among various structural explanations of increased earnings inequality, must be placed within a broad macroeconomic and institutional context. While support for some of the other explanations such as technological change and minimum wages is limited, it is sufficiently interesting and such explanations warrant further attention. Future research in this area might consider the following points.

- There is a need to consider alternative mechanisms by which technological change affects workers and consequently, alternative proxy variables; in particular, direct measures of technological change would be useful.

- There is a need to use alternative empirical approaches for assessing the impact of minimum wages on inequality. The method used here suffered from the limitation that there was little regional (and provincial) variation in the minimum wage levels which may explain the limited results.

Third, some of the variables used to proxy explanations in chapter 4, are often significant but incorrectly signed. Attention needs to be paid to possible alternative mechanisms and proxy variables.

- The minimum wage variable in the context of the education premium regression is consistently significant but incorrectly signed given the model's prediction.[248] The finding of a significant positive relationship which is quite robust to measurement choices is indicative of an alternative mechanism. Specifically,

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[248]. The hypothesis is that a decline in the minimum wage induces firms to switch to a just-in-time labour strategy, disproportionately lay-off less-educated permanent workers which reduces mean earnings of less-educated workers and increases the education premium.

there is need to analyze whether changes in the minimum wage induce firms to substitute university-educated workers for high school educated workers.

- The trade variable in the context of the education premium and inequality regression is frequently significant but incorrectly signed given the model's prediction.[249] It may be that in countries with relatively limited wage flexibility such displacement of less-educated workers results in increased unemployment rather than depressing wages of less-educated workers [see Freeman (1995)].

- More generally, it would be interesting to assess the impact of workers displaced as result of deindustrialization and increased import-competition on the distribution of earnings and unemployment. Suppose that displaced workers are unemployed for long periods of time rather than quickly finding work at lower wages in the service sector. Even if this is the case, the longer periods of unemployment need not be taken as indicative of an unwillingness of workers to work at lower wages, but of demand and institutional factors contributing to wage rigidity.

Given that the unemployment rate has increased from 7.5 per cent in 1989, to 9.5 per cent in 1995, it is expected that earnings inequality again increased. Thus, the main policy implication of this thesis is that while policy interventions which emphasize microeconomic interventions, such as new skills acquisitions, retraining, and technological change, remain appropriate, these results indicate that macroeconomic policies designed to reduce unemployment form a critical component of any strategy aimed at reducing earnings inequality and improving the economic situation of the working poor. Given the current high rates of unemployment, such policies are of immediate concern.

[249]. The hypothesis is that, similar to deindustrialization, a rise in import-competition reduces the relative size of the manufacturing sector, increases the proportion of casual jobs which directly increases inequality, and disproportionately displaces less-educated workers, raising the education premium.

APPENDIX A

MEASUREMENT ERROR AND ITS IMPACT ON ESTIMATES OF EARNINGS INEQUALITY

APPENDIX A

Measurement Error and its Impact on Estimates of Earnings Inequality

The methods of data collection adopted by a statistical agency, in addition to the methods of data compilation, such as whether and how earnings are top-coded as discussed in section 2.3.3 above, will affect the reliability of the data and estimates of earnings inequality at a point in time and over time. Researchers do not typically make decisions about data collection that may affect their estimates of earnings inequality, so a discussion of measurement error at the data collection stage may seem tangential to the discussion of whether researchers' choices matter. The issue is interesting, however, because the bias in inequality estimates arising from these measurement errors is potentially large. Yet this potential bias is rarely discussed by researchers in presenting inequality estimates. It is ironic that greater attention is paid to discussion of sophisticated econometric techniques than to issues of data reliability.

At the data collection stage, it is usual to distinguish between measurement error and sampling error. Measurement error (sometimes referred to as non-sampling error, survey error, or response error) arises from the individuals selected to participate in the sample survey. Sampling error arises because certain groups of individuals are excluded from the sample.

There are two types of measurement error common to all survey data sets and these are non-response and biased response. **Non-response** is of two types which are: item non-response which refers to missing items of information from sampled individuals; and complete non-response which refers to no information on all items because the individual selected refuses to participate or cannot be contacted (no one is at home during the enumeration). Non-response is a particularly serious problem in longitudinal survey because it accumulates over each data collection period, and the larger the number of periods, the greater the non-response rate. The sample is not reselected for each wave of the survey, consequently the "drop-outs" accumulate over each period and over time the sample becomes more and more unrepresentative. Complete non-response in longitudinal surveys is of three types: non-response on the first and all subsequent waves; non-response after the first wave and for all subsequent waves - attrition; and non-response after responding to at least one wave and then response on one or more subsequent waves - non-attrition.[1] In longitudinal surveys, the latter two types of non-response arise because of such factors as failure to locate respondents who move, death, and "survey fatigue". Kalton et al. (1989) reviews changes in the non-response rate among waves for a variety of different panel surveys. To take one example, they note that the Panel Study of Income Dynamics exhibited a response rate of 76 per cent in its first year (1968), but by 1983, the cumulative attrition had reduced this rate to 45 per cent.[2]

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[1]. For example, in the three year LMAS, Michaud and Hunter (1992) report that "16% of non-response was due to attrition and 4% were non-attritors" (i.e. who did not respond to one or more waves and then responded again) [Michaud and Hunter (1993), p. 90]. I assume this means that the total non-response rate was 20 per cent.

[2]. For a set of papers discussing panel surveys, see Kasprazyk et al. (1989). Duncan et al. (1984), using a simulation method, suggest that the bias introduced depends upon the re-weighting method employed, and that one cannot automatically assume that longitudinal surveys generate biased results.

Statistical agencies adjust the data when non-response occurs in both longitudinal and cross-sectional surveys, and the methods are discussed in the following paragraphs. As is noted, however, the potential bias due to non-response cannot be completely eliminated by these methods. While bias is introduced when individuals fail to respond, bias is also introduced when individuals provide inaccurate information. Biased response includes errors which are made on purpose such as the calculated under-reporting of earnings and secondly, errors which are made by mistake due to inability to recall exactly. While surveys are designed in such a manner so as to assist respondents in recalling information, for example in the sequencing of questions, there is no method for addressing the problem of purposeful biased response.

Basically there are two methods for addressing non-response: imputation methods for item non-response and weight adjustments for complete non-response, although the exact method varies among data sets.[3] For item non-response, missing items are typically imputed using a standard "hot-deck" procedure. Each non-respondent is matched to a respondent with similar characteristics where the characteristics used in the matching process typically include age, sex, education, occupation, hours and weeks worked, and place of residence. The method for dealing with complete non-response by an individual or family, is typically done by increasing the weights of "like" respondent records to compensate for the non-response. Here, the weighting is done by the province (or economic region), age and sex variables.

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[3]. For example, the method will depend upon the nature and purpose of the survey and whether it is a cross-sectional or longitudinal survey, as will be mentioned below. See Lepkowski (1989) for a detailed discussion of methods for treating non-response.

These two general methods apply in the case of the LMAS. For partial non-response, records with missing items are imputed from similar records. In the LMAS, 52 characteristics are used in the matching process to select the "like" individual. Adjustments for complete non-response (because no-one is home or refusal to participate), on the other hand, are made through the "balancing weights". In these cases, the weights of interviewed households in close (geographical) proximity to the non-response households are increased in order to reflect the non-response rate. For the cross-sectional files of the LMAS, attrition is dealt with through weighting and adding new respondents.

There is some experimental work being conducted to find better methods than the above-mentioned weight adjustment procedure for dealing with non-response after the first wave in longitudinal surveys. In the Canadian context[4], Michaud and Hunter (1993) argue that in the case of longitudinal data, it is better to use imputation techniques than weight adjustment in the cases of wave non-response (non-attrition) and attrition [p.91]. Michaud and Hunter (1993) correct for non-response in the LMAS data with an imputation method based upon a logistic model and the regular weighting method. They report that the 1987 estimates derived from the imputation method were "consistently closer to the 1986 estimates than those using the regular method of weighting". Of interest to this study is that their choice of adjustment method for non-response made a significant difference for one variable, namely, that of weeks employed. The variable,

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[4]. For a U.S. example (referring to the SIPP data) see Lepkowksi et al. (1993) who discuss the progress on their experimental work on combining imputation and adjustment techniques.

weeks employed, affects the value of annual earnings, although the empirical impact on estimates of earnings inequality remains unknown.

In the remaining paragraphs of this Appendix, it is argued that the weight adjusting method is limited in its ability to correct for measurement error because it is based on the implicit assumption that all non-response is random. In order to use this method, it is assumed that the interviewed and non-interviewed (i.e. the refusing) households share the same characteristics and that there is no relationship between non-response for an individual (due to refusal, no-one home) and, for example, a variable such as earnings. If this assumption is false, then the estimates will be biased and the bias is directly related to the non-response rate (and the non-response rate may change over time). Firstly, two hypothetical examples are outlined to illustrate why non-response is unlikely to be random and its potential impact on estimates of earnings inequality. Secondly, some evidence is advanced which also suggests that non-response is non-random.

While some non-response may be random, if a percentage of the non-response is related to earnings then this will affect estimates of earnings inequality. If non-response is related systematically to earnings, let us suppose in a U-shaped manner (with very low and very high earners more likely not to respond), then these methods of adjustment for non-response introduces bias. Two examples are constructed below to illustrate, firstly, that this U-shaped relationship is plausible and, secondly, that it is plausible for different types of non-response.

First, one might argue that workers with low earnings have a higher complete non-response rate because they are more difficult to contact, given their more difficult lives (greater probability of shift work and/or instability in work, greater residential mobility/telephone inaccessibility), and/or less time to participate in lengthy surveys. Speculatively, it might be the case that less-educated workers are more likely to refuse to participate (note the observed relationship between voting behaviour and education), thereby also underestimating the lower tail of the distribution. Regardless of the reason for non-response, the use of balancing weights over-estimates their earnings, or alternatively, the lower tail of the earnings distribution is underestimated.

Second, suppose that workers with very high earnings refuse to respond to the questions on earnings, or refuse to participate in the survey, which is item and complete non-response, respectively. If an individual refuses to participate in the survey, then the balancing weights are used, and if the other households in close proximity have lower incomes then the non-response household, then the upper tail of the earnings distribution will be underestimated. If an individual refuses to respond to the specific earnings questions but answers all other questions, then earnings are imputed from earnings on the basis of the earnings of individuals with similar characteristics (age, education). Again <u>if</u> there is a relationship between earnings and non-response, then this procedure will underestimate the upper tail.[5]

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[5]. S. Roller, Statistics Canada indicates that income item non-response may be higher among high earners. Further, under-representation of high income persons (complete non-response) may due to non-response or geographic selection of the sample. [personal communication, March 30, 1994].

While these examples are only hypothetical, they suggest plausible reasons why non-response may not be random and there is evidence to support this contention. Coder (1993) shows that measurement error is not found evenly throughout an earnings distribution. He compares U.S. survey data on wages/salaries with data from income tax returns for the same individuals. For a sub-group of the population (married couples for whom social insurance numbers could be matched) he reports the following interesting results:

- the survey data underestimate mean and median earnings by 7 and 5 per cent respectively, even though about 20 per cent of the cases in the income tax data reported deferred earnings which implies that income tax data should generate lower estimates of the mean and median;

- while in general, the survey underestimates mean earnings, in 38 per cent of the cases, the survey had higher earnings than the tax return data but there were a larger percentage of cases with lower earnings in the survey compared to the income tax data and the extent of the error was greater;

- the bias essentially occurs in the top decile; and

- the estimate of earnings inequality (Gini Coefficient) according to the survey data was 90 per cent of the Gini Coefficient generated with the income tax data.

Coder (1993) finds that the missing data in the survey and the use of the imputation method is a major cause of the overall difference between the survey and income tax data. In the survey, 21 per cent of the observations had missing earnings data and this accounted for 40 per cent of the amount by which mean earnings were underestimated in the survey. Further, the upper tail of the distribution is under-represented in the survey compared to the income tax data and, specifically: for earnings less than $200,000 the variance was biased downwards by 10 per cent; and for earnings less than $700,000, the variance is biased downwards by more than 50 per cent.

Second, Michaud and Hunter (1993) found, with respect to the LMAS data, that the non-response rate is non-random or, more concretely, that the non-response rate varies among different groups. The highest non-response rates occurred for people who moved (including those who were non-traceable), were unemployed, and unmarried. They argue that, given the differences in the characteristics of respondents and non-respondents, the method of adjusting weights (of individuals in close geographical proximity) to account for non-response, rather than using information available from preceding waves, is not the best method.

In summary, the two hypothetical examples and evidence cited above suggest that survey data sets systematically underestimate the number of individuals with very low or very high earnings - the tails of the earnings distribution. As a result, the data set will give rise to an underestimation of the degree of earnings inequality.

If the degree of bias due to non-response is constant over time and constant between data sets, the bias would be less of a pro" lem in estimating trends in inequality. This, however, is not the case. First, non-response rates vary considerably from year to year. For example, the individual income non-response rates for the SCF in 1980 and 1982 were 68.7 and 81.1 per cent, respectively. In 1987 and 1988, they were 80.7 and 74.9 per cent, respectively. Karoly (1993) notes that the fraction of respondents in the CPS who do not report at least one income item has grown from 9 per cent in 1964, to 27 per cent in recent surveys. Such missing items are imputed on the basis of income reported by other respondents with similar characteristics, as in the LMAS 1989 and SWH 1981. As noted earlier, if the probability of not reporting income items is related to one's level of income then a bias is introduced, and it appears that this bias has indeed increased. Second, non-response rates vary among data sets. Since methodologies for calculating non-response rates differ among surveys, it is impossible to make comparisons.[6] Third, types of non-response are also likely to vary over time, such as refusal to participate in longitudinal surveys.[7]

To the extent that non-response has increased over time, measurement error has increased, and given the arguments above, then the tails of the distribution are increasingly underestimated. Hence, trends in earnings inequality are underestimated. However, this issue cannot empirically examined with the data available.

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[6]. For example, in some surveys, a household is excluded if only one household member refuses to participate, whereas in others, the household would be included and information imputed for the refusing individual. A project is underway in the Methodology Section, Statistics Canada to try to devise a methodology to calculate non-response rates in each of the surveys which would allow comparisons. [Michael Dumonlin, Statistics Canada].

[7]. See Kalton et al. (1989) who provides estimates of non-response rates in a variety of U.S. surveys.

APPENDIX B

FEATURES OF SURVEY DESIGN COMMON TO THE THREE DATA SETS, THE SWH 1981, LMAS 1989, AND SCF 1981, 1989

APPENDIX B

Features of Survey Design Common to the Three Data Sets, the SWH 1981, LMAS 1989, and SCF 1981, 1989

Shared Sample Survey Methodology and Weighting Method

The three surveys use a proportion of the LFS sample and, consequently, they generate data of similar representativeness. Specifically, the data are representative of a population which is of working age, in the ten provinces and excludes residents in the Territories, institutions, military barracks, and Indian reserves.[8] Given that the three surveys are derived from the LFS sample, the LFS sampling frame and its implications for weighting are outlined below.

(a) Sampling Frame

The LFS is a monthly survey designed to produce monthly estimates of total employment, self-employment and unemployment. The design of the LFS is based upon six rotating groups of respondents. Each group stays in the survey for six months. Each month, one group (one-sixth of the sample) rotates out of the survey after it has been in the survey for six months, and this group is replaced by a new group. Each of the LFS rotation groups represent about 20,000 individuals. Each of the LFS supplementary

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[8]. The information in this Appendix is based upon the microdata documentation accompanying each of the data sets and more detailed information about the LFS provided in the Statistics Canada documents Methodology of the Canadian Labour Force Survey 1976, and Methodology of the Canadian Labour Force Survey 1984-1990, Catalogue 71-526.

surveys, the SWH, LMAS, and SCF, are undertaken with about two-thirds of the total LFS sample, generating samples of about 80,000 individuals. The dates of collection were: January 1982 for the SWH 1981; January and February 1990 for the LMAS 1989[9]; April and May 1982 for the SCF 1981; and April and May 1990 for the SCF 1989.

The LFS survey design is a stratified multi-stage area sample where dwellings are the ultimate sampling unit. The SWH 1981 and SCF 1981 samples are based upon the 1971 Census and the LMAS 1986 and 1989 and SCF 1989 are based upon the 1981 Census. Each of the provinces are divided into a number of primary strata defined as economic regions, where an economic region is an area exhibiting a stable homogeneous economic structure. Each economic region is then divided into self-representing units (SRUs), non-self-representing units (NSRUs), and special areas. Within each of these components, further stratification occurs which involves the selection of primary sampling units, division of primary sampling units into clusters, and sampling of households within clusters. The various levels of stratification are briefly described below.

Self-representing units (SRUs) are cities, typically having a population exceeding 15,000, although the exact population size defining a SRU varies from region to region. The SRUs are further stratified into a number of primary sampling units, called sub-units, and the number selected depends upon the size of the SRU. Each sub-unit includes

[9]. The LMAS 1986 data which are used in chapters 3 and 4 were collected in January and February 1987.

between 1,000 and 12,000 dwellings. Within each sub-unit, a sample of clusters (between six and twelve), are selected randomly, where each cluster is about a city block. Within each cluster, about five or six dwellings are selected.

Non-self-representing units (NSRUs) refer to rural areas and small urban centres. Each NSRU is divided into a number of primary sampling units (between 10 and 20), where each of these primary sampling units represents one of seven industry/labour force segments (agriculture, forestry and fishing, mining, manufacturing, construction, transportation, or services). Urban centers are further sub-divided into a number of clusters where each cluster represents between 2 and 50 households; and for a number of clusters, the dwellings within the cluster are randomly selected.

Special areas refers to hospitals, schools, military bases, and remote areas of the provinces. Within each of these special areas, only the civilian workforce is sampled. For the remote areas, the primary sampling unit is the census enumeration area, within which clusters are defined, and dwellings randomly selected.

The SWH 1981 and SCF 1981 and 1989 are cross-sectional surveys, whereas the LMAS 1989 is a longitudinal survey. Although the LMAS is a longitudinal survey, the sampling frame in the first year of the panel (1988) is identical to that described above. A modification was made to the sampling frame for the subsequent years of the panel to ensure that the data generate representative "cross-sectional" estimates. This modification is of interest to this study since it employs the second year of the panel data (1989) and, consequently, is discussed in section 3.3.2 in chapter 2.

Individuals are included in the survey if their dwellings are selected as part of the sample. The data pertaining to each individual may be provided by the individual him/herself or by proxy from a "knowledgeable" household member. For example, in the LMAS 1986, 61 per cent of the respondents were interviewed directly. This percentage of direct respondents in the LMAS is higher than in the LFS where about 51 per cent of the respondents are interviewed directly. In the SCF, even if a "knowledgeable" household member completes the survey questionnaire for each member, a form containing the income questions is left for each respondent to complete directly.

(b) Weighting Method

The three surveys not only share the same sampling frame with each other and with the LFS, but in addition, they use a similar weighting scheme. The final weight attached to each record is the product of five factors, namely, the basic weight, rural-urban factor, balancing factor for non-response, cluster sub-weight and province age-sex adjustment. The basic weight is derived from the inverse of the sampling ratio relevant to the first stage of stratification. The rural-urban factor adjusts for the ratio of the urban to rural population based on census counts. The balancing factor (as discussed further below) adjusts for complete non-response due to such reasons as refusal, no one home, and non-existent household. The cluster subweight takes account of any growth in the cluster compared to the original design count. The age-sex factor adjusts the sample age-sex ratios in 40 categories in each province to correspond to those derived from the Census.

Methods for addressing Non-response

The methods for addressing the two types of non-response, item non-response and complete non-response, are common to each of the three surveys and follow the general principles outlined in Appendix A. **Item specific non-response** refers to the case where a respondent completes the survey with the exception of certain questions or items. Item non-response is dealt with through imputation from other records. For example, for the SCF 1981 data, income imputation was undertaken for 11,605 records from 57,694 records where income information was complete, or for approximately 17 per cent of all records. It is difficult to compare the rates of non-response to income items between the SWH/LMAS and SCF because different methods are used to calculate the non-response rates and because in the SCF there are many more income-related items than just wages and salaries as in the SWH/LMAS. Thus, even though it appears that the income non-response rate is higher in the SCF compared to the LMAS, we cannot infer that the wages/salaries non-response rate is higher in the SCF since the non-response rates reported for the SCF refer to all income items.[10]

[10]. For example, in the SCF 1989, the overall individual income non-response rate is 22.6 per cent; and in the LMAS 1989 the overall individual wage non-response rate is 14.2 per cent [personal communications, respectively, from M. Dumoulin and S. Roller, Statistics Canada].

Complete non-response refers to the case where no information is available for a selected dwelling due to individuals' refusals to participate, inability to contact individuals, or the selected dwelling does not exist. Non-response to the entire survey is addressed through adjusting the weights of responding (the interviewed) households in close geographical proximity to the non-responding household. This method assumes that the interviewed and non-responding households exhibit similar characteristics, an assumption which was questioned in Appendix A.

While the three surveys share a common sampling frame and method for addressing non-response, there are a number of survey design features which are unique to a specific survey and may influence the earnings data and inequality estimates generated. These features are discussed in sections 3.3 and 3.4 in the text of chapter 2.

APPENDIX C

PROBLEM OF BIAS IN THE SWH 1981 DATA, METHOD TO REVISE THE DATA, AND SIMULATION OF THE DEGREE OF BIAS

APPENDIX C

Problem of Bias in the SWH 1981 Data, Method to Revise the Data, and Simulation of the Degree of Bias

The Problem of Potential Bias in the SWH Earnings Data

The SWH and LMAS capture the same population, that of paid workers[11] and collect data on hours and earnings using the same method except that the LMAS provides greater detail about the months in which an individual starts and/or stops a job. The general method of collecting data and calculating annual earnings, the difference between the two surveys, and implications for bias in annual hours worked, annual earnings, and annual earnings inequality are described here.

In general, in the SWH and LMAS, data on annual earnings, hourly wage rates, and annual hours worked are calculated based upon the information given by respondents on the dollar amount earned for a given time period, and the usual work schedule for each job. This method of collecting the data contrasts with the SCF method where respondents provide directly a dollar amount earned annually from all jobs. The rationale for building this flexibility into the design of these questions, in the SWH and LMAS, is that if respondents can provide information in the way which makes sense to them, this will aid their recall and improve the accuracy of the data.[12]

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[11]. See Appendix B which describes the similarity in survey designs and section 3.3.6 which provides the definition of a paid job used in both surveys.

[12]. See Statistics Canada. Economic Characteristics Division. Labour Force Activity Section. "Hourly Earnings Data from the Survey of 1981 Work History", February 1984, p. 72.

Both the SWH and LMAS use an identical question to collect data on wages and salaries. Note that these questions are repeated for each job held by the respondent. The exact question used in the SWH and the LMAS is: "[w]hat was ....'s usual wage or salary before taxes and other deductions from this employer?" (questions 27a in the SWH and Q107BJ9 in the LMAS).

The respondent provides a dollar amount to the above question and then the time period to which the dollar amount applies, referred to as the rate code (questions q27b in the SWH and Q107BJ9 in the LMAS). The time periods in the SWH are: per hour; per day; per week; per month; per employer (job); or per year. In the LMAS, these six time periods are used along with two others which are: every two weeks; and twice per month.

This information on dollar amounts of wages and salaries for a given time period is collected along with information on the usual work schedule, through four questions in the SWH and five questions in the LMAS. In the SWH, these questions are:

(i) how many weeks per month did ... usually work for this employer?;

(ii) how many days per week did ... usually work?;

(iii) how many hours per day did ... usually work?"; and

(iv) in which months of 1981 did ... work for this employer?"

(questions q22, q21, q20, and q13jan-q13dec, respectively in the SWH).

While the LMAS uses questions very similar to questions (i-iv) above, they are combined with two additional questions, which capture the exact start-and-stop day in a given month of each job. In the LMAS, the questions are:

(i) how many weeks per month did ... usually work at this job in 1989?;

(ii) in the weeks that ... worked at this job how many paid days per week did ... usually work in 1989?;

(iii) on the days that ... worked at this job how many paid hours per day did...usually work in 1989?

(iv) start week of job; and

(v) stop week of job in 1989

(respectively, questions Q101j9, Q102J9, Q103J9, STWKJ9 and SPWKJ9 in the LMAS).

Combining the information on the dollar amount of wages and salaries, the rate code and usual work schedule, it is possible to calculate annual earnings, hourly wage rates, and annual hours worked. The method used in the SWH and LMAS is basically the same, with the exception that in the LMAS the data on start- and/or stop- dates can be used.

In the LMAS, the amount of work performed in the start- and/or stop-month is calculated accurately, whereas in the SWH if an individual starts and/or stops a job, it is assumed that the individual works his/her usual monthly schedule during that month, even if only one day of work was actually undertaken. For the LMAS, annual earnings for each individual is calculated by Statistics Canada taking account of the actual start and stop dates and the variable is included in the public use microdata file. However, for the SWH, annual earnings for each individual must be calculated by researchers using the information contained in the microdata file. The method for calculating annual earnings from the SWH 1981 is outlined in the microdocumentation accompanying the data file. Basically, the method involves calculating annual earnings for each job as the product of: the number of months worked; weeks worked per month; days worked per week; hours worked per day; and adjustment factor of 1.08631 (where 365/336=1.08631 to account for there being more than 4 weeks per month); and the hourly wage rate which is calculated by Statistics Canada and provided in the data file. Then, total annual earnings from all jobs is the sum of annual earnings from each job. Annual hours worked are potentially overestimated in the SWH since it does not capture accurately the work schedule in a job which starts and/or stops during the year.[13] Thus, the SWH potentially overestimates annual earnings.

The potential magnitude of this bias is demonstrated in the following numerical example. Suppose that for a given individual in the months that s/he starts and stops a job, the amount of work performed is only one day in these months, whereas the usual work schedule applies in the intervening months; and the usual work schedule is four weeks per month, five days per week and eight hours per day. So the actual amount of work performed in the stop and start months combined is 16 hours (2 months * 1 day * 8 hours/day = 16 hours). This actual amount of work equal 16 hours would be calculated accurately using the LMAS data. However, in the SWH, the amount of work would be calculated as 320 hours (2 months * 4 weeks/month * 5 days/week * 8 hours/day = 320); and thus, in the SWH, hours are overestimated by 304.

[13]. There are two other possible sources of measurement error in these calculations which affect both the SWH and LMAS estimates of annual earnings, as discussed in section 3.3.7.

Now this is clearly the extreme case and it is more usual for a worker starting and/or stopping a job to work the usual number of days per week in the start- and/or stop-month. Hence, the issue really is the number of weeks worked, at the usual weekly schedule (days/week, and hours/day) in the start- and/or stop-month. So to modify the above numerical example, suppose that the individual rather than working only one day actually works one week at the usual weekly schedule. Then the difference between the LMAS (the actual) and the SWH in annual hours worked is 240 hours [(2 months * 4 weeks/month * 5 days/week * 8 hours/day = 320) - (2 months * 1 week/month * 5 days/week * 8 hours/day = 80) = 240].

The bias does not exist for all workers, as illustrated in Figure C1. There is no bias in annual earnings, annual hours worked and hourly wage rates for workers with only one job who work for the full-year, Group A in Figure C1. For all remaining workers there is potentially a bias in the annual hours worked; specifically, annual hours worked is potentially overestimated. For the group of workers for whom annual hours worked is biased, the bias is greater for those workers who both start and stop jobs during the year (Groups D and E), than for workers who either only start or stop a job during the year (Groups B and C, respectively). Further, the longer the period of time worked, the smaller is the amount of bias, in proportionate terms, in annual hours worked. For example, for workers who both start and stop a job during the year, the extent of bias in annual hours worked is smaller for individuals in Group D compared to Group E. Finally, note that the bias occurs only for about one-half of all workers

(Groups B to E) and the bias essentially occurs in the first and second jobs, since only 2.7 per cent of the sample actually held three or more jobs.

Within this group for whom bias exists, there are two important sub-groups for whom unbiased estimates of either annual earnings or hourly wage rates exists. If the respondents give their wage and salary amount in terms of an amount per employer, then annual earnings estimates are accurate. The hourly wage rate estimates (calculated as annual earnings divided by annual hours worked) will be underestimated, however, since annual hours worked are overestimated. Alternatively, if the respondent gives his/her wage and salary amounts in terms of the other rate codes (hourly, daily, weekly, monthly, or annually) then the hourly wage rate can be calculated accurately given the usual work schedule, the rate code, and the dollar amount. However, the annual earnings estimated (calculated as the product of the hourly wage rates and annual hours worked) will be overestimated since annual hours worked is again overestimated. In conclusion, while the potential magnitude of the bias appears large from the above numerical examples, in reality, the bias in annual hours worked may be substantially less because the bias only affects a proportion of the workers and, second, the bias in annual earnings may be small if respondents provide information on wages and salaries in terms of a job/employer.

Thus, in general, the SWH 1981 potentially overestimates annual hours worked and hence, annual earnings. While the impact of this bias on the reliability of estimates of earnings inequality cannot be determined a priori, it is likely that the SWH 1981 underestimates the degree of earnings inequality. This hypothesis is correct **if** workers who start and/or stop jobs during the year tend to be low hourly wage rate workers. In which case, the usual method of calculating annual hours worked assigns a greater number of annual hours worked to low hourly wage rate workers than they actually worked which reduces the size of the lower tail of the earnings distribution.

A method is proposed below for examining, firstly, the size of the group for whom bias exists in annual hours worked, annual earnings, and hourly wage rates and, secondly, the possible magnitude and significance of the bias on estimates on earnings inequality.

Method for Estimating the Range of Bias in the SWH Earnings Data

With respect to estimating the size of the group for whom bias exists, the proportion of workers for whom estimates of annual hours worked are biased is calculated; and within this group, for each job, the proportion of workers with biased estimates of hourly wage rates or annual earnings is also calculated. Thus, not only can we calculate the proportion of the population for which no bias exists in annual hours worked, annual earnings, or hourly wage rates but we can calculate the proportion of workers for whom no bias exists in either annual earnings or hourly wage rates.

With respect to estimating the magnitude of the bias, the bias may not be large if in the start- and/or stop-months, the individual works the usual, or close to the usual, work schedule. The extent to which an individual works close to his/her usual work schedule in the start- and/or stop-month cannot be calculated directly with the SWH 1981 data, although one could do this with the LMAS data. While this problem cannot be directly examined we can put some bounds on the extent of the problem in order to gain an understanding of the extent of the bias present in the SWH data. A method for doing so is proposed below.

For the group for whom the bias occurs, three variables, annual earnings, annual hours worked, and hourly wage rates, are estimated under five different assumptions regarding the amount of work performed in the start- and stop-month. Equation (1) estimates the expected number of annual hours worked for a given individual i in each job j [$E(AH_{ij})_m$], given assumption "m" about the number of weeks worked in the start- and stop-month.

$$(1) \quad E(AH_{ij})_m = [(\#MONTHS_{ij}-Z_{ij})*(MONTHLY\ HOURS_{ij})*AF] + Z_{ij}*E(HOURS\ IN\ START/STOP\ MONTH_{ij})_m$$

where

$$(2) \quad E(HOURS\ IN\ START/STOP\ MONTH_{ij})_m$$

$$= W_m * (USUAL\ WEEKLY\ HOURS_{ij}) * AF$$

and

i	=	individual 1 to n
j	=	job 1 through 4
m	=	method for estimating bias
	=	1 to 5
AH_{ij}	=	annual hours worked by i in j
Z_{ij}	=	2 if i starts and stops in j
	=	1 if i either starts **or** stops in j
	=	0 if else
W_m	=	is the assigned number of weeks worked in start and stop month where $W_1=1$, $W_2=2$, $W_3=3$, $W_4=4$ and W_5=random number from 1 to 4. W_m must be less than or equal to the usual number of weeks worked ($W_m \leq$ usual weeks/month for i in j). If an individual stops and starts any jobs in the same month, $\sum W_m$ over $j \leq 4$.

AF = adjustment factor=1.08631 to account for there being more than 4 weeks (28 days) per month

(3) $E(AHTOT_i)_m = \sum_{j=1}^{4} E(AH_{ij})_m$

As shown in (1), $E(AH_{ij})_m$ is the expected annual hours worked by individual i, in job j, for a given estimating method m. $E(AH_{ij})_m$ is comprised of two parts. The first component of (1) represents the amount of work performed in the months which are neither start nor stop months, that is, where the usual monthly work schedule as reported does actually apply. We can derive Z_{ij} from the data where Z_{ij} captures whether individual i starts, stops, or starts and stops a job j during the year. Take the following example. Suppose that, for a given job j, individual i: performs work in 12 months; stops and starts this job during 1981; and reports a usual monthly work schedule of 4 weeks/month, 5 days/week, and 8 hours/day. Then the expected hours of work in the non-start or stop months is calculated as: [(12-2)*(4*5*8)*1.08631 = 1738 hours]. The estimated number of hours worked in the months between the start- and stop-months does not vary with the estimating method m which applies only to the start- and/or stop-months.[14]

[14]. The first and second components can be calculated accurately from the data for all individuals with the exception of those individuals who stop a job in December. The stop date for all months is determined in the following way: if an individual stops a job in November this can be captured since q13nov=1 and q13dec=0; however, if an individual stops a job in December, q13dec=1 and there is no information on the month of January.

The second component of (1) reflects the estimated hours worked in the start- and/or stop-month by individual i, in a job j, for a given estimating method m. The second component of (1) is expanded upon in (2), which indicates that the expected hours in the start- and stop-month for individual i, in job j is the product of the usual weekly hours worked (i.e. reported) in job j and a proxy for the number of weeks worked in the start- and/or stop-month, W_m. Here W_m takes the values from 1 to 4 to reflect four different possible number of weeks worked.[15] When m=1, only one week of work is assigned in the start- and/or stop-month, thereby generating the lowest estimate of annual hours worked; when m=4, four weeks of work are assigned thereby generating the largest estimate of annual hours worked. A fifth estimate of the number of weeks worked in the start- and/or stop-month is derived by randomly assigning each individual a number of weeks worked from 1 to 4, rather than assigning each individual the same number of weeks worked (from 1 to 4) Thus, for a given Wm, the expected number of hours worked in the start- and/or stop-month for individual i in job j, is multiplied by Z_{ij} to reflect whether individual i starts or stops job j (Z_{ij}=1), or starts and stops job j (Z_{ij}=2). Using the numerical example from above, and setting the extent of bias W_m=2, an estimate of the second component in (2) is. 2* [2 * 5days/week * 8hours/day] = 160 hours in the start and stop months.

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[15] Values of W_m are set in terms of weeks. This is reasonable given labour market norms which suggest that workers typically work their usual weekly schedule in the start and/or stop month. This assumption will still generate substantial differences between full-time and part-time workers.

Two further conditions are imposed. Firstly, if for each individual i in job j, W_m is greater than the usual weeks worked per month, then W_m is replaced by the usual weeks worked (for i in j). This prevents an individual being assigned a greater number of weeks in the start- and/or stop-month than s/he usually works. The second condition is that individuals are constrained to working a maximum of 4 weeks per month in all jobs. In the usual method of calculating annual hours worked, an individual who stops one job and starts another job could potentially have worked 8 weeks per month.

Thus, estimating method number 4 generates data on annual hours worked (and annual earnings and hourly wage rates) which are essentially the same as the usual method described previously. The values of annual hours worked calculated using this proposed method when $W_m=4$ and the usual method potentially differ because of the second condition noted above. This does not, however, create a noticeable impact.

Finally, note that (2) is estimated for each individual i for each job j and then must be summed over all jobs to generate the expected total annual hours worked in all jobs, as shown in (3).

As noted above, equation (1) is only estimated for the group of workers for whom there is measurement error in the annual hours worked variable due to the failure to capture the exact start and stop dates. So (1) is calculated only for this group. For all other workers, the usual method (described previously) of calculating annual hours worked is applied. The group for whom no bias (in annual hours worked, annual earnings, and hourly wage rates) exists is defined as those workers who held only one paid job and who worked 12 months in that job.

Within the group for whom annual hours are biased, there are two distinct sub-groups, also outlined above, namely, those workers for whom annual earning calculations are correct and the other group of individuals for whom hourly wage rate calculations are correct (see Figure C2). Thus, the method for calculating annual earnings and hourly wage rates takes into account how wages/salaries are reported (the rate code).

If wages/salaries for a given individual i in job j are reported as earnings from employer j (i.e. rate code=6), then the estimate of annual earnings (for i in j) available from the SWH data is unbiased (or at least is not biased due to the measurement error in the start- and/or stop-month). Thus, the best estimate of annual earnings (for i in j) is to use the data directly available from the SWH. We are concerned with eventually generating aggregate statistics (mean, median, inequality measures) for the five estimating methods, and thus, in the case of an individual reporting wages/salaries in terms of annual earnings or per employer, each of the five possible estimates of annual earnings $[E(AHTOT_{ij})_m]$ are identical and equal to the annual earnings using the usual SWH method. That is, the expected value of annual earnings for individual i in job j does not vary with the estimating method W_m as shown in equation (4). Although annual earnings for individual i, in job j are unbiased in the SWH data, the usual hourly wage rates calculation generates biased estimates given that hourly wage rates are calculated as annual earnings divided by annual hours worked variable and this latter variable is overestimated. Thus, each of the five estimates of the hourly wage rate variable $[E(HW_{ij})_m]$ are calculated as in equation (5), as the estimate of annual earnings (which is identical for all five methods) divided by the appropriate estimate of annual hours worked $[E(AH_{ij})_m]$.

(4) $E(AE_{ij})_1 = E(AE_{ij})_m$ for all m

(5) $E(HW_{ij})_m = E(AE_{ij})_{m=4} / E(AH_{ij})_m$

If the wages/salaries for individual i in job j are reported using all other rate codes (earnings per hour, day, week, month, and year (rate codes = 1 to 5)), then hourly wage rates can be calculated without bias (due to measurement error in the start- and/or stop-months). However, the usual method of calculating annual earnings is biased. Thus, for individual i in job j, the expected hourly wage rate in job j is calculated directly from the reported data on wages/salaries and usual work schedule and hence does not vary with the estimating method W_m, as shown in (4'). For rate codes 1 to 5, the estimate of annual earnings for individual i in job j is biased since annual hours worked are biased. Consequently, we derive the expected value of annual earnings for i in j, for a given estimating method m $[E(AE_{ij})_m]$, as the product of the reported hourly wage rate (calculated in (4') and the expected annual hours worked $[E(AH_{ij})_m]$ (calculated in 1-3), as shown in (5').

(4') $E(HW_{ij})_1 = E(HW_{ij})_m$ for all m

(5') $E(AE_{ij})_m = E(HW_{ij})_{m=4} * E(AH_{ij})_m$

Annual earnings are summed across up to four jobs and the average hourly wage rate from up to four jobs are calculated in the usual manner.[16]

Given this method, the results can be interpreted keeping in mind the following points

- Estimate 4 and the usual method of calculating the annual earnings variable should generate virtually identical estimates of annual earnings inequality;
- Estimate 4 should generate the lowest estimate of earnings inequality (i e. the usual method underestimates the degree of earnings inequality);
- Estimate 5 is considered to be the "best" estimate of the annual earnings variable since weeks or work in the start- and/or stop-months are distributed randomly and it generates the "best" estimate of earnings inequality.

Results

The above method is used to estimate, firstly, the size of the group for whom bias exists and, secondly, the possible extent of bias in estimates of annual earnings and hourly wage rate inequality in the SWH 1981 data. The population is defined as all workers between the ages of 17 and 69 years with paid employment.[17]

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[16]. Total annual earnings:

$E(AETOT_i)_m = \sum_{j=1}^{4} (E(AE_{ij})_m.$

Average hourly wage rate:
$E(avgHW_i)_m = [\sum_{j=1}^{4}(E(HW_{ij})_m * E(AH_{ij})_m]] \,/\, E(AHTOT_i)_m$.

[17]. This definition of the population means that workers who combine paid work with self-employment are included For example, if an individual's first job is self-employment and second job is paid work, s/he would be included in the population as defined here and excluded under a definition which focused upon individuals with exclusively paid work.

The group for whom no bias exists in annual hours worked, annual earnings and hourly wage rates represents about 54 per cent of the female population and 63 per cent of the male population, as summarized in Figure C3(a-b) with details shown in Table C1(a-b). The bias in annual hours worked essentially occurs for these workers in the first and second jobs,since the percentage of workers with third and fourth jobs is quite small. More precisely, the percentage of all workers with third and fourth jobs was shown in Table 1 in the text, and the percentage of workers for whom bias exists who have third and fourth jobs is even smaller. As shown in Table C1, of the workers with biased annual hours worked, only 5 per cent of women have a third job and 7 per cent of men have a third job. Concentrating on the first job, even for those workers who have a bias in annual hours worked, only 15 per cent (men and women) do not have biased annual hours worked in their first jobs. These workers have unbiased estimates of annual hours worked in their first jobs because they hold the job for the full-year but start and/or stop another job during the year. The extent of bias is less for those workers who either start or stop a job (Z=1), than for those who stop and start a job (Z=2); for both women and men, the percentages of workers in this first category are respectively, 63 and 58, and in the second category are 22 and 4. As to be expected with the second job, the percentage of workers who both start and stop a job is higher than the percentage of workers who either start or stop.

For the group of workers for whom bias in annual hours worked exists, about 95 per cent of these workers have biased estimates of annual earnings. The bias in annual earnings arises because of the bias in annual hours worked and because they report wages/salaries in some other form than per job (i.e. they use rate codes 1 through 5).

Five estimates of annual earnings and hourly wage rates for each worker are derived using the method described above and the data are used to derive five estimates of annual earnings and hourly wage rate inequality. In Table C2, five estimates of annual earnings inequality using the Gini Coefficient are presented. Estimate 4 should be almost identical to that which would be derived using the usual method of calculating annual earnings.[18] Estimate 4 can be compared with other estimates of inequality where Estimate 1 provides an indicator of inequality when weeks worked in the start- and/or stop-months is the lowest (weeks =1) and Estimate 5 is the "best" estimate, given that workers are randomly assigned 1 through 4 weeks of work.

First, the results support the hypothesis that the usual method of calculating annual earnings in the SWH (the equivalent of Estimate 4) does underestimate the degree of earnings inequality. For example, for women, the Gini Coefficient foı Estimate 4 is .4128 compared to .4361 for Estimate 1. This is plausible, as noted in the part (a), because the usual method assigns workers more hours of work than they likely work and it is likely that workers who start and/or stop jobs during the year receive lower hourly wage rates.

[18]. The Gini Coefficients generated using estimates of annual earnings calculated using the usual method are indeed identical to four decimal places for women and men. Note, however, that the means are not identical. The difference between Estimate 4 and annual earnings generated by the usual method could arise because Estimate 4 (and the other estimates) constrain the total number of weeks of work in all jobs in a given month to be four or less. There is, however, no empirical difference.

Second, the results give us an indication of the extent of bias in estimates of annual earnings inequality generated from the SWH 1981 data, both in terms of statistically significant differences and the empirical magnitude of the difference between Estimate 4 and other possibilities, including the "best" estimate. Since Estimate 4 is same as the estimate of earnings inequality derived from the usual method of calculating annual earnings data, the other estimates are compared with Estimate 4.

For both men and women, the usual SWH method underestimates earnings inequality 11 basis points for women and 9 basis points for men. For example, for women, earnings inequality measured by the Gini Coefficient is .4128 according to Estimate 4 and .4237 according to Estimate 5. For men, the Gini Coefficient is .3474 and .3568 for Estimates 4 and 5. These differences are statistically significant at the 5 per cent level of confidence.

The questions about the reliability of estimates of inequality derived from the SWH 1981 stem not only from an interest in earnings inequality at a point in time, but also from an interest in examining trends over the period 1981 to 1989 which can be undertaken with a comparison of estimates of inequality from the SWH 1981 and the LMAS 1989. Given that the "best" estimate of annual earnings generates estimates of earnings inequality which are substantially larger than those generated by the usual method and that the differences are statistically significant, subsequent empirical work uses the "best" estimate of annual earnings.

FIGURE C1

Groups of Paid Workers with Potentially Biased Data
on Annual Earnings in a Given Job

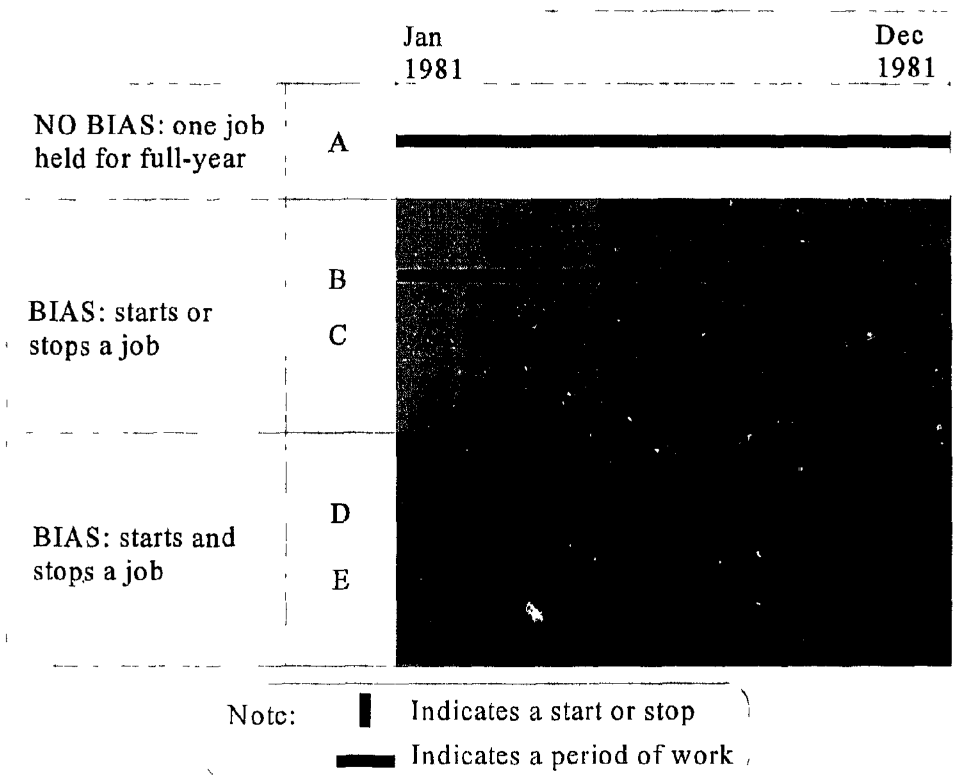
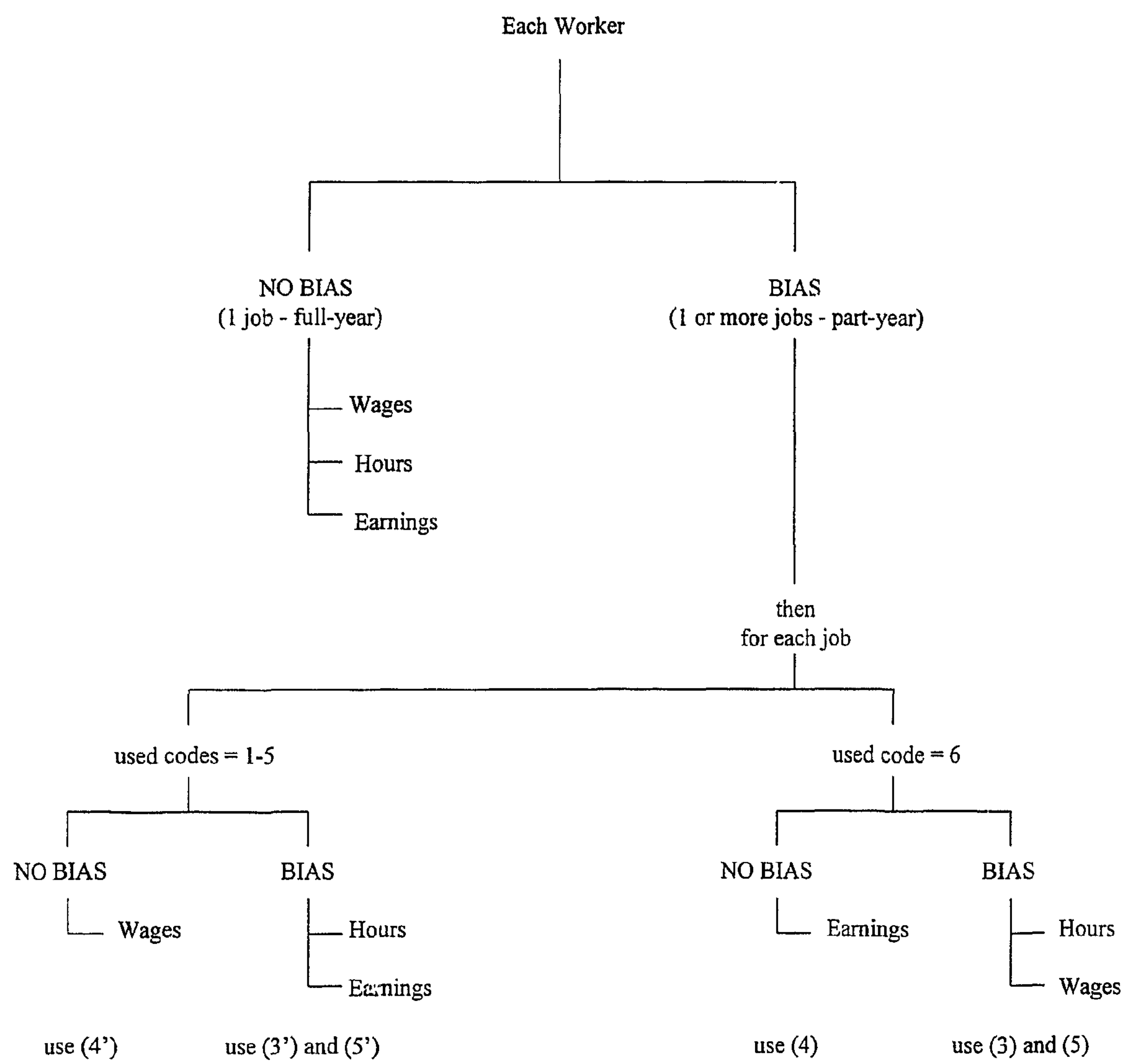


FIGURE C2

Nature of the Bias in Annual Hours,
Hourly Wage Rates and Annual Earnings



Note: Rate Codes: 1 = per hour; 2 = per day; 3 = per week; 4 = per month; 5 = per year; 6 = per employer (job).

FIGURE C3(a)

Extent of Biased Cases in SWH 1981, Women

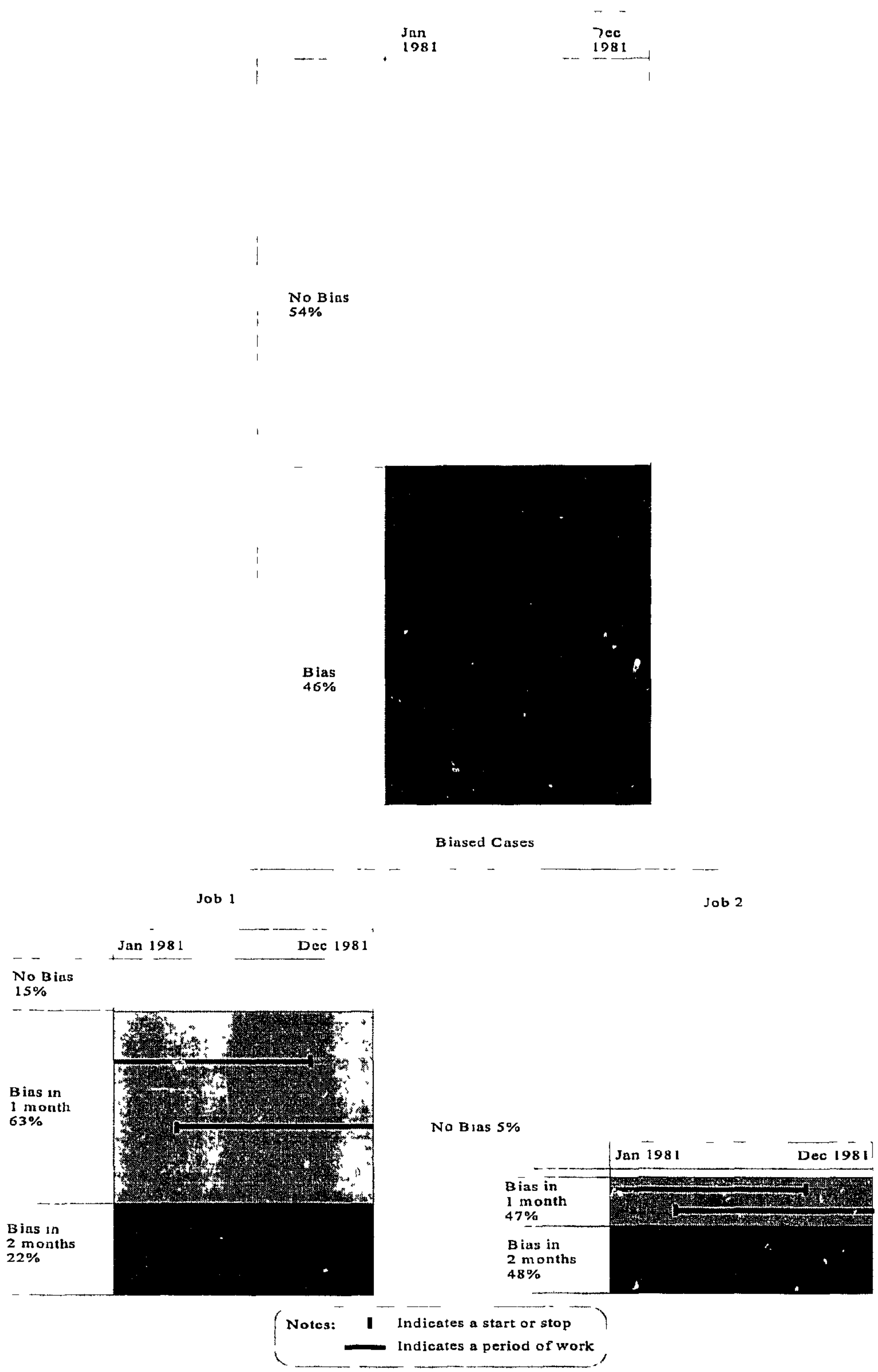


FIGURE C3(b)

Extent of Biased Cases in SWH 1981, Men

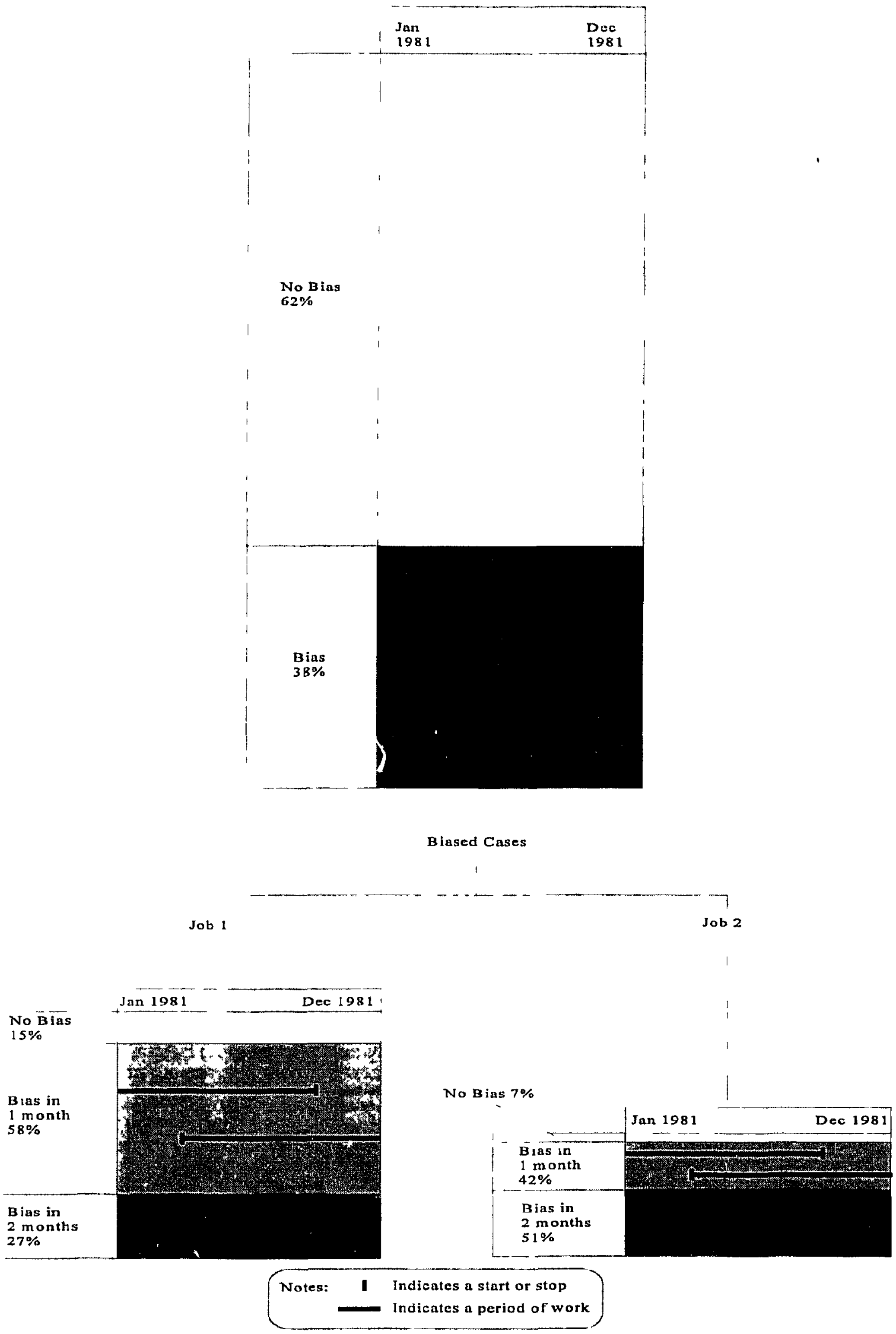


TABLE C1(a)
Extent of Biased Cases, Women, in SWH 1981

	MEN							
	Cases				Percent			
Paid Workers, 17-69 yrs								
No Bias Hours	2,616,974				54			
Bias Hours	2,252,952				46			
Total	4,869,926				100			
	Job 1		Job 2		Job 3		Job 4	
Biased Hours	Case	%	Case	%	Case	%	Case	%
No Bias	287,153	13	41,602	6	3,748	4	188	1
Bias 1 month	1,420,004	63	324,282	47	42,288	40	6,389	30
Bias 2 months	491,706	22	331,193	48	58,960	56	14,472	69
Self-empl.	54,089	2	0	0	0	0	0	0
Sub-total	2,252,952	100	697,077	100	104,996	100	21,049	100
Biased Earnings								
Biased		95		95		97		96
No Bias		5		5		3		4
Total		100		100		100		100

TABLE C1(b)

Extent of Biased Cases, Men, in SWH 1981

	MEN	
	Cases	Percent
Paid Workers, 17-69 yrs		
No Bias Hours	3,919,036	62
Bias Hours	2,388,549	38
Total	6,307,585	100

	Job 1		Job 2		Job 3		Job 4	
Biased Hours	Case	%	Case	%	Case	%	Case	%
No Bias	268,293	11	66,922	7	3,266	2	232	1
Bias 1 month	1,376,481	58	422,637	42	56,798	32	13,424	32
Bias 2 months	638,077	27	506,015	51	116,416	66	28,361	67
Self-empl.	105,698	4	0	0	0	0	0	0
Sub-total	2,388,549	100	995,574	100	176,480	100	42,017	100
Biased Earnings								
Biased		94		95		96		96
No Bias		6		5		4		4
Total		100		100		100		100

TABLE C2

Estimates of Annual Earnings Inequality,
Using Five Simulations of Annual Earnings,
Women and Men, Canada, 1981

	Annual Earnings		
	Mean (1986$)	Gini Coefficient	Standard Error of Gini[2]
Women[1]			
1	13,133	.4361	.00222
2	13,271	.4274	.00219
3	13,484	.4197	.00216
4	13,653	.4128	.00214
5	13,394	.4237	.00217
Men[1]			
1	21,653	.3681	.00187
2	21,929	.3602	.00183
3	22,197	.3533	.00180
4	22,459	.3474	.00178
5	22,060	.3568	.00182

Notes: 1. The population is all individuals with paid work between the ages of 17 and 69 years. The sample sizes for women and men are respectively 4,869,926 and 6,307,586.

2. Jackknife standard errors for the Gini Coefficient.

Source: Calculated using data from the SWH 1981 and method for revising the annual earnings variable described in Appendix C.

APPENDIX D

TABLES PERTAINING TO CHAPTER 2

TABLE D1

Sample Attrition Problem in the LMAS 1989 Longitudinal File

	Longitudinal File		Cross-sectional File	
	Weighted Cases	Percentage	Weighted Cases	Percentage
Total Population	17,501,017	100	17,833,490	100
Pop. with Positive Earnings	11,969,991	68	12,188,632	68
Pop. with Positive Earnings, 17-24 years of age	2,724,594	16	2,594,679	15
Pop. with Positive Earnings, 17-24 yrs of age, by Education. Total	2,724,594	100	2,594,679	100
0-8 years		1		2
Some high school		15		24
High school graduate		27		26
Trade certificate or diploma		28		26
Some post-secondary		16		12
Post-secondary certificate		8		5
University degree		5		5

Source: Calculated from the LMAS 1989 Longitudinal and Cross-sectional Person Files.

TABLE D2(a)

Descriptive Statistics,
Various Measurement Choices, Women, 1981 and 1989

Measurement Choice	1981				1989			
	1986$		Sample Size		1986$		Sample Size	
	Mean	Median	Unweighted	Weighted	Mean	Median	Unweighted	Weighted
SWH/LMAS INCOME DEF'N[1]								
Excl. Wages	13,485	11,934	18,400	4,815,837	14,577	12,616	19,177	5,609,238
Wages/Salaries	13,394	11,796	18,630	4,869,926	14,446	12,389	19,691	5,722,973
SCF INCOME DEF'N[2]								
Wages/salaries	13,575	12,053	19,701	4,923,647	14,817	13,158	23,174	6,046,890
Wages/salaries + S.E.: all	13,190	11,469	21,564	5,306,933	14,660	12,814	25,128	6,481,452
Wages/salaries + S.E.: positive	13,239	11,523	21,503	5,291,201	14,717	12,891	25,046	6,462,746
POPULATION DEF'N								
FT/FY Workers	20,581	18,999	7,940	2,255,991	21,616	19,337	8,814	2,822,602
All Workers: 17-24	9,494	7,348	5,543	1,452,244	8,210	6,154	4,131	1,234,129
All Workers: 25-54	15,162	13,813	11,545	2,997,939	16,368	14,922	14,163	4,069,107

TABLE D2(a) Continued

Descriptive Statistics,
Various Measurement Choices, Women, 1981 and 1989

Measurement Choice	1981				1989			
	1986$		Sample Size		1986$		Sample Size	
	Mean	Median	Unweighted	Weighted	Mean	Median	Unweighted	Weighted
EXCLUSION OF TOP OBSERVATIONS								
1%	12,924	11,668	18,462	4,820,954	13,936	12,250	19,557	5,665,448
2%	12,620	11,500	18,314	4,772,194	13,596	12,096	19,408	5,607,507
5%	11,902	11,060	17,816	4,626,252	12,803	11,684	18,931	5,436,745
EXCLUSION OF BOTTOM OBSERVATIONS								
1%	13,527	11,934	18,398	4,821,660	14,587	12,589	19,417	5,666,558
2%	13,663	12,086	18,186	4,772,577	14,732	12,737	19,155	5,609,030
5%	14,075	12,450	17,538	4,626,433	15,169	13,192	18,405	5,436,981
IMPLEMENTATION OF TOP INCOME CODE								
3	13,283	11,796	18,630	4,869,926	14,305	12,389	19,691	5,722,973
5	13,370	11,796	18,630	4,869,926	14,421	12,389	19,691	5,722,973
7	13,388	11,796	18,630	4,869,926	14,443	12,389	19,691	5,722,973

TABLE D2(b)

Descriptive Statistics,
Various Measurement Choices, Men, 1981 and 1989

Measurement Choice	1981				1989			
	1986$		Sample Size		1986$		Sample Size	
	Mean	Median	Unweighted	Weighted	Mean	Median	Unweighted	Weighted
SWH/LMAS INCOME DEF'N								
Excl. Wages	22,272	21,146	23,108	6,201,887	23,626	22,239	21,261	6,302,475
Wages/Salaries	22,060	20,729	23,635	6,307,586	23,374	21,958	22,080	6,465,659
SCF DATA INCOME DEF'N								
Wages/salaries	24,885	23,977	25,857	6,395,121	24,994	23,263	26,365	6,956,826
Wages/salaries + S.E.: all	24,495	23,407	30,223	7,172,857	24,903	22,442	30,235	7,755,572
Wages/salaries + S.E.: positive	24,635	23,486	30,025	7,141,500	25,047	22,632	30,046	7,721,253
POPULATION DEF'N								
FT/FY Workers	28,167	26,493	14,325	4,026,139	30,509	27,918	13,507	4,190,784
All Workers: 17-24	12,377	9,883	6,114	1,678,660	10,448	7,837	4,553	1,360,550
All Workers: 25-54	26,058	25,042	14,791	3,901,518	26,919	25,618	15,401	4,471,895

TABLE D2(b) Continued

Descriptive Statistics,
Various Measurement Choices, Men, 1981 and 1989

Measurement Choice	1981				1989			
	1986$		Sample Size		1986$		Sample Size	
	Mean	Median	Unweighted	Weighted	Mean	Median	Unweighted	Weighted
EXCLUSION OF TOP OBSERVATIONS								
1%	21,447	20,719	23,419	6,244,482	22,613	21,921	21,900	6,400,160
2%	21,044	20,719	23,212	6,181,257	22,150	21,738	21,706	6,336,148
5%	20,098	20,205	22,584	5,992,044	21,071	21,069	21,157	6,142,147
EXCLUSION OF BOTTOM OBSERVATIONS								
1%	22,279	21,078	23,403	6,244,866	23,607	22,086	21,832	6,401,079
2%	22,501	21,199	23,145	6,181,469	23,839	22,371	21,581	6,336,498
5%	23,164	21,907	22,381	5,992,621	24,541	22,873	20,866	6,142,492
IMPLEMENTATION OF TOP INCOME CODE								
3	21,532	20,729	23,635	6,307,586	22,[illegible]51	21,958	22,080	6,465,659
5	21,982	20,729	23,635	6,307,586	23,221	21,958	22,080	6,465,659
7	22,039	20,729	23,635	6,307,586	23,334	21,958	22,080	6,465,659

TABLE D2(c)

Descriptive Statistics,
Various Measurement Choices, Population, 1981 and 1989

Measurement Choice	1981				1989			
	1986$		Sample Size		1986$		Sample Size	
	Mean	Median	Unweighted	Weighted	Mean	Median	Unweighted	Weighted
SWH/LMAS INCOME DEF'N								
Excl. Wages	18,432	16,575	41,508	11,017,724	19,365	17,145	40,438	11,911,713
Wages/Salaries	18,286	16,342	42,265	11,177,511	19,182	16,883	41,771	12,188,632

Notes to accompany D2(a-c)

1. In each case, the population is aged 17-69 years. Exclusively wages/salaries captures paid workers with no self-employment earnings. Wages/salaries captures earnings from paid work only but may include workers who were also self-employed.

2. In each case, the population is aged 17-69 years. The wages/salaries classification captures paid workers (cow = 1,2) with positive earnings from wages and salaries. The next two classifications represent workers with wages/salaries and/or self-employment earnings from any source and earnings reflect the sum of these two amounts.

TABLE D3(a)

Earnings Inequality Indicators,
Income Definitions - All Workers (SWH/LMAS Data),
Women, 1981 and 1989

Income Definitions - All Workers (SWH/LMAS)	Inequality Indicators 1981						
	Gini	Theil	CV²	Atkinson			
				r = 0.5	r = 0.25	r = 0.5	r = -1.0
Excl Wages/Sal	4210 (0022)	3010 (0060)	6325 (0073)	1617 (0016)	4597 (0041)	5709 (0051)	7724 (.0080)
Wages/Sal	4237 (0022)	3049 (.0041)	6413 (0073)	1637 (.0016)	4646 (0040)	.5762 (0050)	.7763 (0077)
	Inequality Indicators 1989						
Excl Wages/Sal	4121 (0021)	2862 (0051)	6139 (0100)	.1509 (0014)	4194 (0039)	5227 (0054)	7376 (.0119)
Wages/Sal	4158 (0021)	2913 (0051)	6253 (0100)	1536 (0014)	4255 (0038)	.5291 (0052)	7415 (.0113)

Note Standard errors in parentheses

TABLE D3(b)

Earnings Inequality Indicators,
Income Definitions - All Workers (SWH/LMAS Data),
Men, 1981 and 1989

Income Definitions - All Workers (SWH/LMAS)	Inequality Indicators 1981						
	Gini	Theil	CV^2	Atkinson			
				r = 0.5	r = −0.25	r = −0.5	r = −1.0
Excl. Wages/Sal.	.3528 (.0018)	.2154 (.0030)	.4268 (.0044)	.1183 (.0012)	.3639 (.0039)	.4731 (.0054)	.7098 (.0100)
Wages/Sal.	.3568 (.0018)	.2202 (.0030)	.4361 (.0044)	.1210 (.0012)	.3718 (.0038)	.4822 (.0053)	.7178 (.0095)
	Inequality Indicators 1989						
Excl. Wages/Sal.	.3697 (.0020)	.2360 (.0040)	.4841 (.0063)	.1277 (.0013)	.3797 (.0040)	.4878 (.0056)	.7228 (.0109)
Wages/Sal.	.3742 (.0020)	.2417 (.0040)	.4968 (.0063)	.1308 (.0013)	.3883 (.0039)	.4979 (.0055)	.7325 (.0103)

Note: Standard errors in parentheses.

TABLE D3(c)

Earnings Inequality Indicators,
Income Definitions - All Workers (SWH/LMAS Data),
Population, 1981 and 1989

Income Definitions - All Workers (SWH/LMAS)	Inequality Indicators 1981						
	Gini	Theil	CV^2	Atkinson			
				$r = 0.5$	$r = -0.25$	$r = -0.5$	$r = -1.0$
Excl. Wages/Sal.	.3995 (.0014)	.2716 (.0026)	.5547 (.0042)	.1474 (.0010)	.4329 (.0028)	.5465 (.0036)	.7620 (.0060)
Wages/Sal.	.4026 (.0014)	.2758 (.0026)	.5634 (.0042)	.1497 (.0010)	.4387 (.0028)	.5527 (.0036)	.7664 (.0057)
	Inequality Indicators 1989						
Excl. Wages/Sal.	.4079 (.0015)	.2815 (.0032)	.5995 (.0058)	.1493 (.0010)	.4211 (.0027)	.5276 (.0038)	.7467 (.0080)
Wages/Sal.	.4116 (.0014)	.2867 (.0032)	.6118 (.0058)	.1521 (.0010)	.4279 (.0027)	.5351 (.0037)	.7524 (.0075)

Note: Standard errors in parentheses.

TABLE D4(a)

Decile Share of Earnings,
Income Definitions - All Workers (SWH/LMAS Data),
Women, 1981 and 1989

Income Definitions - All Workers (SWH/LMAS)	Share of Total Earnings (%) 1981									
	1	2	3	4	5	6	7	8	9	10
Excl. Wages/Sal.	0.67 1,832	2.07 3,859	3.69 6,216	5.61 8,992	7.80 11,934	9.91 14,572	11.91 17,487	14.39 21,189	17.59 26,493	12.36 211,921
Wages/Sal.	0.65 1,747	2.03 3,753	3.64 6,103	5.56 8,873	7.76 11,789	9.88 14,559	11.92 17,425	14.40 21,989	17.66 26,493	26.50 211,921
	Share of Total Earnings (%) 1989									
Excl. Wages/Sal.	0.87 2,333	2.34 4,571	3.98 7,132	5.86 9,818	7.68 12,614	9.71 15,724	11.76 18,628	13.99 22,275	17.23 28,527	26.57 130,503
Wages/Sal.	0.85 2,253	2.28 4,407	3.91 6,921	5.78 9,611	7.62 12,388	9.68 15,554	11.79 18,481	14.04 22,136	17.31 28,417	26.74 130,503

Note: Top earnings (1986 $) in each decile is indicated below the decile share.

TABLE D4(b)

Decile Share of Earnings,
Income Definitions - All Workers (SWH/LMAS Data),
Men, 1981 and 1989

Income Definitions - All Workers (SWH/LMAS)	Share of Total Earnings (%) 1981									
	1	2	3	4	5	6	7	8	9	10
Excl. Wages/Sal.	0.98 4,287	3.03 9,315	5.26 13,813	7.07 17,611	8.76 21,140	10.31 24,830	11.90 28,012	13.70 33,116	16.09 39,725	22.91 174,813
Wages/Sal.	0.94 4,109	2.93 8,919	5.15 13,675	7.02 17,266	8.74 20,729	10.30 24,476	11.95 27,819	13.75 33,092	16.18 39,725	23.05 174,813

	Share of Total Earnings (%) 1989									
Excl. Wages/Sal.	0.94 4,118	2.73 8,870	4.84 13,923	6.87 18,355	8.64 22,237	10.18 26,038	11.80 29,825	13.69 35,096	16.25 43,054	24.08 200,388
Wages/Sal.	0.91 3,957	2.64 8,575	4.73 13,588	6.77 18,251	8.60 21,958	10.19 25,672	11.82 29,661	13.76 35,004	16.37 42,895	24.22 200,388

Note: Top earnings (1986 $) in each decile is indicated below the decile share.

TABLE D4(c)

Decile Share of Earnings,
Income Definitions - All Workers (SWH/LMAS Data),
Population, 1981 and 1989

Income Definitions - All Workers (SWH/LMAS)	Share of Total Earnings (%) 1981									
	1	2	3	4	5	6	7	8	9	10
Excl. Wages/Salaries	0.74 2,717	2.30 5,860	4.18 9,669	6.25 13,260	8.08 16,575	9.96 20,069	11.92 23,843	14.20 28,620	17.26 35,448	25.12 211,921
Wages/Salaries	0.72 2,638	2.24 5,684	4.10 9,440	6.18 13,185	8.06 16,341	9.95 19,883	11.94 23,841	14.24 28,343	17.33 35,300	25.25 211,921
	Share of Total Earnings (%) 1989									
Excl. Wagaes/Salaries	0.84 3,020	2.33 6,147	4.09 9,646	5.94 13,388	7.88 17,145	9.75 20,731	11.70 24,728	14.05 29,825	17.34 37,736	26.07 200,388
Wages/Salaries	0.82 2,908	2.27 5,916	4.01 9,427	5.87 13,151	7.82 16,883	9.74 20,572	11.71 24,569	14.10 29,700	17.42 37,689	26.25 200,388

Note: Top earnings (1986 $) in each decile is indicated below decile share

TABLE D5(a)

Gini Coefficients, Canada and the United States, 1970s and 1980s, Selected Studies[1]

POPULATION				
	U.S.	Canada		
		SWH/LMAS	SCF	
Year	Karoly[2]	MacPhail[3]	MacPhail[3]	ECC[4]
1967	.441			.389
1968	.442			
1969	.453			
1970	.456			
1971	.456			
1972	.459			
1973	.461			.407
1974	.459			
1975	.455			
1976	.456			
1977	.456			
1978	.453			
1979	.448			
1980	.446			
1981	.453	.403		.402
1982	.458			
1983	.457			
1984	.460			
1985	.459			
1986	.459			.418
1987				
1988				
1989		.412		

TABLE D5(b)

Gini Coefficients, Canada and the United States, 1970s and 1980s, Selected Studies[1]

Year	WOMEN					
	U.S.	Canada				
		SWH/LMAS		SCF		
	Karoly[2]	MacPhail[3]	Morissette[5]	MacPhail[3]	Morissette[5]	ECC[4]
1967						.375
1968	.452					
1969	.448				.414	
1970	.459					
1971	.467				.404	
1972	462					
1973	.461				.407	.390
1974	464					
1975	.458				.398	
1976	.456					
1977	454				409	
1978	.451					
1979	446				405	
1980	441					
1981	438	424	412	419	408	393
1982	439					
1983	445				433	
1984	445					
1985	449					
1986	450				416	405
1987	453					
1988					417	
1989		416	400	414	.401	

TABLE D5(c)

Gini Coefficients, Canada and the United States, 1970s and 1980s, Selected Studies[1]

Year	MEN					
	U.S.	Canada				
		SWH/LMAS		SCF		
	Karoly[2]	MacPhail[3]	Morissette[5]	MacPhail[3]	Morissette[5]	ECC[4]
1967						.350
1968	.370					
1969	.371				.336	
1970	.380					
1971	.386				.340	
1972	.392					
1973	.395				.339	.364
1974	.393					
1975	.395				.344	
1976	.394					
1977	.396				.338	
1978	.398					
1979	.394				.336	
1980	.391					
1981	.395	.353	.346	.354	.346	.363
1982	.408					
1983	.421				.387	
1984	.421					
1985	.423					
1986	.423				.377	.390
1987	.423					
1988					.373	
1989		.370	.359	.380	.371	

Table D5(d)

Annual Percentage Change in Male Annual Earnings Inequality during the 1980s, Measured by the Coefficient of Variation, Selected Countries

All Male Workers				
		Point in Time	Absolute Change	Annual Percent Change
Canada	1981	.421		
	1987	.464	.043	.7
Finland	1987	.460		
	1991	.474	.014	.4
France	1979	.396		
	1984	.434	.038	.8
Israel	1979	.470		
	1986	.512	.042	6
U.S.	1979	.454		
	1986	.527	.073	1.0
Full-time/full year Male Workers				
Australia	1981	.334		
	1985	.357	.023	.6
Netherlands	1983	.304		
	1987	.315	.011	.3
Sweden	1981	.276		
	1987	.298	.022	.4
U.K.	1979	.329		
	1986	.377	.048	.7
U.S.	1979	.439		
	1986	.494	.055	.8

Source: Calculated from Smeeding (1995), Table A-0 which is based on Gottschalk and Joyce (1995)

Notes:

1. Dorion and Barrett (1994), using the SWH/LMAS data, indicate that between 1981 and 1988 the Gini Coefficient declined by .020 for women and .009 for men. Results were not presented separately for 1981, so this study is not included in this table.

2. Karoly (1988). Annual wage and salary income of all persons, 16 years and over, with positive wage and salary income. CPS.

3. Annual wage and salary income, 17 to 69 years of age, with positive wage and salary income.

4. Annual wage and salary income of all persons, 15 years and older, earning at least 5 percent of the average industrial wage.

5. Morissette et al. (1993). Annual wage and salary income, 17 to 64 years of age, exclusively, waged workers, with wage and salary earnings greater than 2.5 percent of the sex-specific mean annual earnings.

TABLE D6(a)

Earnings Inequality Indicators,
Exclusion of Top Observations (SWH/LMAS Data),
Women, 1981 and 1989

Exclusion of Top Observations	Gini	Theil	CV^2	Atkinson $r = 0.5$	Atkinson $r = -0.25$	Atkinson $r = -0.5$	Atkinson $r = -1.0$
Inequality Indicators 1981							
1%	.4113	.2830	.5436	.1558	.4542	.5668	.7704
	(.0019)	(.0033)	(.0037)	(.0014)	(.0040)	(.0051)	(.0079)
2%	.4055	.2753	.5182	.1527	.4493	.5621	.7670
	(.0019)	(.0032)	(.0035)	(.0014)	(.0040)	(.0051)	(.0080)
5%	.3953	.2629	.4811	.1473	.4400	.5529	.7599
	(.0019)	(.0031)	(.0032)	(.0014)	(.0041)	(.0052)	(.0083)
Inequality Indicators 1989							
1%	.4028	.2689	.5300	.1453	.4140	.5184	.7346
	(.0018)	(.0035)	(.0041)	(.0013)	(.0038)	(.0053)	(.0116)
2%	.3962	.2600	.5015	.1416	.4080	.5127	.7305
	(.0018)	(.0033)	(.0037)	(.0012)	(.0038)	(.0053)	(.0118)
5%	.3836	.2446	.4560	.1350	.3964	.5010	.7217
	(.0017)	(.0032)	(.0033)	(.0012)	(.0038)	(.0055)	(.0121)

Note: Standard errors in parentheses

TABLE D6(b)

Earnings Inequality Indicators,
Exclusion of Top Observations (SWH/LMAS Data),
Men, 1981 and 1989

Exclusion of Top Observations	Inequality Indicators 1981						
	Gini	Theil	CV^2	Atkinson			
				r = 0.5	r = -0.25	r = -0.5	r = -1.0
1%	.3456 (.0016)	.2044 (.0025)	.3747 (.0024)	.1150 (.0011)	.3630 (.0038)	.4740 (.0054)	.7124 (.0097)
2%	.3401 (.0016)	.1985 (.0024)	.3567 (.0023)	.1126 (.0011)	.3590 (.0038)	.4701 (.0054)	.7095 (.0098)
5%	.3303 (.0016)	.1893 (.0024)	.3305 (.0021)	.1087 (.0011)	.3527 (.0039)	.4633 (.0055)	.7041 (.0100)
	Inequality Indicators 1989						
1%	.3607 (.0017)	.2210 (.0031)	.4127 (.0032)	.1231 (.0012)	.3774 (.0039)	.4879 (.0056)	.7261 (.0105)
2%	.3546 (.0017)	.2140 (.0030)	.3906 (.0029)	.1202 (.0011)	.3727 (.0039)	.4[illegible]33 (.0056)	.7229 (.0106)
5%	.3437 (.0017)	.2030 (.0030)	.3587 (.0027)	.1155 (.0011)	.3646 (.0040)	.4752 (.0057)	.7167 (.0108)

Note: Standard errors in parentheses

TABLE D7(a)

Earnings Inequality Indicators,
Exclusion of Bottom Observations (SWH/LMAS Data),
Women, 1981 and 1989

Exclusion of Bottom Observations	Inequality Indicators 1981						
	Gini	Theil	CV^2	Atkinson			
				r = 0.5	r = -0.25	r = -0.5	r = -1.0
1%	.4181 (.0022)	.2955 (.0040)	.6254 (.0072)	.1571 (.0015)	.4302 (.0035)	.5241 (.0039)	.6868 (.0040)
2%	.4125 (.0021)	.2865 (.0039)	.6069 (.0071)	.1511 (.0015)	.4064 (.0033)	.4924 (.0036)	.6431 (.0037)
5%	.3959 (.0021)	.2614 (.0037)	.5645 (.0068)	.1353 (.0014)	.3514 (.0028)	.4220 (.0031)	.5485 (.0034)
	Inequality Indicators 1989						
1%	.4102 (.0021)	.2822 (.0050)	.6098 (.0099)	.1471 (.0014)	.3912 (.0031)	.4742 (.0036)	.6246 (.0040)
2%	.4046 (.0021)	.2735 (.0049)	.5944 (.0098)	.1415 (.0013)	.3691 (.0029)	.4444 (.0032)	.5799 (.0035)
5%	.3885 (.0021)	.2501 (.0048)	.5514 (.0094)	.1272 (.0012)	.3219 (.0025)	.3843 (.0028)	.4670 (.0031)

Note: Standard errors in parentheses

TABLE D7(b)

Earnings Inequality Indicators,
Exclusion of Bottom Observations (SWH/LMAS Data),
Men, 1981 and 1989

Exclusion of Bottom Observations	Gini	Theil	CV^2	Atkinson r = 0.5	Atkinson r = -0.25	Atkinson r = -0.5	Atkinson r = -1.0
	Inequality Indicators 1981						
1%	.3506 (.0018)	.2109 (.0029)	.4220 (.0043)	.1142 (.0011)	.3318 (.0031)	.4173 (.0037)	.5882 (.0045)
2%	.3443 (.0018)	.2021 (.0028)	.4086 (.0042)	.1081 (.0011)	.3048 (.0027)	.3789 (.0032)	.5264 (.0039)
5%	.3263 (.0017)	.1788 (.0026)	.3708 (.0040)	.0932 (.0009)	.2494 (.0022)	.3050 (.0026)	.4152 (.0031)
	Inequality Indicators 1989						
1%	.3681 (.0020)	.2323 (.0038)	.4822 (.0062)	.1239 (.0012)	.3475 (.0030)	.4302 (.0035)	.5882 (.0041)
2%	.3621 (.0019)	.2238 (.0037)	.4683 (.0061)	.1182 (.0012)	.3244 (.0028)	.3986 (.0032)	.5402 (.0036)
5%	.3448 (.0019)	.2008 (.0034)	.4291 (.0058)	.1038 (.0011)	.2740 (.0024)	.3330 (.0027)	.4469 (.0031)

Note: Standard errors in parentheses

TABLE D8(a)

Earnings Inequality Indicators,
Top Coding (SWH/LMAS Data),
Women, 1981 and 1989

Top Code/Median	Gini	Theil	CV^2	Atkinson			
				r = 0.5	r = -0.25	r = -0.5	r = -1.0
Inequality Indicators 1981							
3 ($37,014)	.4190 (.0020)	.2940 (.0035)	.5813 (.0041)	.1602 (.0014)	.4607 (.0040)	.5729 (.0050)	.7744 (.0078)
5 ($61,690)	.4227 (.0021)	.3017 (.0038)	.6187 (.0055)	.1628 (.0015)	.4637 (.0040)	.5754 (.0050)	.7759 (.0077)
7 ($86,366)	.4235 (.0022)	.3040 (.0040)	.6336 (.0066)	.1635 (.0016)	.4644 (.0040)	.5760 (.0050)	.7762 (.0077)
Inequality Indicators 1989							
3 ($57,741)	.4101 (.0019)	.2791 (.0037)	.5635 (.0045)	.1495 (.0013)	.4206 (.0038)	.5248 (.0052)	.7390 (.0114)
5 ($96,235)	.4148 (.0020)	.2885 (.0044)	.6070 (.0070)	.1527 (.0014)	.4246 (.0038)	.5283 (.0052)	.7411 (.0113)
7 ($134,729)	.4157 (.0021)	.2909 (.0050)	.6226 (.0094)	.1535 (.0014)	.4254 (.0038)	.5290 (.0052)	.7414 (.0113)

Notes: Standard errors in parentheses

TABLE D8(b)

Earnings Inequality Indicators,
Top Coding (SWH/LMAS Data),
Men, 1981 and 1989

Top Code/Median	Gini	Theil	CV^2	Atkinson r = 0.5	Atkinson r = −0.25	Atkinson r = −0.5	Atkinson r = −1.0
	Inequality Indicators 1981						
3 ($37,014)	.3415 (.0016)	.1994 (.0024)	.3578 (.0022)	.1131 (.0011)	.3602 (.0038)	.4715 (.0053)	.7111 (.0097)
5 ($61,690)	.3546 (.0017)	.2155 (.0027)	.4125 (.0029)	.1195 (.0011)	.3698 (.0038)	.4805 (.0053)	.7168 (.0096)
7 ($86,366)	.3562 (.0018)	.2187 (.0028)	.4275 (.0036)	.1206 (.0012)	.3712 (.0038)	.4817 (.0053)	.7175 (.0095)
	Inequality Indicators 1989						
3 ($57,741)	.3522 (.0016)	.2109 (.0029)	.3792 (.0027)	.1190 (.0011)	.3714 (.0039)	.4824 (.0056)	.7230 (.0106)
5 ($96,235)	.3701 (.0018)	.2332 (.0034)	.4546 (.0038)	.1279 (.0012)	.3848 (.0039)	.4949 (.0055)	.7307 (.0103)
7 ($134,729)	.3731 (.0019)	.2390 (.0037)	.4808 (.0049)	.1299 (.0012)	.3873 (.0039)	.4971 (.0055)	.7320 (.0103)

Notes: Standard errors in parentheses

TABLE D9(a)

Earnings Inequality Indicators,
Population Definitions (SWH/LMAS Data)
Women, 1981 and 1989

Population Definition	Inequality Indicators 1981						
	Gini	Theil	CV^2	Atkinson			
				r = 0.5	r = -0.25	r = -0.5	r = -1.0
FT/FY Workers	.2395 (.0024)	.0977 (.0029)	.2271 (.0051)	.0473 (.0011)	.1156 (.0025)	.1393 (.0034)	.1938 (.0084)
All Workers - 17-24 yrs	.4572 (.0042)	.3555 (.0107)	.8048 (.0309)	.1860 (.0033)	.4933 (.0067)	.5946 (.0078)	.7667 (.0097)
-25-54 yrs	.3948 (.0027)	.2656 (.0045)	.5425 (.0067)	.1443 (.0019)	.4271 (.0054)	.5413 (.0070)	.7608 (.0127)

	Inequality Indicators 1989						
FT/FY Workers	.2576 (.0024)	.1118 (.0043)	.2580 (.0077)	.0543 (.0011)	.1327 (.0026)	.1617 (.0036)	.2283 (.0084)
All Workers - 17-24 yrs	.4500 (.0044)	.3362 (.0116)	.7584 (.0258)	.1715 (.0032)	.4414 (.0076)	.5354 (.0105)	.7289 (.0219)
- 25-54 yrs	.3811 (.0024)	.2466 (.0053)	.5184 (.0100)	.1314 (.0016)	.3800 (.0047)	.4841 (.0068)	.7149 (.0154)

Note: Standard errors in parentheses.

TABLE D9(b)

Earnings Inequality Indicators,
Population Definitions (SWH/LMAS Data)
Men, 1981 and 1989

Population Definition	Gini	Theil	CV^2	Atkinson r = 0.5	Atkinson r = 0.25	Atkinson r = -0.5	Atkinson r = -1.0
	Inequality Indicators 1981						
FT/FY Workers	.2390 (.0017)	.0956 (.0021)	.2119 (.0034)	.0472 (.0007)	.1183 (.0018)	.1436 (.0025)	.2033 (.0076)
All Workers - 17-24 yrs	.4541 (.0037)	.3459 (.0081)	.7504 (.0167)	.1822 (.0028)	.4891 (.0065)	.5934 (.0078)	.7734 (.0100)
-25-54 yrs	.2890 (.0020)	.1445 (.0027)	.2892 (.0037)	.0776 (.0011)	.2353 (.0040)	.3106 (.0061)	.5133 (.0131)
	Inequality Indicators 1989						
FT/FY Workers	.2493 (.0020)	.1060 (.0029)	.2453 (.0049)	.0515 (.0009)	.1255 (.0019)	.1504 (.0023)	.2035 (.0046)
All Workers - 17-24 yrs.	.4527 (.0038)	.3368 (.0083)	.7323 (.0127)	.1731 (.0028)	.4453 (.0070)	.5381 (.0093)	.7223 (.0183)
- 25-54 yrs.	.3107 (.0022)	.1690 (.0038)	.3481 (.0058)	.0907 (.0013)	.2817 (.0048)	.3790 (.0076)	.6413 (.0145)

Note: Standard errors in parentheses.

TABLE D10(a)

Decile Share of Earnings,
Population Definitions (SWH/LMAS Data),
Women, 1981 and 1989

Population Definition	Share of Total Earnings (%) 1981									
	1	2	3	4	5	6	7	8	9	10
FT/FY Workers	4.24 11,047	5.94 13,467	6.92 15,194	7.78 16,934	8.66 18,999	9.61 20,719	10.65 23,178	11.97 26,493	14.11 32,570	20.13 180,090
All Workers 17-24 yrs	0.63 1,100	1.79 2,268	3.04 3,596	4.65 5,256	6.61 7,341	9.28 10,340	12.23 13,088	15.14 15,865	18.59 19,863	28.02 138,122
All Workers 25-54 yrs	0.75 2,376	2.41 5,000	4.26 7,947	6.28 11,050	8.22 13,813	10.00 16,549	11.95 19,863	14.10 23,316	17.02 29,131	25.02 211,921
	Share of Total Earnings (%) 1989									
FT/FY Workers	3.93 10,649	5.53 13,266	6.66 15,617	7.72 17,552	8.52 19,337	9.51 21,636	10.56 24,269	12.11 28,078	14.47 35,096	20.99 130,503
All Workers - 17-24 yrs	0.94 1,362	2.27 2,351	3.47 3,345	4.73 4,483	6.31 6,150	8.84 8,426	11.50 10,560	14.51 13,411	18.69 17,594	28.75 70,302
All Workers - 25-54 yrs	0.98 3,061	2.83 6,146	4.67 9,149	6.44 11,977	8.22 14,922	9.98 17,657	11.64 20,583	13.56 24,125	16.63 31,107	25.05 130,503

Note: Top earnings observation (1986 $) in each decile is indicated below the decile share.

TABLE D10(b)

Decile Share of Earnings,
Population Definitions - (SWH/LMAS Data),
Men, 1981 and 1989

Population Definitions	Share of Total Earnings (%) 1981									
	1	2	3	4	5	6	7	8	9	10
FT/FY Workers	3.97 14,305	5.76 17,956	6.96 20,719	7.91 23,841	8.89 26,493	9.81 29,127	10.91 32,322	12.15 36,327	13.99 43,136	19.65 174,813
All Workers: 17-24 yrs	0.65 1,574	1.87 3,085	3.16 4,790	4.78 7,028	6.71 9,880	9.23 13,122	11.81 16,460	15.07 20,719	18.80 26,493	27.94 132,164
All Workers: 25-54 yrs	1.98 9,518	4.71 14,597	6.42 18,637	7.80 22,008	9.02 25,037	10.20 27,819	11.43 31,791	12.85 35,775	14.82 42,374	20.77 174,813
	Share of Total Earnings (%) 1989									
FT/FY Workers	3.87 14,968	5.70 19,292	6.85 22,378	7.80 25,251	8.72 27,906	9.65 31,107	10.75 34,784	12.09 39,426	14.03 47,171	20.55 200,388
All Workers: 17-24 yrs	0.95 1,677	2.14 2,854	3.35 4,133	4.72 5,860	6.48 7,836	8.68 10,382	11.14 13,314	14.73 17,749	19.19 23,107	28.63 82,717
All Workers: 25-54 yrs	1.58 8,200	4.26 14,298	6.20 18,734	7.64 22,287	8.86 25,618	10.11 28,864	11.39 32,727	12.97 37,151	15.11 44,889	21.88 200,388

Note: Top earnings (1986 $) in each decile is indicated below decile share

TABLE D11(a)

Earnings Inequality Indicators,
Income Definitions - All Workers (SCF Data),
Women, 1981 and 1989

Income Definitions - All Workers (SCF)[1]	Inequality Indicators 1981						
	Gini	Theil	CV^2	Atkinson			
				r = 0.5	r = -0.25	r = -0.5	r = -1.0
Wages/Salaries	.4185 (.0020)	.2943 (.0036)	.5891 (.0049)	.1598 (.0014)	.4578 (.0039)	.5697 (.0051)	.7783 (.0115)
Wages/Salaries + Self-employ - All	.4362 (.0020)	N/A	.6554 (.0057)	N/A	N/A	N/A	N/A
- positive	.4334 (.0020)	.3176 (.0038)	.6478 (.0057)	.1724 (.0015)	.4930 (.0039)	.6109 (.0049)	.8169 (.0088)
	Inequality Indicators 1989						
Wages/Salaries	.4141 (.0018)	.2889 (.0039)	.5868 (.0057)	.1562 (.0013)	.4501 (.0037)	.5641 (.0049)	.7793 (.0073)
Wages/Salaries + Self-employ - All	.4285 (.0020)	N/A	.6660 (.0106)	N/A	N/A	N/A	N/A
- positive	.4254 (.0019)	.3075 (.0048)	.6557 (.0104)	.1645 (.0014)	.4690 (.0037)	.5857 (.0047)	.7992 (.0066)

Note: Standard errors in parentheses

TABLE D11(b)

Earnings Inequality Indicators,
Income Definitions - All Workers (SCF Data),
Men, 1981 and 1989

Income Definitions - All Workers (SCF)[1]	Inequality Indicators 1981						
	Gini	Theil	CV^2	Atkinson			
				r = 0.5	r = -0.25	r = -0.5	r = -1.0
Wages/Salaries	.3536 (.0017)	.2159 (.0026)	.4196 (.0035)	.1192 (.0011)	.3686 (.0038)	.4838 (.0064)	.7676 (.0223)
Wages/Salaries + Self-employ - All	.3732 (.0017)	N/A	.4838 (.0041)	N/A	N/A	N/A	N/A
- positive	.3686 (.0016)	.2343 (.0027)	.4722 (.0040)	.1278 (.0011)	.3886 (.0036)	.5062 (.0058)	.7805 (.0182)
	Inequality Indicators 1989						
Wages/Salaries	.3800 (.0022)	.2545 (.0064)	.5924 (.0235)	.1351 (.0015)	.3957 (.0037)	.5050 (.0049)	.7325 (.0083)
Wages/Salaries + Self-employ - All	.4003 (.0027)	N/A	.8733 (.0999)	N/A	N/A	N/A	N/A
- positive	.3958 (.0027)	.2866 (.0156)	.8588 (.0992)	.1458 (.0021)	.4115 (.0038)	.5208 (.0047)	.7444 (.0075)

Note: Standard errors in parentheses

TABLE D12(a)

Decile Share of Earnings,
Income Definitions - All Workers (SCF Data),
Women, 1981 and 1989

Income Definitions - All Workers (SCF Data)[1]	Share of Total Earnings (%) 1981									
	1	2	3	4	5	6	7	8	9	10
Wages/Salaries	0.69 1,817	2.04 3,838	3.67 6,230	5.62 9,135	7.81 12,053	9.97 15,083	12.15 17,911	14.42 21,271	17.70 27,136	25.94 92,715
Wages/Salaries + Self-employ - All	0.46 1,477	1.79 3,311	3.39 5,673	5.33 8,472	7.56 11,465	9.88 14,570	12.18 17,528	14.58 21,065	17.98 26,850	26.85 145,695
- Positive	0.57 1,536	1.82 3,339	3.41 5,717	5.36 8,534	7.59 11,523	9.87 14,570	12.15 17,563	14.54 21,077	17.94 26,869	26.77 145,695
	Share of Total Earnings (%) 1989									
Wages/Salaries	0.71 2,039	2.16 4,386	3.83 7,018	5.81 10,150	7.81 13,158	9.97 16,421	11.98 19,298	14.24 22,958	17.48 29,632	26.03 117,582
Wages/Salaries + Self-employ - All	0.52 1,824	2.02 4,211	3.67 6,684	5.60 9,649	7.60 12,807	9.80 15,928	11.93 19,037	14.26 22,807	17.58 29,615	27.03 195,614
- Positive	0.65 1,896	2.06 4,293	3.69 6,789	5.62 9,658	7.61 12,891	9.79 15,977	11.90 19,092	14.19 22,837	17.55 29,649	26.94 195,614

Note: Top earnings observation (1986 $) in each decile is indicated below the decile share.

TABLE D12(b)

Decile Share of Earnings,
Income Definitions - All Workers (SCF Data),
Men, 1981 and 1989

Income Definitions - All Workers (SCF Data)[1]	Share of Total Earnings (%) 1981									
	1	2	3	4	5	6	7	8	9	10
Wages/Salaries	0.96 4,629	2.89 10,015	5.10 15,562	7.19 20,042	8.87 23,974	10.40 27,645	11.92 31,788	13.70 36,778	16.21 44,636	22.76 198,675
Wages/Salaries + Self-employ - All	0.71 4,150	2.67 9,154	4.78 14,185	6.85 19,208	8.66 23,399	10.30 26,873	11.89 31,432	13.79 36,487	16.44 44,917	23.92 199,413
- Positive	0.91 4,336	2.73 9,272	4.81 14,363	6.87 19,348	8.65 23,486	10.27 26,977	11.85 31,534	13.74 36,548	16.36 44,975	23.82 199,413
	Share of Total Earnings (%) 1989									
Wages/Salaries	0.89 4,386	2.66 8,886	4.59 13,986	6.61 18,970	8.42 23,254	10.18 27,291	11.83 31,762	13.81 37,267	16.36 45,467	24.64 199,413
Wages/Salaries + Self-employ - All	0.67 4,195	2.53 8,745	4.36 13,158	6.27 18,026	8.16 22,442	9.96 26,753	11.68 31,536	13.72 37,018	16.43 45,604	26.22 877,193
- Positive	0.87 4,298	2.59 8,772	4.40 13,158	6.29 18,181	8.15 22,632	9.93 26,82	11.66 31,565	13.68 37,088	16.32 45,614	26.12 877,193

Note: Top earnings observation (1986 $) in each decile is indicated below the decile share.

APPENDIX E

TABLES PERTAINING TO CHAPTER 3

TABLE E1
Population Sizes of the SWH/LMAS, 1981, 1986 and 1989

	SWH/LMAS					
	1981		1986		1989	
	Cases[1]	%	Cases[1]	%	Cases[1]	%
Total Pop., 17-69 yrs	16,119,664	100.0	17,333,276	100.0	17,833,490	100.0
With Paid Work	11,177,512	69.3	11,964,840	69.0	12,188,632	68.3
By Number of Jobs	11,177,512	100.0	11,964,840	100.0	12,188,632	100.0
Job 1	11,017,724	98.5	11,759,995	98.3	11 911,713	97.7
Job 2	1,692,651	15.1	2,236,935	18.7	2,650,918	21.7
Job 3	297,408	2.7	534,642	4.5	691,219	5.7
Job 4	68,354	0.6	136,977	1.1	149,888	1.2
Job 5	N/A	N/A	38,625	0.3	35,049	0.3

Notes: 1. Weighted number of cases.

TABLE E2

Unemployment Rates[1], Canada, 1970 - 1992

Year	Unemployment Rate (%)	Year	Unemployment Rate (%)	Year	Unemployment Rate (%)
1970	5.7	1980	7.5	1990	8.1
1971	6.2	1981	7.5	1991	10.3
1972	6.2	1982	11.0	1992	11.0
1973	5.5	1983	11.8		
1974	5.3	1984	11.2		
1975	6.9	1985	10.5		
1976	7.1	1986	9.5		
1977	8.1	1987	8.8		
1978	8.3	1988	7.8		
1979	7.4	1989	7.5		

Years	Average Unemployment
1970 - 79	6.7
1981 - 86	9.9
1986 - 89	8.3

Note: 1. Refers to the unemployment rate, for men and women, 15 years and over.

Source: Statistics Canada. Historical Labour Force Statistics. Cat. 71-201.

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TABLE E3 (a)

Earnings Inequality Indicators, All Workers,
Population, 1981, 1986, and 1989

		1981	1986	1989
1986$	Mean	18,284	18,653	19,182
	Median	16,368	16,417	16,883
Sample Size	Unweighted	42,265	43,337	41,771
	Weighted	11,177,511	11,964,549	12,188,632
Decile Share	1	0.72	0.72	0.82
	2	2.25	2.10	2.27
	3	4.10	3.76	4.01
	4	6.19	5.68	5.87
	5	8.05	7.75	7.82
	6	9.94	9.85	9.74
	7	11.94	11.90	11.71
	8	14.23	14.38	14.10
	9	17.30	17.60	17.42
	10	25.29	26.26	26.25
Gini		.4025	.4190	.4116
		(.0014)	(.0014)	(.0014)
Theil		.2757	.2972	.2867
		(.0026)	(.0030)	(.0032)
CV^2		.5634	.6205	.6118
		(.0042)	(.0053)	(.0058)
Atkinson	r = 0.5	.1497	.1595	.1521
		(.0010)	(.0010)	(.0010)
	r = -0.25	.4388	.4594	.4279.
		(.0028)	(.0029)	(.0027)
	r = -0.5	.5531	.5795	.5351
		(.0036)	(.0040)	(.0037)
	r = -1.0	.7683	.8103	.7524
		(.0058)	(.0058)	(.0075)
VLN		1.2157	1.2862	1.1389
		(.0152)	(.0163)	(.0139)

TABLE E3 (b)

Earnings Inequality Indicators, All Workers,
Women, 1981, 1986, and 1989

		1981	1986	1989
1986$	Mean	13,394	13,676	14,446
	Median	11,796	11,534	12,389
Sample Size	Unweighted	18,630	19,934	19,691
	Weighted	4,869,926	5,424,582	5,722,973
Decile Share	1	0.65	0.71	0.85
	2	2.03	2.06	2.28
	3	3.64	3.61	3.91
	4	5.56	5.42	5.78
	5	7.76	7.42	7.62
	6	9.88	9.63	9.68
	7	11.92	12.02	11.79
	8	14.40	14.52	14.04
	9	17.66	17.89	17.31
	10	26.50	26.72	26.74
Gini		.4237	.4280	.4158
		(.0022)	(.0020)	(.0021)
Theil		.3049	.3076	.2913
		(.0041)	(.0043)	(.0051)
CV^2		.6413	.6427	.6253
		(.0073)	(.0079)	(.0100)
Atkinson	r = 0.5	.1637	.1644	.1536
		(.0016)	(.0015)	(.0014)
	r = -0.25	.4646	.4648	.4255
		(.0040)	(.0041)	(.0038)
	r = -0.5	(.5762	.5804	.5291
		(.0050)	(.0054)	(.0052)
	r = -1.0	.7763	.7974	.7415
		(.0077)	(.0074)	(.0113)
VLN		1.301	1.295	1.1117
		(.0231)	(.0231)	(.0190)

TABLE E3 (c)

Earnings Inequality Indicators, All Workers,
Men, 1981, 1986, and 1989

		1981	1986	1989
1986$	Mean	22,060	22,782	23,374
	Median	20,729	21,096	21,958
Sample Size	Unweighted	23,635	23,403	22,080
	Weighted	6,307,586	6,539,967	6,465,659
Decile Share	1	0.94	0.84	0.91
	2	2.93	2.50	2.64
	3	5.15	4.56	4.73
	4	7.02	6.68	6.77
	5	8.74	8.59	8.60
	6	10.30	10.29	10.19
	7	11.95	11.98	11.82
	8	13.75	13.84	13.76
	9	16.18	16.56	16.37
	10	23.05	24.16	24.22
Gini		.3568	.3784	.3742
		(.0018)	(.0019)	(.0020)
Theil		.2202	.2466	.2417
		(.0030)	(.0036)	(.0040)
CV^2		.4361	.4965	.4968
		(.0044)	(.0057)	(.0063)
Atkinson	r = 0.5	.1210	.1348	.1308
		(.0012)	(.0013)	(.0013)
	r = -0.25	.3718	.4103	.3883
		(.0038)	(.0042)	(.0039)
	r = -0.5	.4822	.5342	.4979
		(.0053)	(.0063)	(.0055)
	r = -1.0	.7178	.7984	.7325
		(.0095)	(.0107)	(.0103)
VLN		.9838	1.1222	1.0238
		(.018)	(.0213)	(.0187)

TABLE E4 (a)

Hourly Wage Rate Inequality Indicators,
Population, 1981, 1986, and 1989

		1981	1986	1989
1986$	Mean	10.96	10.75	11.07
	Median	9.74	9.58	9.81
Sample Size	Unweighted	42,265	43,337	41,771
	Weighted	11,177,511	11,964,549	12,188,632
Gini		.2841	.2932	.2868
		(.0013)	(.0015)	(.0013)
Theil		.1374	.1457	.1374
		(.0020)	(.0055)	(.0027)
CV^2		.3360	.3882	.3477
		(.0045)	(.0297)	(.0159)
Atkinson	r = 0.5	.0658	.0698	.0660
		(.0007)	(.0010)	(.0008)
	r = -0.25	.1578	.1681	.1587
		(.0013)	(.0015)	(.0014)
	r = -0.5	.1880	.2009	.1895
		(.0016)	(.0019)	(.0018)
	r = -1.0	.2524	.2728	.2590
		(.0034)	(.0043)	(.0045)
VLN		.2777	.3005	.2801
		(.0027)	(.0029)	(.0028)

TABLE E4 (b)

Hourly Wage Rate Earnings Inequality Indicators
Women, 1981, 1986, and 1989

		1981	1986	1989
1986$	Mean	9.40	9.07	9.49
	Median	8.19	8.00	8.48
Sample Size	Unweighted	18,630	19,934	19,691
	Weighted	4,869,926	5,424,582	5,722,973
Gini		.2811	.2823	.2737
		(.0022)	(.0029)	(.0017)
Theil		.1424	.1437	.1248
		(.0039)	(.0146)	(.0029)
CV^2		.3866	.4919	.2940
		(.0100)	(.0913)	(.0054)
Atkinson	r = 0.5	.0660	.0662	.0600
		(.0013)	(.0022)	(.0008)
	r = -0.25	.1526	.1559	.1440
		(.0023)	(.0030)	(.0018)
	r = -0.5	.1803	.1861	.1725
		(.0026)	(.0034)	(.0025)
	r = -1.0	.2382	.2563	.2398
		(.0046)	(.0076)	(.0067)
VLN		.2580	.2700	.2505
		(.0040)	(.0044)	(.0041)

TABLE E4 (c)

Hourly Wage Rate Inequality Indicators
Men, 1981, 1986, and 1989

		1981	1986	1989
1986$	Mean	12.16	12.13	12.47
	Median	11.26	11.12	11.40
Sample Size	Unweighted	23,635	23,403	22,080
	Weighted	6,307,586	6,539,967	6,465,659
Gini		.2688	.2806	.2777
		(.0016)	(.0016)	(.0019)
Theil		.1218	.1305	.1306
		(.0023)	(.0027)	(.0040)
CV^2		.2826	.3001	.3390
		(.0045)	(.0074)	(.0232)
Atkinson	r = 0.5	.0594	.0641	.0631
		(.0007)	(.0008)	(.0012)
	r = -0.25	.1464	.1585	.1535
		(.0016)	(.0016)	(.0020)
	r = -0.5	.1761	.1905	.1839
		(.0021)	(.0021)	(.0024)
	r = -1.0	.2420	.2589	.2511
		(.0052)	(.0040)	(.0059)
VLN		.2620	.2878	.2733
		(.0036)	(.0036)	(.0037)

TABLE E5 (a)

Annual Hours Worked Inequality Indicators, All Workers, Population, 1981, 1986, and 1989

		1981	1986	1989
1986$	Mean	1,598	1,623	1,630
	Median	1,825	1,835	1,878
Sample Size	Unweighted	42,265	43,337	41,771
	Weighted	11,177,511	11,964,549	12,188,632
Decile Share	1	1.30	1.47	1.58
	2	3.69	3.82	4.01
	3	6.20	6.15	6.38
	4	9.07	8.80	8.87
	5	11.28	11.10	10.98
	6	12.60	12.45	11.97
	7	13.04	12.92	12.75
	8	13.05	12.92	12.80
	9	13.05	13.02	13.15
	10	16.71	17.37	17.53
Gini		.2557	.2591	.2563
		(.0014)	(.0013)	(.0013)
Theil		.1391	.1376	.1316
		(.0016)	(.0016)	(.0017)
CV^2		.2327	.2368	.2294
		(.0018)	(.0018)	(.0019)
Atkinson	r = 0.5	.0820	.0800	.0757
		(.0007)	(.0007)	(.0007)
	r = -0.25	.2810	.2747	.2515
		(.0027)	(.0029)	(.0026)
	r = -0.5	.3791	.3779	.3399
		(.0040)	(.0046)	(.0041)
	r = -1.0	.6180	.6478	.5780
		(.0096)	(.0086)	(.0102)
VLN		.7231	.7019	.6187
		(.0109)	(.0115)	(.0098)

TABLE E5(b)

Annual Hours Worked Inequality Indicators, All Workers, Women, 1981, 1986, and 1989

	1981	1986	1989
Mean	1,387	1,433	1,448
Median	1,564	1,587	1,640
Sample Size Unweighted	18,630	19,934	19,691
Weighted	4,869,926	5,424,582	5,722,973
Decile Share 1	1.03	1.28	1.44
2	3.08	3.41	3.68
3	5.14	5.37	5.74
4	7.39	7.56	7.93
5	10.06	9.98	10.15
6	12.63	12.41	12.24
7	13.60	13.38	13.20
8	15.03	14.63	13.98
9	15.04	14.64	14.41
10	16.98	17.35	17.23
Gini	.3020	.2936	.2805
	(.0020)	(.0019)	(.0018)
Theil	.1764	.1641	.1492
	(.0028)	(.0026)	(.0026)
CV^2	.3012	.2872	.2608
	(.0035)	(.0034)	(.0031)
Atkinson r = 0.5	.1026	.0943	.0853
	(.0012)	(.0011)	(.0010)
r = -0.25	.3354	.3123	.2755
	(.0041)	(.0042)	(.0038)
r = -0.5	.4400	.4201	.3662
	(.0056)	(.0064)	(.0058)
r = -1.0	.6666	.6780	.5989
	(.0111)	(.0104)	(.0145)
VLN	.8865	.8110	.6821
	(.0179)	(.0180)	(.0145)

TABLE E5(c)

Annual Hours Worked Inequality Indicators, All Workers,
Men, 1981, 1986, and 1989

		1981	1986	1989
Mean		1,767	1,781	1,791
Median		2,086	2,097	2,086
Sample Size Unweighted		23,635	23,403	22,080
Weighted		6,307,586	6,539,967	6,465,659
Decile Share	1	1.71	1.76	1.82
	2	4.64	4.50	4.61
	3	7.88	7.49	7.54
	4	10.23	10.03	10.01
	5	11.61	11.56	11.10
	6	11.84	11.77	11.64
	7	11.85	11.78	11.64
	8	11.85	11.78	11.66
	9	12.22	12.54	12.92
	10	16.17	16.79	17.07
Gini		.2118	.2224	.2254
		(.0017)	(.0017)	(.0018)
Theil		.1055	.1104	.1095
		(.0019)	(.0020)	(.0023)
CV^2		.1756	.1883	.1900
		(.0019)	(.0021)	(.0022)
Atkinson	r = 0.5	.0623	.0646	.0633
		(.0009)	(.0009)	(.0009)
	r = -0.25	.2197	.2291	.2175
		(.0035)	(.0039)	(.0036)
	r = -0.5	.3036	.3229	.3004
		(.0055)	(.0065)	(.0058)
	r = -1.0	.5396	.5997	.5410
		(.0174)	(.0148)	(.0140)
VLN		.5430	.5712	.5285
		(.0124)	(.0143)	(.0129)

TABLE E6
Percentage Distribution of the Population by Annual Hours Worked,
All Workers, 1981, 1986 and 1989

Annual Hours Worked	Women			Men			Population		
	1981	1986	1989	1981	1986	1989	1981	1986	1989
1-260	9.3	7.2	6.3	4.0	3.6	3.5	6.3	5.2	4.8
261-728	16.0	16.0	15.0	9.3	10.1	9.6	12.3	12.8	12.1
729-1,040	9.5	10.0	9.7	5.6	5.7	6.0	7.3	7.6	7.7
1,041-1,560	13.5	14.1	16.0	9.0	9.5	9.6	10.9	11.6	12.6
1,561-1,820	6.7	6.8	7.9	5.1	5.0	5.5	5.8	5.8	6.6
1,821-2,080	13.8	14.5	21.2	10.1	9.6	15.2	11.7	11.8	18.0
2,081-2,340	27.9	26.6	18.8	45.2	42.6	35.1	37.6	35.3	27.5
2,341-2,600	1.7	2.1	2.6	5.3	5.7	6.6	3.7	4.1	4.7
2,601-2,860	.7	1.4	1.1	3.0	4.1	4.1	2.0	2.9	2.7
2,861-3,120	.2	0.4	0.4	0.7	0.9	1.1	0.5	0.7	0.8
3,121+	.8	1.0	1.1	2.6	3.2	3.7	1.8	2.2	2.5

APPENDIX F

ECONOMIC REGIONS

APPENDIX F

Economic Regions

Newfoundland
01 Avalon Peninsula
02 Avalon Peninsula to Port-aux-Basque
03 Port-aux-Basques to Strait of Belle Isle and Labrador
04 Central Area

Prince Edward Island
10 The entire province of Prince Edward Island

Nova Scotia
21 Inverness, Richmond, Cape Breton, Victoria Counties
22 The counties of Colchester, Cumberland, Pictou, Guysborough and Antigonish
23 The counties of Annapolis, Kings and Hants
24 The counties of Shelburne, Yarmouth, Digby, Queens and Lunenburg
25 The county of Halifax

New Brunswick
31 The counties of Northumberland, Restigouche and Gloucester
32 The counties of Albert, Westmorland and Kent
33 The counties of Saint John, Charlotte and Kings
34 The counties of Sunbury, Queens and York
35 The counties of Carleton, Victoria and Madawaska

Quebec
40 Nord-du-Québec: the northern part of the county of Territoire-du-Nouveau-Québec.

41 Gaspésie-Iles-de-la-Madeleine: the counties of Iles-de-la-Madeleine, Gaspé-Est, Gaspé-Ouest, almost all of Bonaventure and the northern part of Matane.

42 Saguenay - Lac-Saint-Jean: the counties of Lac-Saint-Jean-Ouest, Lac-Saint-Jean Est, Chicoutimi, a small northern part of Montmorency No. 1 and a small southern portion of Territoire-du-Nouveau-Québec.

43 Québec et Québec-Sud: the counties of Charlevoix-Est, Charlevoix-Ouest, L'Islet, Montmagny, Bellechasse, Motmorency No. 2, Beauce, Lévis, Dorchester, all but the northern tip of Montmorency No. 1, the southeast part of Québec, the northern part of Frontenac, the northern part of Wolfe, the

eastern part of Mégantic, almost all of Lotbinière and Portneuf and a small southern part of Saguenay.

44 Mauricie - Rois-Francs: the counties of Champlain, Nicolet, Drummond, the northern part of Québec, a small north west part of Wolfe, the western part of Mégantic, a small southwestern portion of Lotbinière, a small southwestern part of Portneuf, almost all of Yamaska, the southern part of Saint-Maurice, the east corner of Maskinongé and the southeast part of Abitibi.

45 Estrie: the counties of Compton, Richmond, Sherbrooke, Stanstead, the southern part of Frontenac, the southern part of Wolfe, a small southern part of Arthabaska, the eastern part of Brome and the eastern part of Shefford.

46 La Montérégie: the counties of Bagot, Richelieu, Saint-Hyacinthe, Rouville, Iberville, Missisguoi, Saint-Jean, Chambly, Verchères, La Prairie, Napierville, Huntingdon, Châteauguay, Beauharnois, Soulanges, Vaudreuil, the western part of Brome, the western part of Shefford and a small part of Yamaska.

Montréal-Centre et Laval: the counties of Ile-Jésus and Ile-de-Montréal.

Les Laurentides: the counties of Deux-Montagnes, Argenteuil, Labelle, the northern part of Maskinongé, the northern part of Berthier, the northern part of Joliette, the northern part of Montcalm, almost all of Terrebonne, a small northern part of Papineau and a small northern part of Gatineau.

Lanaudière: the county of L'Assomption, a small northern part of Saint-Maurice, the central part of Maskinongé, the southern part of Berthier, the southern part of Joliette, the southern part of Montcalm and a small southern part of Terrebonne.

47 Outaouais: the county of Hull, almost all of Papineau and Gatineau, and the southern part of Pontiac.

48 Abitibi-Témiscamingue: the county of Témiscamingue, the northern part of Pontiac and the western part of Abitibi.

49 Côte-Nord: almost all of Saguenay county and the southeastern part of the Territoire-du-Nouveau-Québec including Schefferville.

Ontario

50 The united counties of Stormont, Dundas and Glengarry, Prescott and Russell, Leeds and Grenville, the county of Lanark and the Ottawa-Carleton Regional Municipality.

51 The counties of Frontenac, Lennox and Addington, Hastings, Prince Edward and Renfrew.

52 The counties of Northumberland, Peterborough, Victoria, Haliburton and the Muskoka District Municipality.

53 The Regional Municipalities of Durham, York, Toronto, Peel and Halton Regional Municipality excluding the city of Burlington.

54 The counties of Dufferin, Wellington, and Simcoe and the Waterloo Regional Municipality.

55 The county of Brant, the Regional Municipalities of Hamilton-Wentworth, Niagara, Haldimand-Norfolk and the city of Burlington in the Halton Regional Municipality.

56 The counties of Oxford, Elgin and Middlesex.

57 The counties of Kent, Lambton and Essex.

58 The counties of Perth, Huron, Bruce and Grev.

59 The Districts of Nipissing, Parry Sound, Manitoulin, Sudbury, Timiskaming, Cochrane, Algoma, the north eastern part of the District of Kenora, also the Sudbury Regional Municipality.

The Districts of Thunder Bay, Rainy River and a large southwestern part of the Kenora District.

Manitoba

61 The southeastern area of Manitoba. Ontario is its eastern boundary and the international boundary at the south, extending west to the city of Winnipeg. Census Divisions 01, 02 and 12.

62 The region southwest of Winnipeg on the international border. Census Divisions 03 and 04.

63 The southwestern region of the province. The international border in the south and the Saskatchewan border in the west. Census Divisions 05, 06, 07 and 15.

64 The Portage-La-Prairie region, west from Winnipeg city and north to Lake Winnipeg. Census Divisions 08, 09 and 10.

65 The area lying north of the Riding Mountain National Park along the Saskatchewan border. Census Divisions 16, 17 and 20.

66 The area directly north of Winnipeg between Lake Manitoba and Lake Winnipeg. Census Divisions 13, 14 and 18.

67 The city of Winnipeg. Census Division 11.

68 The extreme northern portion of the province. Census Divisions 19, 21, 22 and 23.

Saskatchewan

71 The southwestern area of the province, extending from the Manitoba border on the east, the international border on the south and including Regina in the western portion. Census Divisions 01, 02 and 06.

72 The southwestern area of the province, extending from Moose Jaw in the east, the international boundary in the south and the Alberta border in the west. Census Divisions 03, 04, 07 and 08.

The east central part of the province. Census Divisions 05, 09 and 10.

73 The west central part of the province. Census Divisions 11, 12, and 13.

75 A large area that spreads completely across the province. It includes Prince Albert and North Battleford. Census divisions 14, 15, 16 and 17.

The extreme northern part of the province. Census Division 18.

Alberta

81 The area across the southern part of the province bounded on the east by the province of Saskatchewan, on the suth by the international border and on the west nearly to the province of British Columbia. Census Divisions 01, 02 and 03.

82 The east central part of the province. Census Divisions 04, 05 and 07.

83 The area surrounding and including Calgary. Census Division 06.

84 The western part of the province along the British Columbia border plus areas north of Edmonton. Census Divisions 13, 14 and 15.

85 The area between Edmonton and Calgary. Census Divisions 08 and 09.

86 The area surrounding and including Edmonton. Census Division 11.

87. The Peace River area in the northwestern part of the province. Census Divisions 17, 18 and 19.

88 The northeastern part of the province which includes Fort McMurray. Census Divisions 10, 12 and 16.

British Columbia

91 The East Kootenay Regional District

92 The central Kootenay and the Columbia-Shuswap Regional Districts

93 The Kootenay Boundary, Okanagan-Similkameen, Central Okanagan and the North Okanagan Regional Districts

94 The Squamish-Lillooet and the Thompson-Nicola Regional Districts.

95 The Fraser-Cheam, Central Fraser Valley, Dewdney-Allouette, Greater Vancouver, Powell River and the Sunshine Coast Regional Districts.

96 The Capital, Cowichan Valley, Nanaimo, Alberni-Clayoquot, Comox-Strathcona and the Mount Waddington Regional Districts.

97 The Cariboo, Bulkley-Nechako and the Fraser-Fort George Regional Districts.

98 The Peace River-Liard Regional District.

99 The Central Coast, Skeena-Queen Charlotte, Kitimat-Stikine Regional Districts and the Stikine Region.

APPENDIX G

DETAILED EDUCATION, AGE, INDUSTRY, AND OCCUPATION CATEGORIES AVAILABLE IN THE DATA SET

APPENDIX G

Detailed Education, Age, Industry, and Occupation Categories Available in the Data Set

25 EDUCATION-AGE CATEGORIES

Education

For 1981 and 1986

1. None or elementary (Category 1)
2. Some or complete high school (Category 2)
3. Some Post-secondary (Category 3)
4. Post-secondary certificate or diploma (Category 4)
5. University (Category 5)

For 1989

1. None or elementary (Category 1)
2. Some or complete high school (Categories 2, 3, and 7)
3. Some Post-secondary (Category 4)
4. Post-secondary certificate or diploma (Category 5)
5. University (Category 6)

Age

1. 17-24 years (Categories 2,3)
2. 25-34 years (Category 4)
3. 35-44 years (Category 5)
4. 45-54 years (Category 6)
5. 55-64 years (Category 7)

60 INDUSTRY-OCCUPATION CATEGORIES

Industry

0. Primary

- Agriculture (01)
- Forestry (02)
- Fishing and Trapping (03)
- Metal Mines (04)
- Mineral Fuels (05)
- Non-metal Mines (06)
- Quarries and Sand Pits (07)
- Services Incidental to Mining (08)

1. **Import-Competing**
   - Leather (12)
   - Textile (13)
   - Knitting (14)
   - Clothing (15)
   - Tobacco Products (10)
   - Furniture and Fixture (17)

2. **Resource-based**
   - Wood (16)
   - Paper and Allied Products (18)
   - Primary Metals (20)
   - Non-metallic Mineral Products (25)
   - Petroleum and Coal Products (26)

3. **High Tech**
   - Rubber and Plastics Products (11)
   - Machinery (22)
   - Transport Equipment (23)
   - Electrical Products (24)
   - Chemical and Chemical Products (27)

4. **Other**
   - Food and Beverage (09)
   - Printing-Publishing and Allied Ind (19)
   - Metal Fabricating (21)
   - Miscellaneous Manufacturing (28)

5. **Dynamic1**
   - Transportation (31)
   - Storage (32)
   - Communication (33)
   - Electric Power, Gas and Water Utilities (34)
   - Wholesale Trade (35)

6. **Dynamic2**
   - Finance (37)
   - Insurance Carriers (38)
   - Insurance Agencies and Real Estate (39)
   - Services to Business Management (44)

7. **Traditional**
   - Retail Trade (36)
   - Amusement and Recreation (43)

- Personal (45)
- Accommodation and Food (46)
- Miscellaneous Services (47)
- General Contractors (29)
- Special-Trades Contractors (30)
- Services Incidental to Construction (52)

8. Non-market1

- Education and Related (40)
- Health and Welfare (41)
- Religious Organizations (42)

9. Non-market2

- Federal Administration (48)
- Provincial Administration (49)
- Local Administration (50)
- Other Government Offices (51)

Occupations

1. Managers/Administrators

- Officials and Administrators, Gov't (01)
- Other Managers and Administrators (02)
- Management and Administration Related (03)

2. Professional

- Physical, Life Science (04)
- Maths, Stats, Systems Analysis and Related(05)
- Architects and Engineers (06)
- Architecture and Engineering Related (07)
- Social Science and Related (08)
- Religion (09)
- University and Related (10)
- Elementary, Secondary and Related (11)
- Other Teaching and Related (12)
- Health Diagnosing and Treating (13)
- Medicine and Health Related (15)
- Artistic and Recreation (16)

3. Clerical

- Stenographic and Typing (17)
- Bookkeeping, Account-recording and Related (18)
- Material Recording, Scheduling, and Dist'n (20)
- Reception, Info. Mail, Message Distribution (21)
- Library, File., Corres., Other Clerical (22)

4. **Sales and Services**
   - Sales, Commodities (23)
   - Sales, Services and Other Sales (24)
   - Protective Services (25)
   - Food and Beverage Prep., Lodging and Accom'n (26)
   - Personal, Apparel and Furnishing (27)
   - Other Service Occupations (28)

5. **Primary**
   - Farmers and Farm Management (29)
   - Other Farming, Horticulture and Animal Husb'y (30)
   - Fishing, Hunting, Trapping and Related (31)
   - Forestry and Logging (32)
   - Mining and Quarrying-incl. gas and oil field (33)

6. **Production**
   - Food, Beverage and Related Processing (34)
   - Other Processing Occ. (35)
   - Metal Shaping and Forming Occ. (36)
   - Other Machining Occ. (37)
   - Metal Products, N.E.C. (38)
   - Electrical, Electronics and Related Equipment (39)
   - Textiles, Furs and Leather Goods (40)
   - Wood Products, Rubber, Plastics and Related (410)
   - Mechanics and Repairmen, except Electrical (42)
   - Excavating, Grading, Paving and Related (43)
   - Electrical Power, Lighting and Wire Commun. (44)
   - Other Construction Trades (45)
   - Motor Transport Operators (46)
   - Other Transportation Operators (47)
   - Material Handling (48)
   - Other Crafts and Equipment Operators (49)
   - Other Occupations (50)

APPENDIX H

TABLE PERTAINING TO CHAPTER 4

TABLE H1

Collective Bargaining: Percent of Workers Covered by Collective Bargaining Agreements and their Average Hourly Wages[1], Women and Men, 1981, 1986, and 1989

	Women			Men		
	Number	% LF	Hourly Wage (Current $)	Number	% LF	Hourly Wage (Current$)
Covered						
1981	1,344,968	28.2	8.65	2,460,181	40.1	10.04
1986	1,498,096	28.2	11.82	2,345,078	37.0	13.94
1989	1,671,811	30.0	13.37	2,324,185	37.2	16.10
Not Covered						
1981	3,427,733	71.8	6.46	3,669,903	59.9	8.59
1986	3,822,339	71.8	8.02	3,991,782	63.0	11.13
1989	3,895,387	70.0	9.75	3,918,668	62.8	13.12
Total						
1981	4,772,701	100.0	7.08	6,130,084	100.0	9.17
1986	5,320,435	100.0	9.09	6,336,860	100.0	12.17
1989	5,567,198	100.0	10.84	6,242,853	100.0	14.23

Notes: 1. Refers to Collective bargaining in first job.

TABLE H2

Deindustrialization: Distribution of Paid Employment by Industrial Sector[1] by Education Level, Women and Men, 1981, 1986, and 1989

	Women			Men		
	HS or less	Univ.	All Educ. Levels	HS or less	Univ.	All Educ. Levels
Manufacturing						
1981	559,861	18,695	689,736	1,222.268	113,821	1,646,551
1986	485,388	42,190	666,002	1,048,167	130,306	1,519,002
1989	433,217	44,774	633,015	1,041,137	135,582	1,567,098
Services						
1981	2,406,183	439,145	3,941,993	2,548,976	603,238	4,079,044
1986	2,453,480	654,152	4,535,823	2,500.435	746,317	4,425,531
1989	2,351,309	786,553	4,825,470	2,306,830	817,290	4,329,701
Primary						
1981	77,674	5,727	108,444	303,335	25,723	383,398
1986	72,130	8,197	118,610	281,026	38,442	392,328
1989	73,859	6,079	108,713	238,384	37,274	346,055
Not Identitied						
1981	18,028	5,405	32,528	11,086	4,316	21,091
1986	-	-	-	-	-	-
1989	-	-	-	-	-	-
All Industries						
1981	3,061,746	468,971	4,772,701	4,085,666	752,098	6,130,084
1986	3,010,998	704,539	5,320,436	3,829,628	915,064	6,336,861
1989	2,858,384	837,406	5,567,198	3,586,351	990,147	6,242,854

Notes: 1. Refers to the industrial sector associated with the individual's first job.

TABLE H2

Deindustrialization: Distribution of Employment by Industrial Sector[1]
by Education Level, Women and Men, 1981, 1986, and 1989

	Women			Men		
	HS or less	Univ.	All Educ. Levels	HS or less	Univ.	All Educ. Levels
Manufacturing						
1981	559,861	18,695	689,736	1,222.268	118,821	1,646,551
1986	485,388	42,190	666,002	1,048,167	130,306	1,519,002
1989	433,217	44,774	633,015	1,041,137	135,582	1,567,098
Services						
1981	2,406,183	439,145	3,941,993	2,548,976	603,238	4,079,044
1986	2,453,480	654,152	4,535,823	2,500.435	746,317	4,425,531
1989	2,351,309	786,553	4,825,470	2,306,830	817,290	4,329,701
Primary						
1981	77,674	5,727	108,444	303,335	25,723	383,398
1986	72,130	8,197	118,610	281,026	38,442	392,328
1989	73,859	6,079	108,713	238,384	37,274	346,055
Not Identitied						
1981	18,028	5,405	32,528	11,086	4,316	21,091
1986	-	-	-	-	-	-
1989	-	-	-	-	-	-
All Industries						
1981	3,061,746	468,971	4,772,701	4,085,666	752,098	6,130,084
1986	3,010,998	704,539	5,320,436	3,829,628	915,064	6,336,861
1989	2,858,384	837,406	5,567,198	3,586,351	990,147	6,242,854

Notes: 1. Refers to the industrial sector associated with the individual's first job.

TABLE H3

Import Competing and High Tech Manufacturing Sub-sectors:
Distribution of Employment[1], by Education Level,
Women and Men, 1981, 1986, and 1989

	Women			Men		
	HS or Less	Univ.	All Educ. Levels	HS or less	Univ.	All Educ. Levels
<u>Import</u>						
1981	185,501	1,156	208,492	119,669	6,750	146,627
1986	146,896	3,894	172,315	108,005	8,774	141,133
1989	129,171	6,282	151,411	111,113	1,415	135,868
<u>High Tech</u>						
1981	146,096	4,491	187,826	347,640	62,104	534,967
1986	132,154	16,391	199,685	316,953	60,047	501,951
1989	100,408	10,192	170,959	299,144	65,187	521,833
<u>All Manuf.</u>						
1981	559,861	18,695	689,736	1,222,268	118,821	1,646,551
1986	485,388	42,190	666,002	1,048,167	130,306	1,519,002
1989	433,217	44,774	633,015	1,041,137	135,582	1,567,098

Notes: 1. Refers to the industrial sector with the individual's first job.

TABLE H4(a)

Structural Change Within the Service Sector: Employment, Wages, and Earnings[1], by Education Level, Women, 1981, 1986, and 1989

	Employment			Wages (Current$)			Earnings (Current$)		
	HS or less	Univ.	All	HS or less	Univ.	All	HS or less	Univ.	All
Dynamic									
1981	638,534	51,416	941,290	7.24	9.35	7.36	11,563	14,237	11,581
1986	555,955	116,106	999,211	9.41	13.12	9.98	15,542	22,957	16,581
1989	568,267	149,649	1,162,063	10.66	14.90	11.66	17,653	25,297	19,137
Traditional									
1981	1,131,821	42,930	1,453,228	5.18	7.29	5.35	6,768	10,262	6,892
1986	1,226,467	72,511	1,726,495	6.24	9.19	6.50	8,109	14,086	8,496
1989	1,170,790	102,179	1,785,522	7.44	11.86	7.97	10,167	17,365	11,035
Non-Market									
1981	635,828	334,798	1,547,475	7.21	11.45	8.77	10,455	17,807	12,916
1986	671,057	465,535	1,810,117	9.05	15.06	11.37	13,722	23,978	17,550
1989	612,252	534,726	1,877,885	10.38	17.72	13.39	15,512	28,845	20,682
All Services									
1981	2,406,183	439,144	3,941,993						
1986	2,453,479	654,152	4,535,823						
1989	2,351,309	786,554	4,825,470						

Notes: 1. Refers to the industrial sector with the individual's first job

TABLE H4(b)

Structural Change within the Service Sector: Employment, Wages, and Earnings[1], by Education Level, Men, 1981, 1986, and 1989

	Employment			Wages (Current$)			Earnings (Current$)		
	HS or less	Univ.	All	HS or less	Univ.	All	HS or less	Univ.	All
Dynamic									
1981	862,579	202,801	1,414,685	8.95	11.86	9.57	17,387	24,220	18,615
1986	832,520	243,889	1,477,095	11.91	18.21	13.41	23,694	37,912	26,667
1989	751,117	263,085	1,478,067	13.18	20.60	15.42	25,178	41,389	29,758
Traditional									
1981	1,195,775	57,850	1,573,245	7.77	10.34	7.91	13,397	20,240	13,646
1986	1,221,445	94,640	1,793,738	9.27	12.83	9.49	15,780	23,707	16,241
1989	1,183,493	107,047	1,749,825	10.95	14.13	11.13	19,147	27,540	19,609
Non-Market									
1981	490,622	342,587	1,091,114	8.67	13.10	10.40	16,116	25,818	19,677
1986	446,469	407,797	1,154,698	11.49	17.95	14.11	21,405	35,800	26,976
1989	372,221	447,158	1,101,808	13.55	20.09	16.76	24,789	39,729	31,685
All Services									
1981	2,548,976	603,238	4,079,044						
1986	2,500,434	746,326	4,425,531						
1989	2,306,831	817,290	4,329,780						

Notes: 1. Refers to the industrial sector with the individual's first job.

TABLE H5(a)

Technological Change and Occupational Mix:
Employment, Wages and Earnings[1], by Educational Level,
Women, 1981, 1986, and 1989

	Employment		Wages (Current $)	Earnings (Current $)
Manuf - Manag.		% Manuf. LF		
1981	28,273	4.1	8.81	16,344
1986	54,416	8.2	11.36	22,481
1989	57,019	9.0	14.14	25,125
Manuf - Prof.				
1981	36,117	5.2	9.61	17,608
1986	35,192	5.3	11.22	18,119
1989	36,491	5.8	12.66	21,714
Dynamic - Manag.		% Service LF		
1981	115,971	2.9	9.16	16,396
1986	167,665	3.7	11.69	22,324
1989	205,783	4.3	14.48	25,878
Dynamic - Prof.				
1981	45,052	1.1	9.18	13,808
1986	68,782	1.5	13.03	22,014
1989	92,406	1.9	14.36	23,108
Tradit - Manag.				
1981	85,163	2.2	7.12	12,158
1986	129,413	2.9	8.59	15,838
1989	152,735	3.2	10.95	20,524
Tradit - Prof.				
1981	41,704	1.1	7.33	8,603
1986	65,769	1.4	8.11	11,825
1989	67,100	1.4	9.81	13,279

TABLE H5(a)(continued)

Technological Change and Occupational Mix:
Employment, Wages and Earnings[1], by Educational Level,
Women, 1981, 1986, and 1989

	Employment		Wages (Current $)	Earnings (Current $)
Non-mkt - Manag.		% Service LF		
1981	68,744	1.7	11.04	19,780
1986	126,363	2.8	15.79	25,105
1989	155,630	3.2	16.88	31,189
Non-mkt - Prof.				
1981	832,400	21.1	9.98	14,584
1986	941,892	20.8	12.72	19,827
1989	980,237	20.3	15.12	23,082

Notes: 1. Refers to the industrial sector with the individual's first job.

TABLE H5(b)

Technological Change and Occupational Mix:
Employment, Wages and Earnings[1], by Educational Level,
Men, 1981, 1986, and 1989

	Employment		Wages (Current $)	Earnings (Current $)
Manuf - Manag.		% Manuf. LF		
1981	146,007	8.9	11.90	25,562
1986	140,509	9.3	18.36	40,592
1989	152,331	9.7	19.23	41,084
Manuf - Prof.				
1981	109,118	6.6	11.15	21,974
1986	106,829	7.0	14.84	29,833
1989	103,137	6.6	16.42	32,605
Dynamic - Manag.		% Service LF		
1981	214,963	15.2	11.51	24,804
1986	266,000	18.0	17.96	37,929
1989	266,047	18.0	19.58	40,681
Dynamic - Prof.				
1981	167,413	11.8	11.77	22,788
1986	167,215	11.3	15.34	30,580
1989	200,529	13.6	18.17	35,047
Tradit - Manag.				
1981	169,564	10.8	9.13	19,675
1986	203,040	11.3	12.38	26,058
1989	198,190	11.3	14.30	29,847
Tradit - Prof.				
1981	55,478	3.5	9.99	14,607
1986	62,931	3.5	10.37	17,040
1989	72,124	4.1	10.85	17,502

TABLE H5(b)(continued)

Technological Change and Occupational Mix:
Employment, Wages and Earnings[1], by Educational Level,
Men, 1981, 1986, and 1989

	Employment		Wages (Current $)	Earnings (Current $)
Non-mkt - Manag.		% Service LF		
1981	147,594	13.5	13.45	27,092
1986	183,183	15.9	18.07	36,651
1989	158,302	14.4	21.41	41,288
Non-mkt - Prof.				
1981	428,283	39.3	11.39	21,470
1986	462,325	40.0	15.31	29,561
1989	476,011	43.2	18.12	34,538

Notes: 1. Refers to the industrial sector with the individual's first job.

TABLE H6

Labour Supply by Education Level,
Women and Men, Canada, 1981, 1986, and 1989

	Women	Men
Workforce[1]		
University		
1981	472,383	761,758
1986	711,739	944,046
1989	857,037	1,011,333
H.S. or less		
1981	3,097,558	4,156,848
1986	3,052,491	3,902,750
1989	2,917,845	3,682,498
Univ/H.S. Workforce		
1981	.1525	.1833
1986	.2332	.2419
1989	.2937	.2746
Growth in Univ/H.S. Workforce		
(% per annum)		
1981-86	10.6	6.4
1986-89	8.6	4.5

Notes: [1] The workforce is defined as individuals with positive earnings from paid employment between the ages of 17- 64 years.

BIBLIOGRAPHY

Abraham, K.G. and H.S. Farber. (1987). "Job Duration, Seniority, and Earnings", American Economic Review, Vol. 77, No. 3, pp. 278-297.

Agarwal, B. (1986). "Women, Poverty, and Agricultural Growth in India", Journal of Peasant Studies, Vol. 13, No. 4, pp. 165-220.

Ahluwalia, M.S. (1976). "Income Distribution and Development: Some Stylized Facts", American Economic Review, Vol. 66, No. 2, pp. 128-135.

Akerlof, G.A. and J.L. Yellen. (1985). "A Near-Rational Model of the Business Cycle, with Wage and Price Inertia", The Quarterly Journal of Economics, Vol. 100, Supplement, pp. 823-838.

Akyeampong, E.B. (1989). "Working for minimum wage", Perspectives on Labour and Income, Winter 1989.

American Statistical Index (1993) Annual, Vol. 80.

Atkinson, A.B. (1994). "Seeking to Explain the Distribution of Income", London School of Economics, International Centre for Economics and Related Disciplines Discussion Paper No. WSP/106.

Atkinson, A.B. (1993). "What is Happening to the Distribution of Income in the UK?", London School of Economics, International Centre for Economics and Related Disciplines Discussion Paper No. WSP/87.

Atkinson, A.B., J. Gomulka and J. Micklewright. (1984). "Unemployment Benefit, Duration and Incentives in Britain", Journal of Public Economics, 23, pp. 3-26.

Atkinson, J. (1987). "Flexibility or Fragmentation? The United Kingdom Labour Market in the Eighties", in Labour and Society, Vol. 12, No. 1.

Baldwin, R.B., B. Diverty and D. Sabourin. (1995). "Technology Use and Industrial Transformation: Empirical perspectives", Statistics Canada, Analytical Studies Branch Research Paper No. 75.

Bar-Or, Y., J. Burbidge, L. Magee, and A. L. Robb. (1995). "The Wage Premium to a University Education in Canada 1971-1991", Journal of Labor Economics, Vol. 13, No. 4, p. 762.

Beach, C.M. (1989). "Dollars and Dreams: A Reduced Middle Class? Alternative Explanations", Journal of Human Resources, Vol. 24, Mo. 2, pp. 162-193.

Beach, C.M. (1977). "Cyclical Sensitivity of Aggregate Income Inequality", Review of Economics and Statistics, Vo. 59, pp. 59-66.

Beach, C.M. and R. Davidson. (1983). "Distribution-Free Statistical Inference with Lorenz Curves and Income Shares", Review of Economic Studies, L, pp. 723-735.

Beach, C.M. and S.F. Kaliski. (1986). "Lorenz Curve Inference with Sample Weights: An Application to the Distribution of Unemployment Experience", Applied Statistics, Vol. 35, No. 1, pp. 38-45.

Beach, C.M. and G.A. Slotsve (1993). "Polarization of Earnings in the Canadian Labour Market", in T.J. Courchene (ed.) Stabilization, Growth and Distribution: Linkages in the Knowledge Era. Kingston: John Deutsch Institute for the Study of Economic Policy.

Becker, G. (1981). A Treatise on the Family. Cambridge, MA: Harvard University Press.

Berman, E., J. Bound and Z. Griliches. (1994). "Changes in the Demand for Skilled Labor Within U.S. Manufacturing: Evidence From the Annual Survey of Manufactures", Quarterly Journal of Economics, Vol. CIX, No. 2, pp. 367-397.

Bishop, J.A., J.P. Formby and P.D. Thistle. (1991). "Changes in the US Earnings Distributions in the 1980s", Applied Economics, 23, pp. 425-434.

Blackburn, M.L. (1989). "Interpreting the Magnitude of Changes in Measures of Income Inequality", Journal of Econometrics, Vol. 42, pp. 21-25.

Blackburn, M.L. (1990). "What Can Explain the Increase in Earnings Inequality Among Males?", Industrial Relations, Vol. 29, No. 3, pp. 441-455.

Blackburn, M.L. and D.E. Bloom. (1987). "Earnings and Income Inequality in the United States", Population and Development Review, Vol. 13, No. 4, pp. 575-609.

Blackburn, M.L. and D.E. Bloom. (1993). "The Distribution of Family Income: Measuring and Explaining Changes in the 1980s For Canada and the United States", in D. Card and R. Freeman (eds.), Small Differences that Matter: Labour Markets and Income Maintenance in Canada and the United States, Chicago: University of Chicago Press.

Blackburn, M.L., D.E. Bloom and R.B. Freeman. (1990). "The Declining Economic Position of Less Skilled American Men", in G. Burtless (ed.) A Future of Lousy Jobs?, Washington, DC: The Brookings Institution.

Blackorby, C., D. Donaldson, and M. Auersperg. (1981). "A New Procedure for the Measurement of Inequality Within and Among Population Subgroups", Canadian Journal of Economics, Vol. 14, No. 4, pp. 665-685.

Blank, R. and A. Blinder. (1986). "Macroeconomics, Income Distribution, and Poverty", in S. Danzinger and D Weinberg (eds.), Fighting Poverty, What Works and What Doesn't, Cambridge, MA: Harvard University Press.

Blank, R. and D. Card. (1993). "Poverty, Income Distribution, and Growth: Are They Still Connected?", Brookings Papers on Economic Activity, No. 2.

Blaug, M. (1992). The Methodology of Economics: Or How Economists Explain, Cambridge, MA: Cambridge University Press.

Blaug, M. (1979). Economic Theory in Retrospect, Cambridge: Cambridge University Press, 3rd edition.

Blinder, A. and H. Esaki. (1978). "Macroeconomic Activity and Income Distribution in the Post-war United States", Review of Economics and Statistics, November, pp. 604-608.

Bluestone, B. and B. Harrison. (1988). "The Growth of Low-Wage Employment: 1963-86", AEA Papers and Proceedings, May, pp. 124-134.

Boland, L. (1989). "Methodology after Samuelson: Lessons for Methodologists", in L. Boland, The Methodology of Economic Model Building, New York: Routledge.

Boland, L.A. (1991a). " Current Views on Economic Positivism", in D. Greenaway, M. Bleaney and I. Stewart (eds.), Companion to Contemporary Economic Thought, New York: Routledge.

Boland, L.A. (1991b). "Methodology", in J. Eatwell, M. Milgate, and P. Newman (eds.), The New Palgrave Dictionary of Economics, London: Macmillan Press Ltd., pp.455-458.

Boland, L.A. (1992). "Knowledge in Neoclassical Economic Theory", in L. Boland, Some Lies my Teachers Told Me, New York: Routledge.

Borjas, G., R. Freeman, and L. Katz. (1991). "On the Labor Market Effects of Immigration and Trade", NBER Working Paper No. 3761.

Boston, T. (1990). "Segmented Labor Markets: New Evidence from a Study of Four Race-Gender Groups", Industrial and Labor Relations Review, Vol. 44, No. 1, pp. 99-115.

Boumahdi, R. and J.M. Plassard. (1992). "Another Look on Earnings Functions" Economics Letters, Vol. 38, pp. 73-76.

Bound, J. and H. Holzer. (1991). "Industrial Shifts, Skills and the Labour Market for White and Black Males", National Bureau of Economic Research Working Paper No. 3715.

Bound, J. and G. Johnson. (1992). "Changes in the Structure of Wages in the 1980s: An Evaluation of Alternative Explanations", American Economic Review, Vol. 82, pp. 371-392.

Brandolini, A. and P. Sestito. (1994). "Cyclical and Trend Changes in Inequality in Italy, 1977-1991", Paper for the 23rd General Conference of the International Association for Research in Income and Wealth.

Bulow, J.I. and L.H. Summers. (1986). "A Theory of Dual Labor Markets with Application to Industrial Policy, Discrimination, and Keynesian Unemployment", Journal of Labor Economics, Vol. 4, No. 3, pp. 376-414.

Burtless, G. (1990). "Earnings Inequality Over the Business Cycles", in G. Burtless (ed.) A Future of Lousy Jobs?, Washington, DC: The Brookings Institution.

Burtless, G. (1990). "Introduction and Summary", in G. Burtless (ed.) A Future of Lousy Jobs?, Washington, DC: The Brookings Institution.

Burtless, G. (1993). "The Contribution of Employment and Hours Changes to Family Income Inequality", AEA Papers and Proceedings, May, pp. 131-135.

Burbidge, J.B., L. Magee, and A.L. Robb (1994). "Canadian Wage Inequality over the Last Two Decades", Mimeo, Department of Economics, McMaster University.

Buse, A. (1982). "The Cyclical Behaviour of the Size Distribution of Income in Canada: 1947-78", Canadian Journal of Economics, Vol. 15, No. 2, pp. 189-204.

Cairnes, J. (1874). Some Leading Principles of Political Economy Newly Expounded, London: Macmillan.

Caldwell, B. (1982). "The Philosophical Attack on Logical Empiricism", in B. Caldwell, Beyond Positivism: Economic Methodology in the Twentieth Century, London: Allen & Unwin.

Card, D. (1992). "The Effect of Unions on the Distribution of Wages: Redistribution or Relabelling?", National Bureau of Economic Research Working Paper No. 4195.

Christopherson, S. and M. Storper. (1989). "The Effects of Flexible Specialization on Industrial Politics and the Labor Market: The Motion Picture Industry", Industrial and Labor Relations Review, Vol. 42, No. 3, pp. 331-347.

Coddington, A. (1972). "Positive Economics", Canadian Journal of Economics, Vol. 5, pp. 1-15.

Coder, J.F. (1993). "Using Administrative Record Information to Evaluate the Quality of the Income Data Collected in the Survey of Income and Program Participation", in Statistics Canada, Design and Analysis of Longitudinal Surveys, Ottawa: Ministry of Industry, Science and Technology.

Cowell, F.A. (1989). "Sampling Variance and Decomposable Inequality Measures", Journal of Econometrics, Vol. 42, pp. 27-41.

Cowell, F. and S. Jenkins. (1994). "How Much Inequality Can We Explain? A Methodology and an Application to the USA", London School of Economics, International Centre for Economics and Related Disciplines Discussion Paper No. DARP/7.

Cross, R. (1982). "The Duhem-Quine Thesis, Lakatos and the Appraisal of Theories in Macroeconomics", The Economic Journal, 92, pp. 320-340.

Cutler, D.M. and L.F. Katz. (1991). "Macroeconomic Performance and the Disadvantaged", Brookings Papers on Economic Activity, February, pp. 1-74.

Cutler, D.M. and L.F. Katz. (1992). "Rising Inequality? Changes in the Distribution of Income and Consumption in the 1980s", AEA Papers and Proceedings, May, pp. 546-551.

Davis, S.J. (1992). "Cross-Country Patterns of Change in Relative Wages", in O.J. Blanchard and S. Fischer (eds.) NBER Macroeconomics Annual, Cambridge, MA: MIT Press.

DeFreitas, G., D. Marsden and P. Ryan. (1991). "Youth Employment Patterns in Segmented Labor Markets in the US and Europe", Eastern Economic Journal, April-June , pp. 223-236.

de Marchi, N. (1992). "Methodology as Attempt to Understand Practice", in N. de Marchi (ed.), Post-Popperian Methodology of Economics: Recovering Practice, Boston: Kluwer Academic Publishers.

Dickens, W.T. and L. Katz. (1987). "Inter-industry Wage Differences and Industry Characteristics", in K. Lang and J. Leonard (eds.), Unemployment and the Structure of Labour Markets, Oxford: Basil Blackwell.

Dickens, W.T. and K. Lang. (1985). "A Test of Dual Labor Market Theory", The American Economic Review, September, pp. 792-805.

Doeringer, P. and M. Piore. (1971). Internal Labor Markets and Manpower Analysis. Lexington, M.A.: Heath and Co.

Doiron, D.J. and G.F. Barrett. (1994). "Inequality in Male and Female Earnings: The Role of Hours and Wages", (mimeo) earlier version appeared as UBC Discussion Paper No. 92-36 (and CRESP DP-03), forthcoming The Review of Economics and Statistics, Vol. 78, No. 3, August 1996.

Dooley, M.D. (1986). "The Overeducated Canadian? Changes in the Relationship Among Earnings, Education, and Age for Canadian Men", Canadian Journal of Economics, Vol. 19, No. 1, pp. 142-159.

DuMouchel, W.H. and G.J. Duncan. (1983). "Using Sample Survey Weights in Multiple Regression Analyses of Stratified Samples", Journal of the American Statistical Association, September, pp. 535-543.

Dunlop, J. (1957). "The Task of Contemporary Wage Theory" in G.W. Taylor and G.W. Pierson (eds.), New Concepts in Wage Determination, New York: McGraw-Hill, pp. 117-139.

Eardley, T. and A Corden. (1994). "Earnings from Self-Employment: the Problem of Measurement and the Effect on Income Distribution in the UK", Paper for the 23rd General Conference of the International Association for Research in Income and Wealth.

Economic Council of Canada. (1991). Employment in the Service Economy. Ottawa: Supply and Services Canada.

Edwards, R. (1975). "The Social Relations of Production in the Firm and Labor Market Structure" in Edwards, M. Reich, and D. Gordon (eds.) Labor Market Segmentation, Lexington, M.A.: Heath and Co.

Edwards, R. (1979). Contested Terrain: The Transformation of the Workplace in the Twentieth Century. New York, Basic Books.

Erksoy, S. (1994). "The Effects of Higher Unemployment on the Distribution of Income in Canada: 1981-1987", Canadian Public Policy, Vol. XX, No. 3, pp. 318-328.

Evans, M. (1995). "Out for the Count: The Incomes of the Non-Houshold Population and the Effect of Their Exclusion from National Income Profiles", London School of Economics, International Centre for Economics and Related Disciplines Discussion Paper No. WSP/111.

Feenstra, R. and G. Hanson. (1995). "Foreign Investment, Outsourcing and Relative Wages", National Bureau of Economic Research Working Paper No. 5121.

Fethke, G. (1985). "The Conformity of Wage-Indexation Models with Stylized Facts", American Economic Review, Vol. 75, No. 4, pp. 856-.

Fichtenbaum, R., K. Gyimah-Brempong, and P. Olson. (1994). "New Evidence on the labor Market Segmentation", Review of Social Economy, Vol. 52, No. 1, pp. 20-39.

Folbre, N. (1986). "Hearts and Spades: Paradigms of Household Economics", World Development, Vol. 14, No. 2, pp. 245-255.

Folbre, N. (1993). "How Does She Know? Feminist Theories of Gender Bias in Economics", History of Political Economy, Vol. 25, No. 1, pp. 167-182.

Freeman, R.B. (1986). "Demand for Education", in O. Ashenfeller and R. Layard (eds.) Handbook of Labor Economics, Volume I, North Holland: Elsevier Science Publishers.

Freeman, R.B. (1995). "Are Your Wages Being Set in Beijing?", The Journal of Economic Perspectives, Vol. 9, No. 3, pp. 15-32.

Freeman, R. and K. Needels. (1993). "Skill Differentials in Canada in an Era of Rising Labor Market Inequality", in D. Card and R. Freeman (eds.), Small Differences that Matter: Labour Markets and Income Maintenance in Canada and the United States, Chicago: University of Chicago Press.

Freeman, C. and L. Soete. (1987). "Information Technology and Change in Techno-Economic Paradigm", in C. Freeman and L. Soete (eds.), Technical Change and Full Employment, Basil Blackwell Inc.

Frenken, H. and K. Maser. (1992). "Employer-Sponsored Pension Plans - Who is Covered?", Perspectives, Winter, pp. 27-34.

Friedman, M. (1953). Essays in Positive Economics. Chicago: The University of Chicago Press.

Fritzell, J. (1992). "Income Inequality Trends in the 1980s: A Five Country Comparison", LIS Working Paper No. 73.

Gera, S., D. Caldwell, and D. Ferguson. (1993). "Industrial Restructuring in Canadian Manufacturing: A Comparison Between the Early 1980s and 1990s", Paper presented to the Canadian Economics Association Meetings, Ottawa, June 4-6, 1993.

Gera, S. and G. Grenier. (1994). "Interindustry Wage Differentials and Efficiency Wages: Some Canadian Evidence", Canadian Journal of Economics, February, pp. 81-100.

Gittleman, M. and M. Joyce. (1994). "Earnings Mobility and Long-Run Inequality: An Analysis Using Matched CPS Data", Bureau of Labor Statistics, June.

Globe and Mail. Article on Unpaid Labour. April 7, 1994.

Golding, C. and L.F. Katz. (1995). "The Decline of Non-Competing Groups: Changes in the Premium to Education, 1890-1940", National Bureau of Economic Research Working Paper No. 5202.

Goodman, A., P. Johnson and S. Webb. (1994). "The U.K. Income Distribution 1961-91: The Role of Demographic and Economic Changes", Paper presented at the 23rd General Conference of the International Association for Research in Income and Wealth.

Gordon, D. R. Edwards, M. Reich. (1982). Segmented Work, Divided Workers: The Historical Transformation of Work in the United States. Cambridge: Cambridge University Press.

Gottschalk, P. (1993). "Changes in Inequality of Family Income in Seven Industrialized Countries", American Economic Review, May.

Gottschalk, P. and M. Joyce. (1991). "Changes in Earnings Inequality-An International Perspective', LIS Working Paper 66, Luxembourg.

Gottschalk, P. and M. Joyce. (1992). "The Impact of Technological Change, Deindustrialization, and Internationalization of Trade on Earnings Inequality--an International Perspective", (mimeo).

Gottschalk, P. and M. Joyce. (1995). "The Impact of Technological Change, Deindustrialization, and Internationalization of Trade on Earnings Inequality: An International Perspective", in K. McFate, R. Lawson, and W.J. Wilson (eds.), Poverty, Inequality, and the Future of Social Policy, New York: Russell Sage Foundation, pp. 197-228.

Grubel, H.G. and L.A. Boland. (1986). "On the Efficient Use of Mathenatics in Economics: Some Theory, Facts and Results of an Opinion Survey", KYKLOS, Vol. 39, Fasc. 3, pp. 419-442.

Gustafsson, B. (1993). "The Development of the Distribution of Well-being in Sweden during the 1970s and 1980s", (mimeo).

Hanratty, M. and R. Blank. (1993). "Down and Out in North America: Recent Trends in Poverty Rates in the U.S. and in Canada", Quarterly Journal of Economics, Vol. 10, pp. 233-257.

Harding, Ann. (1994). "The Impact of Social, Demographic and Labour Force Change Upon Measures of Income Distribution in Australia: An Application Using Microdata and Microsimulation", Paper presented at the 23rd General Conference of the International Association for Research in Income and Wealth.

Harrison, B. (1972). Education, Training and the Urban Ghetto. Baltimore, MD: John Hopkins University Press.

Harrison, B. and B. Bluestone. (1989). "Wage Polarisation in the U.S. and the "Flexibility" Debate", School of Urban and Public Affairs, Working Paper 89-51.

Harrison, B. and B. Bluestone. (1990). "Wage Polarisation in the US and the 'Flexibility' Debate", Cambridge Journal of Economics, 14, 351-373.

Hartmann, H. (1981). "Capitalism, Patriarchy, and Job Segregation by Sex", Signs, Vo. 1, No.3, Part 2.

Hausman, D.M. (1989). "Economic Methodology in a Nutshell", Journal of Economic Perspectives, Vol. 3, No. 2, pp. 115-127.

Hayek, F.A. (1943). "The Facts of the Social Sciences", Ethics: An International Journal of Social, Political, and Legal Philosophy, October, pp. 1-13.

Heckman, J.J. (1979). "Sample Selection Bias as a Specification Error", Econometrica, Vol. 47, pp. 153-161.

Howell, D.R. and E.N. Wolff. (1991). "Trends in the Growth and Distribution of Skills in the U.S. Workplace", Industrial and Labor Relations Review, Vol. 44, No. 3, pp. 486-502.

Hutchison, T.W. (1938). The Significance and Basic Postulates of Economic Theory, London: Macmillan & Co., Ltd.

Jantti, M. (1993). "Changing Inequality in Five Countires: The Role of Markets, Transfers and Taxes", (mimeo).

Jenkins, S.P. (1991). "The Measurement of Income Inequality", in L. Osberg (ed.), Economic Inequality and Poverty International Perspectives, Armonk, N.Y.: M.E. Sharpe, Inc, pp. 3-38.

Jenkins, S.P. (1992). "Accounting for Inequality Trends: Decomposition Analyses for the UK 1971-86", University College of Swansea, Department of Economics, Discussion Paper Series No. 92-10.

Jenkins, S.P. and N. O'Leary. (1994). "Household Income Plus Household Production: The Distribution of 'Extended Income' in the U.K.", Paper for the 23rd General Conference of the International Association for Research on Income and Wealth.

Johnson, J. (1984). Econometric Methods. New York: McGraw-Hill Book Company, third edition.

Johnson, D., S. Shipp and E. Jacobs. (1994). "Expenditure Trends and Measures of Inequality: 1960-1992", Paper for the 23rd General Conference for the International Association for Research in Income and Wealth.

Johnson, S. (1995). "More Evidence on the Effect of Higher Unemployment on the Canadian Size Distribution of Income", Canadian Public Policy, Vol. XXI, No. 4, pp. 423-428.

Juhn, C., K.M. Murphy and B. Pierce. (1993). "Wage Inequality and the Rise in returns to Skill", Journal of Political Economy, Vol. 101, No. 3, 410-442.

Kaldor, N. (1978). Further Essays on Economic Theory, London: Duckworth.

Kalton, G., K. Kasprzyk, and D.B. McMillen. (1989). "Nonsampling Errors in Panel Surveys", in D. Kasprzyk, G. Duncan, G.Kalton and M.P. Singh (eds.), Panel Surveys. Wiley Series in Probability and Mathematical Statistics, New York: John Wiley, pp. 249-270.

Kanbur, R.S.M. (1984). "The Measurement and Decomposition of Inequality and Poverty", in F. van der Ploeg (ed.) Mathematical Models in Economics, John Wiley & Sons Ltd.

Karoly, L. (1988). " A Study of the Distribution of Individual Earnings in the United States from 1967 to 1986", Ph.D. Dissertation, Department of Economics, Yale University.

Karoly, L.A. (1989). Computing Standard Errors for Measures of Inequality Using the Jacknife", (mimeo), The Rand Corporation, Department of Economics.

Karoly, L. (1992). "Changes in the Distribution of Individual Earnings in the United States from 1967 to 1986", The Review of Economics and Statistics, Vol. 74, No. 1, pp. 107-115.

Karoly, L. (1993). "The Trend in Inequality Among Families, Individuals, and Workers in the United States: A Twenty-five Year Perspective", in S. Danzinger and P. Gottschalk (eds.), Uneven Tides: Rising Inequality in America, New York: Russell Sage Foundation.

Katz, L.F. and K.M. Murphy. (1992). "Changes in Relative Wages, 1963-1987: Supply and Demand Factors", Quarterly Journal of Economics, Vol. 107, No. 1, pp. 35-78.

Katz, L.F. and A.L. Revenga. (1989). "Changes in the Structure of Wages: The United States vs Japan", Journal of the Japanese and International Economies, Vol. 3, pp. 522-553.

Kasprzyk, D., G. Duncan, G. Kalton and M.P. Singh. (1989). Panel Surveys, New York: John Wiley, pp. 249-270.

Kerr, C. (1954). "The Balkanization of Labor Markets", in E. Bakke (ed.), Labor Mobility and Economic Opportunity, Cambridge, MA: MIT Press.

Klamer, A. (1988). "Negotiating a new conversation about economics", in A. Klamer, D.N. McCloskey and R.M. Solow (eds.), The Consequences of Economic Rhetoric. New York: Cambridge University Press, pp. 265-79.

Knight, F.H. (1940). "What is Truth in Economics?", The Journal of Political Economy, February, pp. 1-32.

Knight, F.H. (1956). On the History and Method of Economics, Chicago: The University of Chicago Press.

Knight, J.B. (1976). "Explaining Income Distribution in Less Developed Countries: A Framework and an Agenda", Oxford Bulletin of Economics and Statistics, Vol. 38, pp. 161-177.

Koopmans, T.C. (1947). "Measurement Without Theory", The Review of Economics and Statistics, Vol. 29, 161-172.

Koopmans, T.C. (1957). Three Essays on the State of Economic Science, New York: McGraw-Hill.

Krueger, A. (1993). "How Computers have Changed the Wage Structure: Evidence from Microdata, 1984-89", Quarterly Journal of Economics, Vol. 108, No. 1, pp. 33-60.

Kuhn, T.S. (1970). The Structure of Scientific Revolutions, Chicago: The University of Chicago Press.

Kynch, J. and A. Sen. (1983). "Indian women: well-being and survival", Cambridge Journal of Economics, Vol. 7, pp. 363-383.

Lavoie, H. (1991). "Changes to Educational Attainment Questions", Feature ARticle in The Labour Force.

Lawrence, R. and M. Slaughter. (1993). "Trade and U.S. Wages: Great Sucking Sound or Small Hiccup?", in Brookings Papers on Economic Activity, Microeconomics, Vol. 2., Washington, D.C.: Brookings Institution.

Lawson, T. (1989). "Abstraction, Tendencies and Stylised Facts: A Realist Approach to Economic Analysis", Cambridge Journal of Economics, Vol. 13, pp. 59-78.

Leckie, N. and C. Caron. (1991). "On Non-Wage Labour Income", Perspectives, Winter, pp. 47-55.

Lemieux, T. (1993) "Unions and Wage Inequality in Canda and the United States", Chapter 3 in D. Card and R. Freeman (eds.), Small Differences that Matter: Labour Markets and Income Maintenance in Canada and the United States, Chicago: University of Chicago Press.

Leontief, W. (1971). "Theoretical Assumptions and Nonobserved Facts", American Economic Review, 61, pp. 1-7.

Lepkowski, J.M. (1989). "Treatment of Wave Nonresponse in Panel Surveys:, in D. Kasprzyk, G. Duncan, G. Kalton and M.P. Singh (eds.), Panel Surveys, New York: J.W. Wiley and Sons, Inc., pp. 348-374.

Lepkowski, J.M., D.P. Miller, G. Kalton, and R. Singh. (1993). "Imputation for Wave Nonresponse in the SIPP", in Statistics Canada, Design and Analysis of Longitudinal Surveys, Ottawa: Ministry of Industry, Science and Technology.

Levy, F. and R.J. Murnane. (1992). "U.S. Earnings Levels and Earnings Inequality: A Review of Recent Trends and Proposed Explanations", Journal of Economic Literature, Vol. XXX, September, pp. 1333-1381.

Lin, Z (1993). "Self-Employment in Canada: Characteristics, Distribution and Determination", (mimeo), Human Resources and Labour Canada, Program Evaluation Branch, Insurance Programs Directorate.

Lipsey, R.G. (1989). Economics as a Social Science, London: Butler & Tanner Ltd.

Logan, R. (1994). "Voluntary Part-time Workers", Perspectives, Vol. 6, No. 3, pp. 18-24.

Love, R. and M. Wolfson. "Income Inequality: Statistical Methodology and Canadian Illustrations", Statistics Canada, Catalogue 13-559.

Lowe, G. (1991). "Computers in the Workplace", Perspectives, Summer.

Machin, S. and J. Waldfogel. (1994). "The Decline of the Male Breadwinner", London School of Economics, Welfare State Programme, Suntory-Toyota International Centre for Economics and Related Disciplines, Discussion Paper WSP/103.

Machlup, F. (1978). Methodology of Economics and Other Social Sciences, New York: Academic Press, Inc.

Magnac. T. (1991). "Segmented or Competitive Labor Markets?", Econometrica, Vol. 59, No. 1, pp. 165-187.

Maki, U. (1993). "Two Philosophies of the Rhetoric of Economics", in W. Henderson, T. Dudley-Evans, and R. Backhouse (eds.), Economics and Language, London: Routledge, pp. 23-50.

Manser, M. and M. Brown. (1980). "Marriage and Household Decision-making: A Bargaining Analysis", International Economic Review, Vol. 21, No.1, pp. 31-44.

Marshall, K. (1993). "Employed Parents and the Division of Housework", Perspectives, Autumn, pp. 23-30.

McCloskey, D.N. (1983). "The Rhetoric of Economics", Journal of Economic Literature, June, pp. 481-517.

McCloskey, D.N. (1989). "Why I am no Longer a Positivist", Review of Social Economy, Fall, pp. 225-238.

McConnell, C.R. and S.L. Brue. (1993). Economics. London: McGraw-Hill Inc., 12th edition.

McElroy, M. and M. Horney. (1981). "Nash-Bargained Household Decisions:Towards a Generalisation of the Theory of Demand", International Econmic Review, Vol. 22, No. 2, pp. 333-349.

Merrilees, W.J. (1982). "Labour Market Segmentation in Canada: An Econometric Approach", Canadian Journal of Economics, August, pp. 458-473.

Michaud, S. and L. Hunter. (1993). "Strategy for Minimizing the Impact of Non-Response for the Survey of Labour and Income Dynamics", in Statictics Canada, Design and Analysis of Longitudinal Surveys, Ottawa: Ministry of Industry, Science and Technology.

Michon, F. (1981). "Dualism and the French Labour Market: Business Strategy, Non-Standard Job Forms, and Secondary Jobs", in F. Wilkinson (ed.), The Dynamics of Labour Market Segmentation, London: Academic Press.

Mincer, J. (1989). "Human Capital Resonses to Technological Change in the Labor Market", National Bureau of Economic Research Working Paper No. 3207.

Mincer, J. (1991). "Human Capital, Technology, and the Wage Structure: What do Time Series Show?", National Bureau of Economic Research Working Paper No. 3581.

Mirowski, P. (1991). "The When, the How and the Why of Mathematical Expression in the History of Economic Analysis", Journal of Economic Perspectives, Vol. 5, No. 1, pp. 145-157.

Mirowski, P. (1989). More Heat than Light. New York: Cambridge University Press.

Mirowski, P. (1991). "The When, the How and the Why of Mathematical Expression in the History of Economic Analysis", Journal of Economic Perspectives, Vol. 3, No.1, pp. 145-157.

Mizon, G.E. (1991). "The Role of Measurement and Testing in Economics", in D. Greenaway, M. Bleaney and I. Stewart (eds.), Companion to Contemporary Economic Thought, New York: Routledge.

Moore, R. (1981). "Aspects of Segmentation in the U.K. Building Industry", in The Dynamics of Labour Market Segmentation, edited by F. Wilkinson. London: Academic Press.

Morgan, T. (1988). "Theory versus Empiricism in Academic Economics: Update and Comparisons", Journal of Economic Perspectives, Vol. 2, No. 4, pp. 159-164.

Morissette, R. (1995). "Why Has Inequality in Weekly Earnings Increased in Canada?", Statistics Canada, Analytical Studies Branch, Research Paper No. 80.

Morissette, R., J. Myles and G. Picot. (1993). "What is Happening to Earnings Inequality in Canada?", Statistics Canada, Analytical Studies Branch, Research Paper No. 60.

Morissette, R. and D. Sunter. (1994). "What is Happening to Weekly Hours Worked in Canada?", Statistics Canada, Analytical Studies Branch, Research Paper No. 65.

Murphy, K. and F. Welch. (1992). "The Structure of Wages", Quarterly Journal of Economics, Vol. 107, No. 1, pp. 215-326.

Myles, J., G. Picot, and T. Wannell. (1988). "Wages and Jobs in the 1980s: Changing Youth Wages and the Declining Middle", Analytical Studies Branch Research Paper No. 17, Statistics Canada.

Noreau, N. (1994). "Involuntary Part-timers", Perspectives, Vol. 6, No. 3, pp. 25-30.

Nygard, F. and A. Sandstrom. (1981). Measuring Income Inequality, Stockholm: Almqvist & Wiksell International.

Ogwang, T. (1995a). "Convenient Method of Computing Jacknife Estimates of Standard Error of Gini Index", (mimeo).

Ogwang, T. (1995b). "Kuznets' U-curve Hypothesis as a Technical Property of the CV Inequality Measure", (mimeo).

Osberg, L. (1981). Economic Inequality in Canada, Toronto: Butterworths.

Osberg, L. and E. Wolff. (1984). The Information Economy - The Implications for Unbalanced Growth. Halifax, N.S.: Institute for Research on Public Policy.

Osberg, L. (1995). "Concepts of Unemployment and the Structure of Employment", Economie Appliquee, Tome XLVIII, No. 1, pp. 157-181.

Osberg, L., R. Apostle and D. Clairmont. (1986). "Segmented Labour Markets and the Estimation of Wage Functions", Dalhousie University, Department of Economics, Working Paper No. 86-06.

Osberg, L., S. Erksoy and S. Phipps. (1993). "Unemployment, Unemployment Insurance and the Redistribution of Income in Canada in the 1980s: Provisional Results", Dalhousie University, Department of Economics, Working Paper No. 93-07, June.

Osberg, L., S. Erksoy and S. Phipps. (1994). "Behavioral Response, Sociodemographic Change and the Distribution of Income: How to Value the Poorer Prospects of the Young?", Paper for the 23rd General Conference of the International Association for Research in Income and Wealth.

Patrinos, H. (1993a). "Educational Expansion, Increasing Returns to Schooling, and Rising Inequality in the 1980s", Paper prepared for the Canadian Economics Association Meetings, Ottawa, June 4-6.

Patrinos, H. (1993b). "Increasing Earnings Inequality in Canada: Testing the Industrial Restructuring Hypothesis", Paper prepared for the Canadian Economics Association 1993 Meetings, Ottawa, June 4-6.

Perron, P. and F. Vailancourt. (1988). The Evolution of Poverty in Canada 1975-1980, Economic Council Discussion Paper No. 343, Ottawa.

Phipps, S.A. (1993). "Measuring Poverty Among Canadian Households", The Journal of Human Resources, Vol. 28, pp. 162-184.

Picot, G, J. Myles and T. Wannell. (1990). "Good Jobs/Bad Jobs and the Declining Middle: 1967-1986", Statistics Canada, Analytical Studies Branch, Research Paper No. 28.

Piore, M. (1975). "Notes for a Theory of Labor Market Segmentation", in Labor Market Segmentation, edited by R. Edwards, M. Reich, and D. Gordon. Lexington, M.A.: Heath and Co.

Piore, M. and C. Sabel (1984). The Second Industrial Divide: Possibilities for Prosperity. New York: Basic Books.

Pold, H. (1994). "Jobs! Jobs! Jobs!", Perspectives, Autumn, pp. 14-17.

Radner, D.B. (1994). "Noncash Income, Equivalence Scales, and the Measurement of Economic Well-Being", Paper for the 23rd General Conference of the International Association for Research in Income and Wealth.

Reagan, P. and D.P. Sheehan. (1985). "The Stylized Facts About the Behavior of Manufacturers' Inventories and Backorders over the Business Cycle: 1959-1980", Journal of Monetary Economics, 15, 217-246.

Rebitzer, J.B. (1988). "Unemployment, Labor Relations, and Unit Labor Costs", AEA Papers and Proceedings, May, pp. 389-394.

Rebitzer, J.B. and M.D. Robinson. (1991). "Employer Size and Dual Labor Markets", The Review of Economics and Statistics, November, pp. 710-715.

Rebitzer, J.B. and L.J. Taylor. (1991). "A Model of Dual Labor Markets When Product Demand is Uncertain", The Quarterly Journal of Economics, November, pp. 1373-1383.

Rebitzer, J.B. and L.J. Taylor. (1995). "Do Labor Markets Provide Enough Short-Hour Jobs? An Analysis of Work Hours and Work Incentives", Economic Inquiry, April, pp. 257-273.

Reich, M., D.M. Gordon and R.C. Edwards. (1973). "Dual Labor Markets: A Theory of Labor Market Segmentation", American Economic Association, May, pp. 359-365.

Resnick, S. and R. Wolff. (1988). "Marxian theory and the rhetorics of economics", in A. Klamer, D. McCloskey and R. Solow (eds), The Consequences of Economics Rhetoric, New York: Cambridge University Press.

Richardson, D.H. (1994). "Changes in the Distribution of Wages in Canada, 1981-1992", Discussion Pasper No.: 94-22, Department of Economics, University of British Columbia.

Riddell, C.W. (1995). "Human Capital Formation in Canada: Recent Developments and Policy Responses", in Keith G. Banting and Charles M. Beach (eds.) Labour Market Polarization and Social Policy Reform, Kingston, Ontario, Canada: School of Policy Studies.

Robinson, S. (1976). "A Note on the U Hypothesis relating Income Inequality and Economic Development", American Economic Review, Vol. 66, pp. 437-440.

Rosenberg, S. (1989). "From Segmentation to Flexibility", Labour and Society, October, pp. 363-407.

Rosenzweig, M. (1986). "Program Interventions, Intrahousehold Distribution and the Welfare of Individuals: Modelling Household Behaviour", World Development, Vol. 14, No.2, pp. 233-244.

Rosenzweig, M. and T.P. Schultz. (1982). "Market Opportunities, Genetic Endowments, and Intrafamily Resource Distribution: Child Survival in Rural India", American Economic Review, Fol. 72, No. 4, pp. 803-815.

Rossetti, J. (1992). "Deconstruction, Rhetoric, and Economics", in N. de Marchi (ed.), Post-Popperian Methodology of Economics: Recovering Practice, Boston: Kluwer Academic Publishers.

Rubery, J. (1978). "Structured Labour Markets, Worker Organization and Low Pay", in Cambridge Journal of Economics, Vol. 2, No. 1.

Rubery, J. (1988). Women and Recession, London: Routledge and Kegan Paul.

Rubery, J. (1989). "Flexibility in the Labour Market", in F. Green (ed.), The Restructuring of the Uk Economy, London: Harvester.

Rubery, J. and F. Wilkinson. (1981). "Outwork and Segmented Labour Markets", in F. Wilkinson (ed.), The Dynamics of Labour Market Segmentation, London: Academic Press.

Ryan, P. (1981). "Segmentation, Duality and the Internal Labour Market", in F. Wilkinson (ed.), The Dynamics of Labour Market Segmentation, London: Academic Press.

Samuelson, P.A. and W.D. Nordhaus. (1993). Economics. New York: McGraw-Hill, Inc, 15th edition.

Sandstrom, A., J. Wretman and B. Walden. (1985). "Variance Estimators of the Gini Coefficient Simple Random Sampling", Metron, Vol. 43, pp. 41-70.

Seiz, J. (1993). "Feminism and the History of Economic Thought", History of Political Economy, Vol. 25, No. 1, pp. 185-201.

Seiz, J.A. (1992). "Gender and Economic Research", in N. de Marchi (ed.), Post-Popperian Methodology of Economics: Recovering Practice, Boston: Kluwer Academic Publishers.

Sen, A.K. (1976). "Poverty: an Ordinal Apporach to Measurement", Econometrica, Vol. 44, pp. 219-231.

Sengenberger, W. (1981). "Labour Market Segmentation and the Business Cycle", in F. Wilkinson (ed.), The Dynamics of Labour Market Segmentation, London: Academic Press.

Setterfield, M.A., D.V. Gordon and L. Osberg. (1992). "Searching for a Will o' the Wisp: An Empirical Study of the NAIRU in Canada", European Economic Review, Vol. 36, pp. 119-136.

Shafer, J.R., J. Elmeskov and W. Tease. (1992). "Saving Trends and Measurement Issues", Scandinavian Journal of Economics, Vol. 94, No. 2, pp. 155-175.

Shapiro, C. and J.E. Stigl .. (1984). "Equilibrium Unemployment as a Worker Discipline Device",] .e American Economic Review, June, pp. 433-444.

Shorrocks, A.F. (1980). "The Class of Additively Decomposable Inequality Measures", Econometrica, April, pp. 613-625.

Shorrocks, A.F. (1983). "Ranking Income Distributions", Economica, Vol. 50, pp. 3-17.

Slottjie, D. (1990). "The State of Empirical Work on Economic Inequality", Journal of Econometrics, 43, pp. 1-3.

Smeeding, T.M. (1995). untitled. (mimeo).

Smeeding, T.M. and J. Coder. (1993). "Income Inequality in Rich Countries During the 1980s", Paper prepared for the Journal of Income Distribution.

Smeeding, T.M. et. al. (1990). "Income Poverty in Seven Countries: Initial Estimates from the LIS Database", in T.M. Smeeding, M. O'Higgins and L. Rainwater (eds.), Poverty, Inequality and Income Distribution in Comparative Perspective, Washington, DC: The Urban Institute Press.

Smeeding, T.M. et. al. (1993). Poverty, Inequality, and Family Living Standards Impacts Across Seven Nations: The Effect of Noncash Subsidies for Health, Education and Housing. New York: International Association for Research in Income and Wealth.

Stager, D. (1985). Economic Analysis and Canadian Policy. Toronto: Butterworths and Co., Ltd.

Statistics Canada. (1984). Hourly Earnings Data from the Survey of 1981 Work History, February.

Statistics Canada. Methodology of the Canadian Labour Force Survey 1984-1990, Catalogue 71-526

Statistics Canada. Methodology of the Canadian Labour Force Survey 1976.

Statistics Canada. Estimates of Labour Income. Catalogue 72-005 (Quarterly).

Statistics Canada. Historical Labour Force Statistics. Catalogue 71-201.

Statistics Canada. Labour Force Annual Averages. Catalogues 71-220 (Annual), Catalogue 71-529 (Occasional).

Statistics Canada. (1994). Women in the Labour Force, 1994 Edition, Catalogue 75-507E Occasional.

Statistics Canada. (1992). Labour Market and Income Data Guide: Choosing the Best Data Source for Your Needs. Labour and Household Surveys Analysis Division.

Statistics Canada. CALURA. Labour Unions. Catalogue 71-202 (1989).

Stewart, I.M.T. (1991). "The Role of the Methodologist", in D. Greenaway, M. Bleaney and I. Stewart (eds.), Companion to Contemporary Economic Thought, New York: Routledge.

Stigler, G.J. (1965). Essays in the History of Economics, Chicago: The University of Chicago Press.

Strassmann, D. (1993). "The Stories of Economics and the Power of the Storyteller", History of Political Economy, Vol. 25, No. 1, pp. 147-165.

Sundrum, R.M. (1990). Income Distribution in Less Developed Countries, New York: Routledge.

Tarling, R. (1987). "Introduction", in R. Tarling (ed.), Flexibility in Labour Markets, London: Academic Press.

Theodossiou, I. (1995). "Wage Determination for Career and Non-career Workers in the UK: Is There labour market Segmentation?", Economica, Vol. 62, pp. 195-211.

Thistle, P.D. (1990). "Large Sample Properties of Two Inequality Indices", Econometrica, March, pp. 725-728.

Tyler, J., R.J. Murnane and F. Levy. (1995). "Are Lots of College Graduates Taking High School Jobs? A Reconsideration of the Evidence", National Bureau of Economic Research Working Paper No. 5127.

Villa, R. (1981). "Labour market Segments and the Construction Industry in Italy", in F. Wilkinson (ed.), The Dynamics of Labour Market Segmentation, London: Academic Press.

Walsh, V. (1991). "Philosophy and Economics", in J. Eatwell, M. Milgate, and P. Newman (eds.), The New Palgrave Dictionary of Economics, London: Macmillan Press Ltd., pp. 861-869.

Weil, G. (1984). "Cyclical and Secular Influences on the Size Distribution of Personal Income in the U.K.: Some Econometric Tests", Applied Economics, 16, 749-755.

Weiss, A. (1980). "Job Queues and Layoffs in Labor Markets with Flexible Wages", Journal of Political Economy, Vol. 88, No. 31, pp. 526-538.

Weisskopf, T. (1987). "The Effect of Unemployment on Labor Productivity: An International Comparative Analysis", in International Review of Applied Economics, Vol. 1, No. 2.

White, H. (1980). "A Heteroskedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Heteroskedasticity", Econometrica, Vol. 48, pp. 817-8138.

Winter-Ebmer, R. and J. Zweimuller. (1992). "Occupational Segregation and Career Advancement", Economics Letters, Vol. 39, pp. 229-234.

Wolff, E.N. (1994). "International Comparisons of Personal Wealth Inequality", Paper for the 23rd General Conference of the International Association for Research in Income and Wealth.

Wolfson, M. (1986). "Statis Amid Change-Income Inequality in Canada 1965-1983", The Review of Income and Wealth, Series 32, Number 4, pp. 337-370.

Wolfson, M. (1994). "When Inequalities Diverge", American Economic Review, Vol. 84, No. 2, pp. 353-358.

Wood, A. (1994). North-South Trade, Employment and Inequality: Changing Fortunes in a Skill-Driven World. Oxford: Clarendon Press.

World Bank. (1995). Workers in an Integrating World. World Development Report. 1995

Yitzhaki, S. and R.I. Lerman. (1991). "Income Stratification and Income INequality", Review of Income and Wealth, Vol. 37, No. 3, pp. 313-328.

Zellner, A. (1962). "An Efficient Method of Estimating Seemingly Unrelated Regressions and Tests for Aggregation Bias", Journal of the American Statistical Association, Vol. 57, pp. 348-368.