Three Essays on Industrial Policy, Income Inequality and Economic Development – A Case Study of South Korea

by

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To my father Oak Sool

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LIST OF ABBREVIATIONS

ABM (Agent-based Model)
ATE (Average Treatment Effect)
ATT (Average Treatment Effect on the Treated Group)
COGS Cost of Goods Sold
DART Data Analysis, Retrieval, and Transfer System
DiD Difference-in-differences
EBIT Earnings Before Interest and Taxes
HCI Heavy and Chemical Industry
HHI Herfindahl-Hirschman Index
IMF International Monetary Fund
ISIC International Standard Industrial Classification
KFTC Korea Fair Trade Commission
KOSTAT Korean Statistical Information Service
KSIC Korean Standard Industrial Classification
MRFTA Monopoly Fair Trade Act
OECD Organisation for Economic Co-operation and Developmen
PLD Profit-led Demand
PPI Producer Price Index
ROE Rate On Equity
RPTs Related-party Transactions
SFC-ABM Stock-flow Consistent Agent-based Model
TFP Total Factor Productivity
TWFE Two-way Fixed Effects
ULC Unit Labour Cost
UMC Unit Material Cost

Abstract

This thesis examines the relationship between the state's intervention of a different nature – industrial policy and pro-competitive reforms – and income inequality dynamics, using the Korea's heavy and chemical industry (HCI) promotion during the 1970s and the pro-competitive reforms (1998-2000) as a case study. Chapter 2 focuses on the HCI promotion period (1973-1979) and investigates the impact of the state's selective industrial policy on sectoral economy, income distribution, and sectoral capacity utilization. The study finds that while industrial policy has a positive effect on capacity utilization in both targeted and non-targeted sectors, increased market power of firms in targeted industries significantly reduces the effectiveness of the state's intervention. The study also shows that the industrial policy regime is vulnerable to external shocks, such as an oil price shock. These negative effects can lead the economy to stagnation and thus excess capacity problems due to the reduced effective demand and over-investment in targeted sectors. Chapter 3 examines the association between heavy and chemical industry (HCI) promotion drive (1973-1979) and arguably the first income inequality hike in the history of Korea's economic development. Using an agent-based model (ABM) in which aggregate events emerge from the rich interactions of heterogeneous agents in the markets, this chapter shows how industrial policy that favours particular firms or industry sectors generates income inequality as well as a highly skewed income distribution among different income groups. The study highlights income inequality dynamics with special reference to the effect of preferential interest rates and discriminated access to credit markets among firms. The simulation shows the preferential interest rates for large firms in terms of asset size give a major impetus to the dramatic income inequality spike, compared to that of baseline regime (in the absence of preferential rate). Chapter 4 focuses on the impact of pro-competitive reforms on the market power and labour share of firms' value added during financial crises, using Korean firm-level data from 1990 to 2010 and difference-in-differences (DiD) estimation strategy. One of major findings is that surprisingly, the market power of top 30 *chaebols* was strengthened by pro-competitive reforms given that the reforms aimed to reduce excessive market power of high-ranking *chaebols*, and there was a significant decline in overall labour share of value added and an increase in the profit share of these large enterprises. The study argues that these outcomes are due to the pro-competitive reforms being primarily business-friendly and focused on *chaebol* restructuring, with relatively less attention devoted to labour-friendly policies. The study highlights the need for policymakers to consider the potential trade-offs between pro-competitive reforms and their impact on labour market outcomes.

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1 Introduction

"Political Economy, you think, is an enquiry into the nature and causes of wealth – I think it should rather be called an enquiry into the laws which determine the division of produce of industry amongst the classes that concur in its formation. No law can be laid down respecting quantity, but a tolerably correct one can be laid down respecting proportions. Every day I am more satisfied that the former enquiry is vain and delusive, and the latter the only true object of the science."

- David Ricardo, *"Letter to T.R. Malthus, October 9, 1820"*,
in Collected Works, Vol.VIII:p.278-9

One of the most disturbing features of recent economic development among many advanced and developing countries has been the unequal distribution of national income between capital and labour, and the rise in overall income inequality. Income disparity within countries has already reached an unprecedented level; for example, Mexico's Gini coefficient has remained high above 0.5 throughout the 1990s based on World Bank data[1]. South Africa's Gini coefficient has remained consistently high since the 1980s and reached 0.593 in 1993. The trend has become noticeable in most OECD countries since the 1980s; the disposable income of the top 10 percent of the population was on average around seven times higher than that of the bottom 10 percent in the 1980s and around nine and a half times higher in 2010 (Keeley, 2015).[2] Challenging Kaldor (1957)'s stylized fact of a stable labour share, the recent literature (e.g., Karabarbounis and Neiman, 2013; Piketty, 2014; Autor et al., 2020) has documented a continuous decline in the share of labour income over recent decades.

This thesis makes a novel contribution to the ongoing discussion on the decline

[1] https://data.worldbank.org/indicator/SI.POV.GINI

[2] According to Keeley (2015), their average inequality has increased by almost 10 percent to 32 Gini points, and the shift was even more pronounced over roughly the same period among the top 1 percent of earners, especially in English-speaking countries. In the U.S., for example, the share of pre-tax income going to the richest 1 percent more than doubled, reaching almost 20 percent in 2012. The rising wealth disparity in the U.S. in recent decades is mainly due to the increase of the top incomes combined with an increase in saving rate inequality (Saez and Zucman, 2016).

in the labour share and increasing income inequality by exploring the impact of the state's targeted industrial policies on the evolution of those variables. In particular, the thesis explores the evolution and dynamics of income inequality and labour income shares in relation to Korea's policy choices during the Heavy and Chemical Industry (HCI) promotion period (1973-1979) and the period around the 1997 Asian financial crisis (1992-2010). These two events represent two distinct approaches in terms of the state's attitude towards large business groups or *chaebols*.[3] During the 1970s, the government of South Korea adopted a highly selective industrial policy, which extended preferential credit facilities to large business groups, referred to as *chaebols*, in several key industries, including electronics, automobiles, shipbuilding, machinery, petrochemicals, iron and steel, and nonferrous metals. However, in the late 1990s, the government implemented pro-competitive reforms aimed at reducing entry barriers created by monopolized industries, with a specific focus on *chaebols*. This transition marked a departure from the government-led economic growth model (*developmental* state) of the past and signaled a shift towards a new paradigm of economic development (*transformative* state) in South Korea (Cherry, 2005). This shift raises an important question regarding the impact of these contrasting policy choices on factor shares, income inequality and the nature of economic growth. Thus, the primary objective of this thesis is to explore the influence of the state's industrial policies on these critical economic indicators in South Korea.

Chapter one focuses on understanding the sectoral variation in how businesses respond to government policy, the consequent macroeconomic results, and their distributional implications, such as the growth in the market power of firms, which was one of the major outcomes of the HCI promotion policy that significantly affected the macroeconomy in terms of both growth and income distribution. This chapter

[3]Most *chaebols* began in 1960s. Some of them have a colonial origin in the sense that some founders obtained the facilities of some Japanese firms. Most *chaebols* grew through the close political tie with the government during the 1970s when the government implemented large scale industrial programs. *Chaebols* are more precisely identified as highly diversified private business groups, owned and run by family members. Most importantly, they have been politically promoted and financially supported by the government through discretionary credit allocation. The Korean *chaebol* is often compared with the Japanese *zaibatsu* or *keiretsu*. Unlike the *chaebol*, the *keiretsu* is usually structured with an affiliated bank, giving the associated companies almost unlimited access to credit.

also examines the short-run and long-run stability of the economy in the process of industrialization by simulating a dynamic two-sector economy with a protectionist trade regime. I use the Kalecki-Steindl framework, which emphasizes the macroeconomic effects of firms' market power (markups), excess capacity and investment function without any saving constraint. This chapter presents a model that facilitates an examination of the sectoral dynamics under a selective industrial policy regime, wherein the state provides preferential policy measures to certain industries. This state-led growth regime promotes higher savings and generates unilateral dependency between sectors. I derive equations for sectoral capacity utilization and demonstrate the different dynamic patterns of capacity utilization through preferential policy measures. The findings indicate that preferential interest rates and export promotion have a positive effect on capacity utilization rates in both sectors. The difference between preferential and market interest rates plays a central role in capital accumulation, thus promoting economic growth. However, the two-sector model suggests that the increasing market power of firms reduces the effect as it discourages sectoral production. Moreover, the analysis reveals that the economy as a whole becomes more vulnerable to external shocks, such as an oil price shock, when selective industrial policy is pursued. These results suggest that the recession as well as the decline in the labour share during the final stages of industrial promotion cannot be solely attributed to the preferential measures *per se*, which caused an increase in the market power of firms in the heavy industry sector, but also to external factors, notably the second oil crisis in 1978.

Chapter two addresses the question of how big business promotion measures including discriminated access to credit markets affect income inequality. Compared to the previous chapter, this chapter uses an agent-based model (ABM), and pays attention to the heterogeneity of economic agents including firms, households and banks and their complex interactions as a major feature of the distributional dynamics. Unlike the functional income distribution, income inequality is involved in the behavioural equations of heterogeneous agents in the economy. This study provides an alternative way to microfound economic models based on the notion of *complexity à la* Tesfatsion

and Judd (2006).[4] In complex, evolving environment under Knightian uncertainty, agents may behave according to simple heuristics or a rule of thumb rather than sophisticated hyper-rationality (Simon, 1997). In this sense, an agent is an autonomous computational unit, which does what it wants to do while an object in the traditional model does what the modeler wants it to do such as utility or profit optimization. This chapter finds that preferential interest rate policy – one of the representative policy measures – has a major impact on income inequality. Through an ABM framework, several policy experiments were conducted to investigate the impact of various policy options on income inequality. Specifically, the focus was on the effect of preferential interest rates on income and wealth inequality, as measured by the Gini coefficients. The results indicate that preferential credit has a disproportionate effect on the growth of firms and earnings of households across different income groups, leading to a widening of income and wealth disparities. These findings have important implications for policymakers and suggest that complementary redistribution policy may be necessary to address rising income inequality under the big business promotion regime.

Chapter three presents an empirical study that estimates the causal effects of pro-competitive reforms on firms' market power and labour share of the value added by utilizing firm data from the Korean stock market. The study employs a difference-in-differences (DiD) method to estimate the causal association between the 1998 pro-competitive reforms and firms' markups and labour share of firms' value added. Prior research by De Loecker and Eeckhout (2018); De Loecker et al. (2020) highlight that rising corporate profit share is not solely caused by every firm's growing capacity to command higher prices over the unit cost of production (i.e., markup pricing), but rather by a small number of superstar firms that have become increasingly dominant in every sector of the economy. Moreover, seminal works by Kalecki (1938, 1940, 1971a) suggest that firms with higher market power tend to have lower labour share (see also Ennis and Kim (2017); Ennis et al. (2019); Han and Pyun (2020); Barkai (2020) among

[4]According to Tesfatsion and Judd (2006), a system is said to be complex if (i) it is composed of interacting agents; (ii) the behavior of each component is affected by the behavior of other agents; (iii) the systems shows emergent properties out of numerous micro-interactions among agents.

many others). To explore the behavioural responses of Korean firms, including *chaebols* and their affiliates, to the pro-competitive reforms, this chapter uses comprehensive firm-level unbalanced panel data from 1992 to 2010. Assuming that the pre-1997 Asian financial crisis will have a similar impact on *chaebols* and non-*chaebol* firms, the DiD method is deemed appropriate for the task at hand. The implementation of pro-competitive reforms on *chaebols* in the midst of the financial crisis creates a natural experiment that can successfully address the causal relationship between pro-competitive reforms and the targeted large enterprises. The study finds that the pro-competitive reforms did not significantly reduce the *chaebols*' market power. Interestingly, the study uncovers an intriguing outcome of pro-competitive reforms that entail mergers and acquisitions and restructuring processes among unproductive and debt-laden enterprises. Specifically, the reforms resulted in a discernible decrease in the labour share of firms, particularly bigger firms. This finding implies that while pro-competitive reforms aim to promote competition in product markets, it does not necessarily translate into more competition in the labour market. Superstar firms with high market power may use their resources to attract and retain top talent, giving them an advantage over smaller firms in the labour market. This may result in an increase in the bargaining power of these firms over their employees, leading to a decline in the labour income share. Additionally, pro-competitive reforms may not address labour market imperfections such as monopsony power, where a single employer has market power in the labour market and can set wages below the competitive level. Hence, it is important to consider the potential effects of pro-competitive policies on both product and labour markets to ensure a balanced and equitable outcome.

2 Sectoral Dynamics of Industrial Policy in a Two-sector Economy: the Case of Korea's Heavy and Chemical Industry (HCI) Promotion (1973-1979)

2.1 Introduction

The impact of the rampant corona-virus pandemic since 2019, which has led to the recent supply chain shortage crisis and the prospect of imminent stagflation, renewed interest[5] in industrial policy among policymakers. Industrial policy generally refers to the government's strategic support for particular firms or industries which are considered to be critical for the country's economic growth and well-being of its population. Industrial policy can also be defined as "a policy aimed at particular industries and firms as their components to achieve the outcomes that are perceived by the state to be efficient for the economy as a whole," implying that industrial policy usually means *selective* industrial policy (Chang, 1993, p.60). The primary goal of industrial policy in this context is either a structural change from traditional agricultural economy to more modern and industrially diverse manufacturing and service economy or industrialization through preferential support for the targeted industries (Syrquin, 2008). From 1973 to 1979, the South Korean government initiated a significant industrial policy known as the Heavy and Chemical Industry (HCI) Promotion policy, aimed at promoting the development of underpinning industries for economic growth. The state designated several key strategic fields: electronics, automobiles, shipbuilding, machinery, petrochemicals, iron and steel, and nonferrous metals as a backbone of the economic development plan.[6] The main form of the government's support entails easy access to preferential interest rates, preferential capital subsidies, preferential loans, exemptions from import tariffs and debt guarantee.

[5] "Is industrial policy making a comeback?" *Council on Foreign Relations*, Mar. 16^{th}, 2021; "Industrial Policy's Comeback" *Boston Review: Forum*, Sep. 15^{th}, 2021; "Many countries are seeing a revival of industrial policy" *The Economist: Special Report*, Jan. 10^{th}, 2022.

[6] This agenda was called 'The Five-Year Economic and Social Development Plan,' and the HCI promotion policy was enacted through the third implementation period of the plan (1972-76) and the fourth period (1977-1981).

There is no agreement in the literature on the effectiveness of large-scale industrial interventions (Noland and Pack, 2003; Harrison and Rodríguez-Clare, 2010). The case of Korea is not an exception (Auty, 1992). Despite worries about market distortion and corruption, Korea's sectoral interventions may have had a positive impact on economic growth and successfully brought about a structural transformation of the economy (Amsden, 1992). In contrast, the 1979-81 economic downturn is largely attributed to the HCI promotion (World Bank, 1987). In particular, the Korean HCI drive is criticized at the micro level for the misallocation of subsidized credit to create excess HCI capacity that gave a low financial return (Kwack, 1984; Park, 1986; Rhee, 1987; Leipziger, 1988; Kim et al., 2021). This chapter revisits the Korean HCI promotion policy, addressing the question, "How did Korea's selective industrial intervention affect sectoral capacity utilization, economic growth and income distribution?"

The Kalecki-Steindl distributional framework has traditionally served as a prominent framework for understanding the potential impact of market power concentration on economic growth and income distribution. Specifically, the framework posits that oligopolistic markup pricing has a significant impact on profit or labour income shares, which, in turn, determine consumption and investment spending, net exports, and macroeconomic outcomes such as capacity utilization, employment, and economic growth. These outcomes, in turn, provide feedback mechanisms to markups and income distribution, further reinforcing their impact on economic growth and distributional outcomes. In particular, this framework suggests that a few large firms with market power can lead to lower wages and reduced investment, which may impede economic growth, while higher profits can stimulate investment but may also lead to reduced consumption.

A group of two-sector models developed in the Kaleckian tradition offer a workable framework for various policy regimes that take into account the significance of income distribution and sectoral demand. For instance, Dutt (1995) investigates the interest rate policy of developing nations with industrial and agricultural sectors. Lavoie and Ramírez-Gastón (1997) and Kim and Lavoie (2017) present the Kaleckian traverse model with target rate of return pricing scheme to illustrate how the economy

shifts from one steady growth path to another. Fujita (2018) investigates how sectoral capacity utilization interacts with the whole sectoral interdependence described in Sraffa (1975). Finally, Nishi (2020) incorporates endogenous labour productivity into the baseline Kaleckian model, generating a periodic solution path of the economy.

Even though the Kaleckian literature has a substantial body of two-sector models that illuminate a practical framework that takes into account the significance of income distribution and sectoral usage, the industrial policy regime still requires more crucial features to represent the East Asian emerging economies in the 1970s. This chapter extends the Kalecki-Steindl framework to an open economy and a two-sector economy and incorporates the following features as a contribution to the existing literature: (i) a unique two-sector open economy framework in which one sector is highly subordinate to another sector to represent industrial policy regimes in which the two sector economy is divided into the targeted and non-targeted sectors/industries (i.e., heavy and chemical industry (HCI) or H sector and light industry or L sector). This unilateral dependence between the two sectors is facilitated by protectionist policy or import substitution; (ii) differentiated capital mobilization through discriminated access to privileged credit or preferential interest rates; and (iii) export promotion element through the pegged exchange rate system. The main objective of this augmented two-sector open economy framework is to deal with the issue of effective demand given the relatively small domestic market inherent in many East Asian developing countries after World War II (Mott, 2010). Hence, this element is a crucial element of the model that facilitates fast economic growth by creating demand from foreign sectors. Additionally, the paper builds on previous research by examining the distributional impacts of market power concentration on targeted industries, such as the Korean *chaebols*.

The paper presents the following major findings on the impact of industrial policy on the dynamics of sectoral capacity utilization. First, preferential interest rates and export promotion have a positive effect on capacity utilization rate in both H and L sectors. In particular, the difference between preferential and market interest rates plays a central role in capital accumulation, thus boosting economic growth. This outcome contrasts with the neoclassical view that lower interest rates

under the repressed financial regime may dampen economic growth through inefficient credit allocation. Second, the two-sector model suggests that the increasing market power of firms in the HCI (H) sector reduces the capacity utilization rate of both sectors. Third, the open market extension offers a more exact stability requirement on the sectoral economy in steady-state with significant ramifications. That is, the concentration of market power in the targeted sector, or the H sector, can result in a higher potential for capacity utilization compared to the non-targeted sector, or the L sector. However, there is still a limit to how much a firm or sector can increase capacity utilization, as it is constrained by the availability of labour and capital resources. This suggests that while the H sector may have a higher potential for capacity utilization, it is still susceptible to over-investment and excess capacity as the economy stagnates under the open market two-sector economy. Lastly, the present analysis reveals that the industrial policy regime is particularly vulnerable to external factors such as commodity price shocks or inflation resulting from factors outside the control of the regime, such as an oil price shock. Specifically, the findings suggest that the susceptibility of the industrial policy regime to these external factors is relatively high, indicating that the regime may be disproportionately affected by such shocks. These results underscore the need for policymakers to consider these factors when designing and implementing industrial policy measures, as failure to do so may lead to unintended consequences or exacerbate the impact of external shocks on the economy.

The rest of the paper is structured as follows. Section 2.2 briefly contextualizes and evaluates the HCI promotion policy and presents observed episodes during the HCI promotion period. Section 3.4 introduces the Kalecki-Steindl framework and derives the equilibrium conditions for the sectoral capacity utilization with the system stability conditions. Section 2.4 analyzes the short-run and long-run dynamics of the capacity utilization and their trends. Section 2.5 simulates the sectoral economy and discusses the simulated economy with real data. Finally, Section 2.6 concludes the study with a brief summary of the main implications of the paper.

2.2 Overview and Evaluation of the HCI Promotion Policy

2.2.1 Contextualizing Sectoral Intervention under the HCI Promotion

The state's initial economic revitalization initiatives in the 1960s focused more on export promotion than import substitution. This drive focused on the consumption goods industries or light industries and made the most of the low labour costs. However, this labour-intensive export promotion faced a number of external challenges, most notably increased price rivalry brought on by the growth of nearby developing nations like China and Vietnam. The early 1970s oil price surge, which began by the first oil shock in 1973, increased production costs, which prevented the businesses from being price competitive. In order to deal with the diminishing labour cost competitiveness and rising protectionism in the early 1970s, officials viewed the capital-intensive HCI promotion as a different growth strategy. The policymakers considered the capital-intensive HCI promotion as an alternative growth strategy to cope with the declining labour cost competitiveness and increasing protectionism in the early 1970s. In fact, HCI firms were expected to have a strong linkage effect – either positive spillover effects of an upstream firm's growth (automobile companies) on other downstream industries who produce inputs (tire and battery companies) for the upstream company or similar positive spillover effects from upstream companies but to the industry (raw materials such as steel and rubber) that enables the upstream industry to succeed (Hirschman, 1958; Liu, 2019). This input-output linkage may not only reduce transaction costs but also diversify potential risk (Haggard et al., 2000).[7]

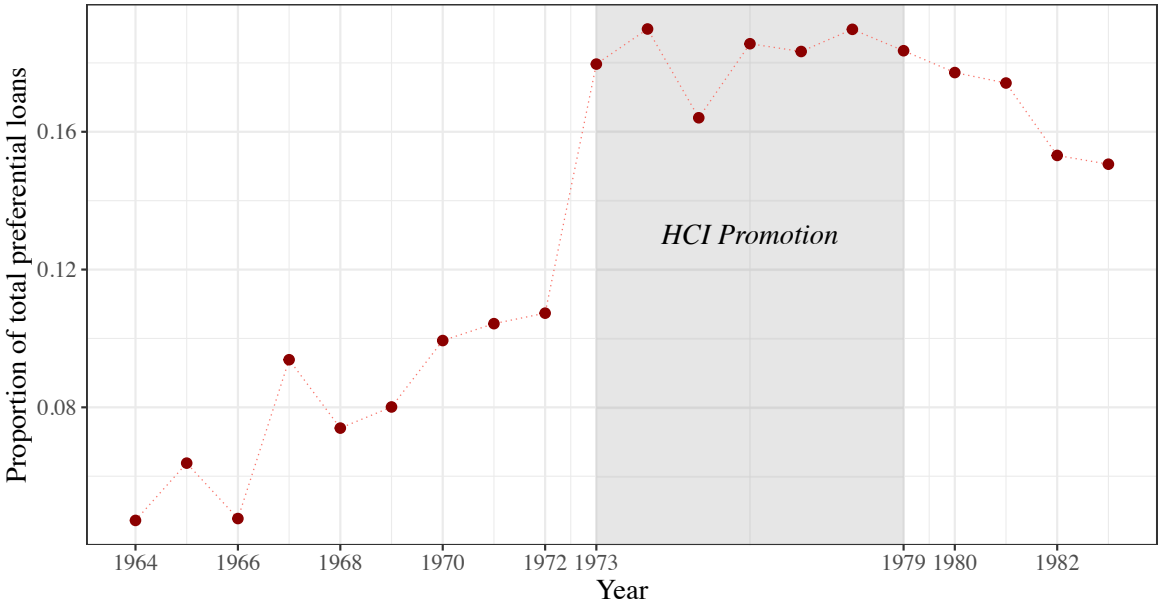
The HCI push was officially announced in 1973 as a major project of the third Five-Year Economic and Social Development Plan (1972-1976). One of the most essential elements of the project was the sufficient credit supply for many long-term investment projects such as construction, housing, basic heavy industry as social infrastructure. Considering the backwardness of financial institutions, the role of the government, which could act as a financial intermediary became necessary and crucial

[7]From a geopolitical perspective, officials also needed to adopt a more proactive approach than the labour-intensive export promotion strategy used in the 1960s. The Nixon Doctrine, the first significant military withdrawal of 20,000 out of 61,000 US troops by June 1971, further fueled policymakers' interest in heavy and chemical industrialization.

in credit allocation.

2.2.2 Credit Allocation during HCI Promotion

During the early phases of Korea's development, the government was in charge of distributing foreign aid among the industrial sectors rather than developing efficient financial markets that may act as efficient financial intermediaries to transmit money from savers to investors. In doing so, the government encouraged *chaebols* and employed severe financial repression to finance their operations. Lee (1992) argues that the government's considerable engagement in Korea's financial system can be seen as an "internal capital market" and characterizes the relationship between the *chaebol* as a "quasi-internal organisation" due to its tight ties to the *chaebol*. Amsden (1992, 1997) refers to the state's management of the *chaebols* "entrepreneurial" in that the state forbade *chaebols* to establish their own financial intermediaries.



Source: Bank of Korea, Economic Statistics Yearbook (various issues), measured in Korean currency (Won) value

Figure 2.1: Trends of Policy Loans for the HCI

Figure 2.1 shows the increase in the proportion of total preferential loans in the early 1970s. In 1973, the proportion jumped to more than 15 percent of entire loans and the volume sustained all through the promotion period. As a result, the growth rate of capital investment peaked around 45 percent in 1976 and 1978, and the rate

dropped from 45 percent to around 10 percent in the final stage of HCI promotion (see Figure 2.2 (left)). The proportion of bank loans poured into the HCI sector accounted for more than 75 percent of total credit supplied to the entire manufacturing sector. Preferential capital subsidies and exemptions from import tariffs enabled the HCI sector to nearly double the total value of capital during the promotion (Lane, 2018). The scale of the financial support not only accelerated the structural change of the economy but also stimulated HCI firms' exports, which took more than 50 percent of the total export (Cho et al., 1991). In many regards, the HCI promotion in the 1970s was similar to the previous labour-intensive export promotion policy, but the size of loans was much bigger than it was before, and the the selection criterion was more industry-specific or targeted.

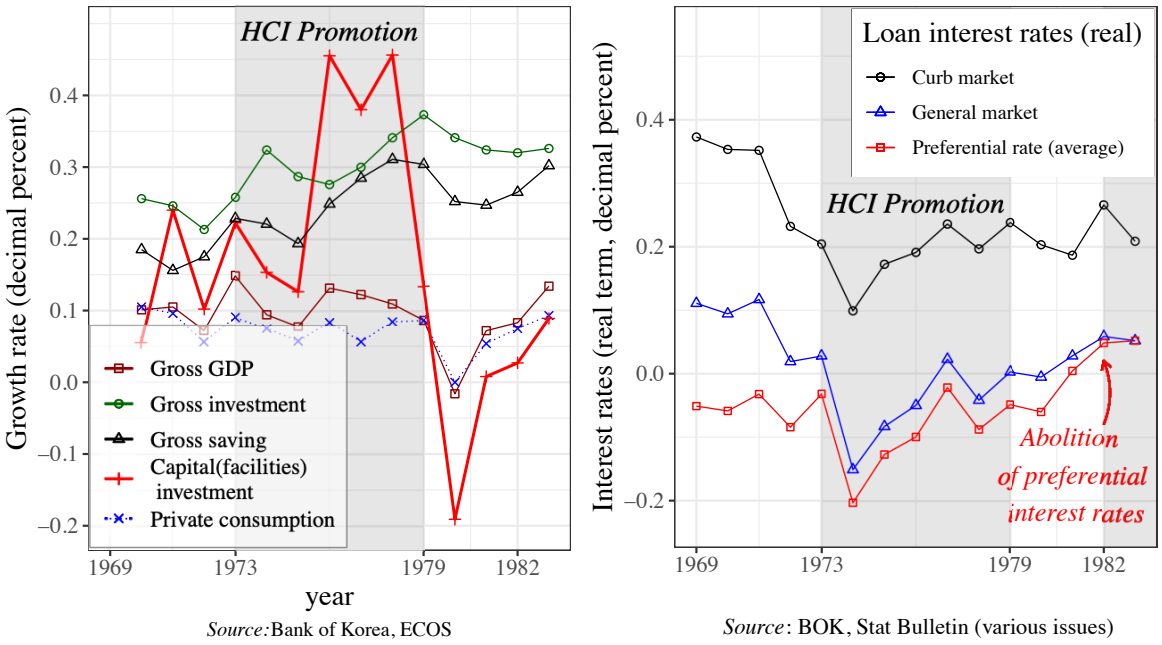


Figure 2.2: Trends of the Growth Rate of Capital Investment, Other Macro Variables (Left) and Trends of Three Major Interest Rates (Right)

Besides credit allocation control, the government regulated interest rates in the credit market throughout the HCI promotion period. Figure 2.2 (right) shows the evolution of interest rate regimes. From 1964 to 1971 (labour-intensive light industry and export promotion period), the government raised interest rates for both loans and deposits by which most of rates doubled with the exception of corporate loans.

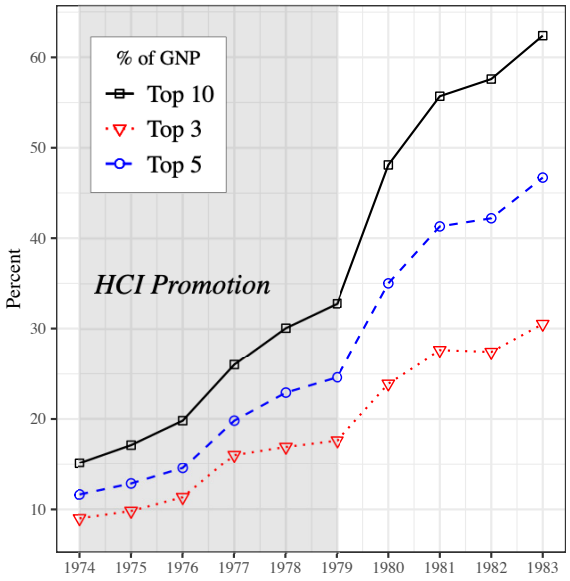
The government treated the corporate sector in a different manner. The policymakers instructed banks to lower the interest rate for corporate loans to 8 percent, the rate significantly lower than the curb market rate of 30 to 40 percent (Chung, 2007). Compared to Taiwan and Japan, who also exercised substantial government control over the credit market, the significantly lower real interest rates in Korea, often below zero due to the recurring high inflation rate stifled the growth of the Korean banking sector, and the volume of financial savings was relatively small compared to other counterparts in East Asia (Cho, 1989). In addition, in order to mobilize private savings and thus encourage private investment, banks in the official credit market were also instructed to keep the interest rates on loans lower than those for deposits (18 percent and 22.8 percent, respectively) (Chung, 2007). Up until 1980, when the initial deregulation of the commercial banks was announced, banks were a major means of financing the HCI promotion and were under government control. In the 1970s, the credit market control fueled a rise in the curb market, an unofficial source of credit.

The policy under the earlier regime still led to a financial stress in the business sector due to soaring interest costs for *chaebols* (Chung, 2007), requiring the government to take an immediate action. On 3 August 1972, the government announced *8.3 Measure* or the Presidential Emergency Decree, one of the most aggressive interventionist financial measures by Park's regime. Through the measure, President Park took an emergency financial action that could bail out the debt-ridden firms. The action allowed them to roll the debts over for three years with a favourable monthly interest rate of 1.35 percent and to declare a moratorium on the curb market debt. In 1973, interest rates were reverted from higher to lower regime. Figure 2.2 (Left) describes the reverted interest rate structure during the HCI promotion. The gap between general market rate and curb market rate did not change,[8] but overall interest rates were drastically lowered. My model captures this feature: lower preferential rate which stayed below zero (average -8.8 percent) with (almost) constant interest rate differential between the preferential rate and the curb market

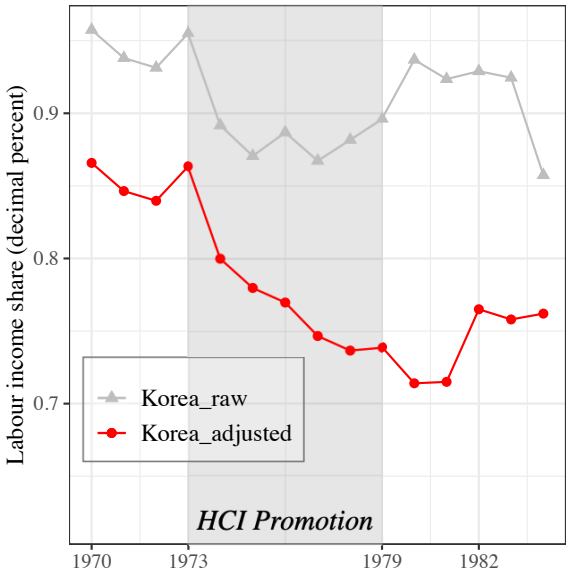
[8]This is due to the fact that favourable interest rates persisted throughout the 1960s. The difference from that of 1970s was that the former was industry-neutral whereas the latter was industry-specific.

rate. Firms in the heavy industry sector (targeted sector) could get easy access to either the preferential credit rate or the general market rate whereas others in the light industry (non-targeted sector) had to resort to the curb market rate.

2.2.3 Evaluation of HCI Push: Growth, Stagnation and Income Distribution



Source: Kim (1987)



Source: Lee et.al (2014) for Kor_adj, OECD, Kor_raw

Figure 2.3: Combined Sales of Top 10 Largest Chaebols (Left) and Labour Income Share Trends: International Comparison (Right)

Observation 1. The Growth of the *Chaebols* The remarkable growth of Korean big businesses did not occur until the early 1970s when the government's HCI promotion policy was implemented. In the middle of the HCI promotion period, the combined sales of top 10 *chaebols* reached 20 percent of total GNP and continued to rise during the 1980s as Figure 2.3 (left) shows. The expansion of the *chaebols* in the six targeted industries in 1979, the final year of the HCI promotion.

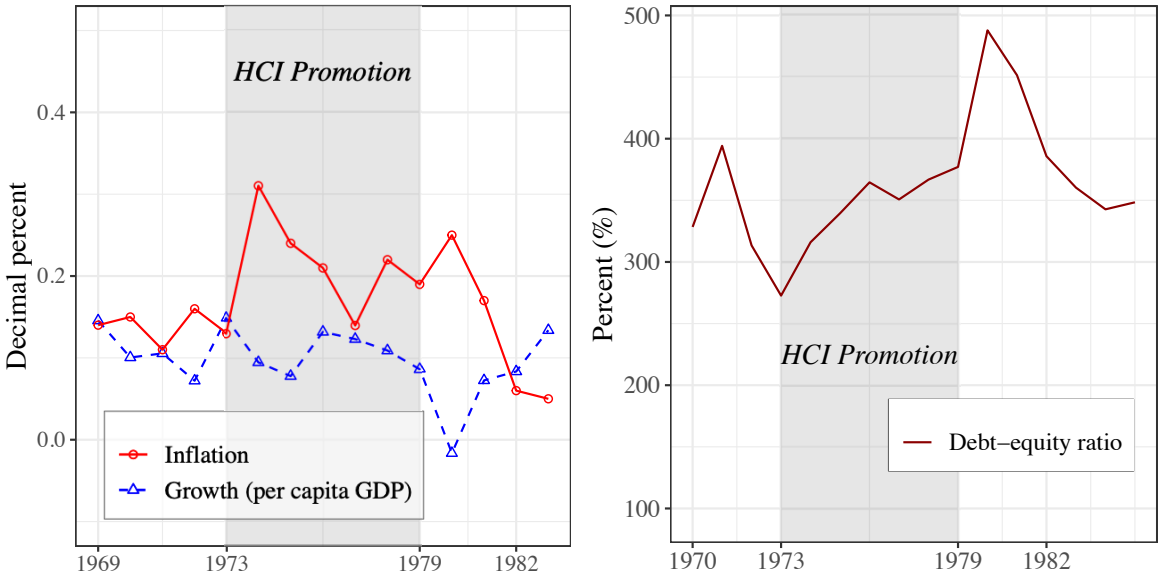
Observation 2. Declining Wage Share The HCI promotion was accompanied by a constant decline in the labour income share (Kim, 1990; Lee et al., 2014; Lee, 2015). This is largely believed to be due to the rapid growth of large business groups (*chaebols*) and their bargaining power in wage negotiation. Figure 2.3 (right) shows

that the adjusted wage share[9] during the HCI promotion declined and rebounded as the promotion was terminated.

Observation 3. The Increase in the Idle Capacity The Korean HCI promotion policy resulted in capital misallocation and underused capacity (Kwack, 1984; Park, 1986; Rhee, 1987; Leipziger, 1988; Kim et al., 2021). This is mainly related to the negative real cost of borrowing and thus over-investment until 1982 when preferential interest rates were abolished. According to Jones and Sakong (1980), more than 30 or 40 percent of all investment made in the machinery sector were idled, and the government did not put any serious restraints on the *chaebols*' accumulation. Instead it committed to growth by business promotion and concentration to reduce project gestation period rather reduce inequality (Jones and Sakong, 1980). Towards the end of the 1970s, the economy of the concerned country was beset with a host of challenges, including a persistent current account deficit, escalating foreign debt, and a deceleration in growth rates. Moreover, the economy suffered a further setback due to the compounded impact of the second oil shock in 1978.

Observation 4. High Inflation and Declining Growth Rate Inflation was rampant throughout the industrial promotion period due to the two oil shocks occurred in 1973 and 1978. During this period, the overall annual per-capita real GDP growth rate was relatively high, but was falling from 1976 to 1980 as shown in Figure 2.4 (left panel).

[9]It is important to note that the estimation methods of labour share may vary depending on how the income of self-employed individuals is treated, particularly in cases like Korea where their proportion is significantly higher compared to other countries. Gollin (2002) suggests three options: (i) to consider the self-employment income same as labour income only; (ii) to consider the self-employment income as the same share of labour income as that of other economic sectors; (iii) to equalize the self-employment income to the average wage income of wage earners whose number is obtained from the data. There is no agreement on which option to choose among economic institutions or statistical agencies. For example, the OECD publishes the labour share based on the third option. However, Lee et al. (2014); Lee (2015) points out that this option overestimates the labour share in the sense that the real data (available from 1975) shows per-capita operating surplus of non-wage earners has always been lower than the compensation of the employees. The Bank of Korea (BOK) in fact calculates the labour share without any adjustment on the income of the self-employed, but instead considers self-employment income as solely capital income. The first option also can overestimate the labour share by ignoring the fact that the self-employed own capital. This figure uses the estimation method suggested by Lee et al. (2014); Lee (2015).



Source: Economic Statistics Yearbook, BOK

Source: BOK, Financial Statement Analysis

Figure 2.4: Trends of Inflation and Growth Rate and Debt-equity Ratio of Manufacturing Sector

Observation 5. Growth of HCI Sector with its Contribution to Exports and Escalating Debt-equity Ratio Throughout the HCI promotion period, the HCI sector dramatically expanded. In 1979, HCI industry took 54.7 percent of the entire industry (38.9 percent in 1970) while light industry took 45.3 percent (61.1 percent in 1970). As a result, its contribution to exports also increased, taking 41.9 percent of total exports in 1977. However, most of firms in the manufacturing sector including *chaebols* experienced a sharp increase in the debt-equity ratio as shown in Figure 2.4 (right). During the HCI promotion period, beside the government's policy loans, private banks were also encouraged to provide policy loans at favourable conditions to competitive enterprises. Consequently, private manufacturing firms took advantage of policy loans provided by commercial banks at preferential lending rates, which are still lower than those of curb market. This led to a sharp increase in the debt-equity ratio of firms in the manufacturing sector in Korea during the 1970s.

2.3 The Model

2.3.1 Characterization of Industrial Policy Regime

A two-sector open economy model is presented in this subsection. The H industry sector, also known as the heavy and chemical industries, is the focus of the government's industrial policy. The model's primary characteristics reflect the industrial policy context that provides support to the H sector through the development of specific policy instruments, including (i) preferential interest rates for the H sector to promote capital investment; (ii) unilateral reliance of the L sector on the H sector due to import substitution for intermediate goods; and (iii) transition towards export promotion and the implementation of a *de facto* dollar peg regime. The model's emphasis on the H sector underscores the government's efforts to foster economic development and improve its balance of payments position, while also providing a framework for analyzing the intersectoral linkages and policy trade-offs that arise in an open economy context.

In a capitalist economy, capitalists and workers operate within an environment characterized by the interaction of supply and demand in the marketplace. The capitalists, who own capital input can exercise their power to set prices and wages by setting markups, which affects the income distribution and thus workers' effective demands for goods and services.

The Structure of the Economy The economy is described as follows. There are two sectors operating in the economy: heavy and chemical industry (H sector) and light industry (L sector). We assume that Leontief production technology is used. This is a standard consideration in the Kaleckian literature in the sense that the Leontief function is able to capture a situation where idle capacity is generated. In reality, some level of fixed proportionality exists between inputs, which can result in idle capacity within firms. The Cobb-Douglas function, which assumes that inputs of capital and labour are substitutable at all levels of production, fails to capture the

phenomenon of idle capacity. Hence, the the level of output production is given by

$$Q^x = \min\left[\frac{N^x}{a_N^x}, u^x\frac{K^x}{a_K^x}\right] = \min\left[\frac{N^x}{a_N^x}, u^x K^x\right], \quad x = \{H, L\} \tag{2.1}$$

where Q^x denotes output in real terms, N^x, required labour employment, and K^x, capital stock in real terms. a_K^x denotes the sectoral fixed amount of capital input stock per unit of potential output, which is assumed to be one so that a_N^x denotes the (relative) fixed amount of labour input per unit of potential output. Hence, the inverse of a_N^x is the sectoral capital-labour ratio or the relative productivity. $u^x \in (0, 1)$ is the key endogenous variable in the model, representing the industry-specific *actual* rate of capacity utilization given by

$$u^x := \frac{Q^x}{Q_F^x}, \quad x = \{H, L\}. \tag{2.2}$$

where Q_F^x denotes potential level of output. $u^x = 1$ when the capacity is fully utilized. It is important to note that, in addition to its definition, u^x is endogenously determined by a number of industrial policy instruments. As a result, the capacity utilization rates – the primary focus of this study – serves as industrial policy's medium, which has a variety of macroeconomic effects.

In this economy, I also assume that labour is always abundant so that the production is solely determined by capital. In this case, the amount of labour required is pre-determined and fixed for a given level of output. This assumption can be supported by a low rate of unionization as well as less bargaining power and a labour market characterized by a large pool of unemployed workers who are willing and able to work at the prevailing wage rate. Thus, with the condition of full capacity utilization, Q_F^x is given by

$$Q_F^x = K^x, \quad x = \{H, L\}, \tag{2.3}$$

and the actual production function is

$$Q^x = u^x K^x, \;\; x = \{H, L\}. \tag{2.4}$$

The required labour employment for output production will be determined by production technology. Also by the property of the Leontief technology, the labour requirements at full capacity utilization is $N^x = a_N^x K^x, \;\; x = \{H, L\}$. The actual level of labour employment is given by

$$N^x = a_N^x u^x K^x, \;\; x = \{H, L\}. \tag{2.5}$$

Firms in both sectors mark up their prices over prime costs to adjust their production to meet consumption demand as follows. For firms in the heavy industry,

$$p^H = (1 + \mu^H)\Big[w^H a_N^H + \gamma \epsilon p_m^*\Big] \tag{2.6}$$

where μ^H is the markup rate, which is exogenously determined. γ is the fixed requirement of the imported intermediate good per unit of output for firms in HCI sector. Since output is simply the multiple of capacity utilization and capital, γ is in fact one (H sector is fully subordinate to foreign production sector). ϵ is exchange rate, and p_m^* the fixed foreign-currency price of the imported intermediate good. In case of firms in the L sector, capital input K^L is in fact the output produced by firms in H sector. One potential attribute of the model representing a two-sector open economy is the equivalence between capital input and intermediate goods imported from the foreign sector. The firms operating in the H sector require intermediate goods for their production processes, which are commonly imported from foreign sectors due to the lower level of technology of most indigenous firms in developing countries. That is, the firms in H sector may have to require foreign intermediate products that necessitate top technology.

Another point we need to note here is that firms markup mainly on unit labour cost and intermediate goods price without considering capital cost such as rental cost

of machinery. Here I assume that the markup is based on the perceived degree of market power that the firm possesses in its industry rather than on the actual total cost of production. In the current model, the markup is seen as a measure of the firms' market power and the level of concentration in the market based on Kalecki (1942, 1971b). In this view, firms may absorb some of the costs of capital in order to prioritize maintaining stable levels of employment and output rather than maximizing profits through mere price change.[10]

Finally, this model assumes that there is no depreciation of capital. This assumption leads us to think that the cost of production may be more closely related to investment rather than capital in the sense that the capital goods are not aging or that they are being replaced by newer capital goods at the same rate as they are depreciating. In other words, it refer to the expenses incurred when a firm acquires new capital goods, such as machinery or equipment to expand its productive capacity. In this model, they are simply the prices of intermediate goods produced by either foreign firms or domestic firms.

For firms in the light industry,

$$p^L = (1 + \mu^L)\Big[w^L a_N^L + \phi p^H\Big] \tag{2.7}$$

where ϕ is the fixed required rate of intermediate good per unit of output produced by firms in the heavy industry or HCI sector. This model postulates that the light industry highly depends on the production of heavy industry while the heavy industry highly depends on the production of foreign sector. Hence, the structure of this economy lies in somewhere between Kaleckian two-sector model which lacks the interdependence of industries and Sraffian economy which assumes a full interdependence of industries. We also need to note that under the Kaleckian-Steindl framework, the markup pricing has a strong distributional implication. That is, the sectoral profit share π^x is determined

[10]There are some Kaleckian literature that added unit interest costs to unit labour costs when applying the markup (e.g., Godley and Cripps, 1983; Godley and Lavoie, 2007). One issue, however, is what is the relevant interest rate, nominal or real that determines the real normal profit rate (Lavoie, 1995). Kalecki himself did not think interest rates played much of a role, because he thought that interest rates did not significantly vary through the business cycle.

by markup rate and the ratio of materials to labour costs as follows:

$$\pi^H = \frac{\mu^H\left(1+\frac{\gamma\epsilon p_m^*}{w^H a_N^H}\right)}{1+\mu^H\left(1+\frac{\gamma\epsilon p_m^*}{w^H a_N^H}\right)} \tag{2.8}$$

$$\pi^L = \frac{\mu^L\left(1+\frac{\phi p^H}{w^L a_N^L}\right)}{1+\mu^L\left(1+\frac{\phi p^H}{w^L a_N^L}\right)} \tag{2.9}$$

where π^x is a monotonic increasing function of markups and the ratio of material to labour costs.[11] Here we assume that $w^H \neq w^L$, indicating that there is a restricted pool of workers available for the H sector due to the salary disparity between sectors. At this point, we may think of the case in which labour mobility between the sectors is fairly difficult.

Investment or capital accumulation is determined by two main components: net profit rate and capacity utilization rate. $I = g_K \cdot K$ where g_K is the rate of capital growth, in particular, which is given as

$$g_K^x = \frac{I^x}{K^x} = \alpha_0^x + \alpha_1^x(R^x - i^x) + \alpha_2^x u^x, \quad x = \{H, L\} \tag{2.10}$$

where α_0 is autonomous component, so called *animal spirit* from Keynes (1936) which may represent consumer confidence. $\alpha_1 > 0$ and $\alpha_2 > 0$ are assumed. This investment function highlights the role of endogenous factors such as profits and capacity utilization in determining firm's investment decision. Here I distinguish each parameter by sector to take full advantage of sectoral variation facilitated by the two-sector model. i^x is the industry-specific interest rate in real term. So i^H denotes the preferential loan interest rate with the condition that $i^H < i^L$ in real term. R^x is the sectoral or industry-specific rate of return or profit which, in view of equation (2.6) and equation (2.7), is given by

$$R^x := \frac{\pi^x Q^x}{K^x} = \pi^x u^x, \quad x = \{H, L\} \tag{2.11}$$

[11] See Appendix Section A.2 for the algebraic notes for the profit ratio.

where π^x is the profit share of total income.[12]

Equation (2.10) is the slightly revised version of the canonical Kaleckian investment function, $I/K = a + br + c \cdot Q/K$, where r is profit rate and Q/K is capacity utilization, which is found in Rowthorn (1981); Dutt (1984); Blecker (1989); Lavoie (1992). There are two main reasons for the revision: first, since equation (2.6) and equation (2.7) include the unit material costs from the use of intermediate goods, the investment reflects the net profit rate that nets out the borrowing costs; second, the investment decision is expected to be significantly affected by the credit interest rates under the HCI promotion regime. Hence, the capital stock in each of the two sectors grows according to the rates of investment in each sector, which is composed of the rate of autonomous investment, the rate of net profit and the rate of capacity utilization. Depreciation of the capital is assumed away to reflect that the effect of depreciation is very small in the short run. This assumption is motivated by the belief that the impact of capital depreciation on investment and output is negligible over short time horizons. Hence, by assuming away depreciation, the current model can focus on the immediate dynamics of investment and output, without being encumbered by additional complexity.[13]

With respect to international trade, the export performance of firms in the H sector depends on price competitiveness as measured by $\frac{\epsilon p^{H^*}}{\bar{p}^H}$ where p^{H*} and $\bar{p}^H$ are the foreign currency price of foreign manufactured goods and domestic goods price expressed in domestic currency value, respectively. In particular, $\bar{p}^H$ is the exporting price, which is assumed to be not only different from domestic price but also fixed so that export performance of H sector is mainly a function of the exchange rate. The

[12]The profit rate R^x is computed based on the profit share π^x. See Appendix Section A.2 for the algebraic notes for the profit rate.

[13]While the assumption of zero depreciation is useful for short-run models, it is worth noting that it is a significant departure from the real-world phenomenon of physical capital wear and tear, and other factors that result in the depreciation of capital. Over longer time horizons, the effect of depreciation can become increasingly important, and accounting for it becomes necessary in more detailed models of investment and growth that aim to capture the long-run evolution of the capital stock and the level of output.

function is represented by the ratio of export E relative to capital stock K, is given by

$$\frac{E^H}{K^H} = \zeta_0 + \zeta_1 \epsilon \Big(\frac{p^{H*}}{\bar{p}^H} \Big), \tag{2.12}$$

where $\zeta_i > 0$ are constants. ϵ is the fixed nominal exchange rate defined as Won/USD.

Now, we want to derive equations for the sectoral equilibrium conditions by setting the sectoral excess demand to be zero. Each sectoral equilibrium condition leads to the equation for the sectoral capacity utilization. Thus, the equation shows the equilibrium path of capacity utilization rate in each sector, which is affected by the changes in the key exogenous variables such as markups or profit shares, interest rates for the credit, etc. The demand for investment goods produced by the firms in the heavy industry sector is composed of the intermediate demand for investment goods in the light industry sector, $p^H \phi Q^L$, real investment in both sectors, $p^H I^H + p^H I^L$, and foreign demand for investment goods, $p^H E^H$. Then the excess demand for heavy industry is given by

$$ED^H = \underbrace{\phi Q^L + (I^H + I^L) + E^H}_{\text{Demand for investment goods}} - \underbrace{Q^H}_{\substack{\text{Supply of} \\ \text{investment goods}}} \tag{2.13}$$

Equivalently, we have

$$\begin{aligned} \frac{ED^H}{K^H} &= \frac{\phi Q^L}{K^H} + \frac{I^H}{K^H} + \frac{I^L}{K^H}\frac{K^L}{K^L} + \frac{E^H}{K^H} - \frac{Q^H}{K^H} \\ &= \phi u^L k + \alpha_0^H + \alpha_1^H(\pi^H u^H - i^H) + \alpha_2^H u^H \\ &+ \left[\alpha_0^L + \alpha_1^L(\pi^L u^L - i^L) + \alpha_2^L u^L \right] k + \zeta_0 + \zeta_1 \epsilon \Big(\frac{p^{H^*}}{p^H} \Big) - u^H \end{aligned} \tag{2.14}$$

where $k = \frac{K^L}{K^H}$.

Similarly, the excess demand for light industry is given by

$$\begin{aligned}\frac{p^L ED^L}{p^L K^L} &= \frac{p^L(C^H + C^L - Q^L)}{p^L K^L} = \frac{\overbrace{w^H N^H + w^L N^L}^{\substack{\text{Total consumption} \\ \text{out of their wage bill} \\ \text{with zero saving propensity}}}}{p^L K^L} - \frac{p^L Q^L}{p^L K^L} \\ &= (1-\pi^H)\frac{pu^H}{k} - \pi^L u^L\end{aligned} \tag{2.15}$$

where C^x indicates the consumption demand of workers in x sector. Here, aggregate consumption is solely composed of labour workers' consumption (i.e., $s = 1$). This assumption is consistent with the Kaleckian literature that oftentimes posits that investment is assumed to be determined by the rate of profit and not affected by the level of saving. This implies that if capitalists save all their income, it will not affect the level of investment or aggregate demand. $p = \frac{p^H}{p^L}$.

Following Nishi (2020), the labour productivity growth rate in each sector is endogenously determined as a function of the profit share π^x and capacity utilization u^x. This setting implies that the labour productivity growth is induced by not only a change in the production side but also a change in the income distribution. Labour productivity tends to grow regardless of the direction in the income distribution dynamics. For example, when the profit share is reduced, or equivalently the wage share is increased, firms tend to save labour inputs. In contrast, even when the profit share rises, firms pursue labour-saving technology by innovation so that they may keep a certain level of profit rate (Nishi, 2020). Accordingly, the sectoral labour productivity growth rate denoted by $\widehat{1/a_N^x}$ is determined as follows:

$$\widehat{1/a_N^x} = q^x(\pi^x, u^x),\ q_u^x > 0,\ x = \{H, L\} \tag{2.16}$$

where q_π^x and q_u^x are the first derivative with respect to profit rate and utilization, respectively. $q_\pi^x \lessgtr 0$ can be the case. The positive sign of q_π^x indicates the productivity growth regime is *profit-led* while the opposite sign indicates the regime is *wage-led*.[14]

[14]According to Blecker (1989, 2010), in an open economy setting, whether a sector is profit- or wage-led tends to depend on the source of a distributional shift: profit-led outcomes are more likely when rising unit labour costs squeeze profit mark-ups, while wage-led outcomes are more likely when

$q_u^x > 0$ implies that there is a positive association between capital utilization and labour productivity. The labour productivity also leads to endogenous change in the growth of nominal wages (Nishi, 2020). Thus, as labour productivity gap between sectors widens, wage gap between sectors also increases. Thus, the growth rate of sectoral nominal wage is given by

$$\hat{w}^x = \eta^x \cdot \widehat{1/a_N^x}, \; x = \{H, L\} \tag{2.17}$$

where $0 \leq \eta^x \leq 1$ denotes the strength of association between the productivity and the wage rate and is affected by the bargaining power of unions. That is, a rise in unions' bargaining power leads to an increase in η^x, thereby $\hat{w}^x$ increases. When $\eta^x = 1$, then wages grow at the same pace that labour productivity rises. In the model, η^x is exogenous. Also, it is believed in general $\eta^H > \eta^L$, implying that workers in the firms of H sector usually have less bargaining power than their counterparts in L sector given the higher market power of the firms in H sector. Combining equation (2.17) with equation (2.16) yields:

$$\hat{w}^x = \eta^x q^x(\pi^x, u^x), \; x = \{H, L\}. \tag{2.18}$$

The short-run equilibrium condition that $ED^x = 0$ finally yields the equations for the sectoral capacity utilization. The equilibrium rates for two sectoral capacity utilization rates will solve the following system of two equations:

$$u^H = \underbrace{\left[\frac{\phi + \alpha_2^L + \alpha_1^L \pi^L}{1 - \alpha_2^H - \alpha_1^H \pi^H}\right]}_{\mathbf{A}} k u^L + \underbrace{\left[\frac{\alpha_0^H - \alpha_1^H i^H + (\alpha_0^L - \alpha_1^L i^L)k + \zeta_0 + \zeta_1 \epsilon\left(\frac{p^{H^*}}{p^H}\right)}{1 - \alpha_2^H - \alpha_1^H \pi^H}\right]}_{\mathbf{B}}. \tag{2.19}$$

$$u^H = \underbrace{\left[\frac{\pi^L}{p(1 - \pi^H)}\right]}_{\mathbf{C}} k u^L \tag{2.20}$$

firms' target mark-ups vary depending on the changes in the degree of market power of firms.

where $k = \frac{K^L}{K^H}$ and $p = \frac{p^H}{p^L}$.[15]

Hence the short-run equilibrium is defined as:

$$u^{H^*} = \frac{\mathbf{B}(\bar{k}) \cdot \mathbf{C}}{\mathbf{C} - \mathbf{A}} \tag{2.21}$$

$$u^{L^*} = \frac{\mathbf{B}(\bar{k})}{(\mathbf{C} - \mathbf{A})\bar{k}} \tag{2.22}$$

where relative capital stock between the two sectors k is fixed as $\bar{k}$. The derivation above ensures that the capacity utilization rates are endogenously determined by many factors. One of the primary reasons that the rate is below one is to maintain market power and avoid competition. Thus, as shown in equation (2.19) and equation (2.20), u^x is significantly influenced by the profit share, π^x, which is mainly determined by the degree of firms' market power or markups, μ^x. By producing less than the maximum possible output, in particular, firms in H sector can sustain their higher output prices than those produced at full capacity. In addition, they can quickly adjust its production to match sudden changes in market demand.

Parametric Assumptions Here I want to present parametric assumptions for the current model to be operational. Note that the accuracy and reliability of the values of the parameters are crucial. I will attempt to validate these assumptions by providing simulation evidence in the simulation section, and convincing parameter values are presented in Appendix Section A.4. The forthcoming dynamic illustration of the model and simulation section will be preceded by a succinct presentation of the underlying assumptions, which are essential for a clear understanding of the subsequent analysis, in particular, the existence of a unique equilibrium of the system.

Assumption 1. $\mathbf{C} > \mathbf{A} > 0$ and $\mathbf{B} > 0$.

where $\mathbf{A}$ and $\mathbf{C}$ refers to the positive slope of equation (2.19) and equation (2.20), respectively. $\mathbf{B}$ refers to the positive intercept of equation (2.19). This assumption requires that α_0^x, α_1^x and α_2^x are sufficiently small for a unique equilibrium to exist in the system. This assumption states that the slope of capacity utilization equation for

[15] See Appendix Section A.3 for the algebraic details on the derivation.

light industry (equation (2.20)) is steeper than that of capacity utilization equation for heavy industry (equation (2.19)) so that we have a unique equilibrium of the economy.

Assumption 2. The effect of profit share (π^H) on $\mathbf{C}$ is greater than that of price change ($p = \frac{p^H}{p^L}$). That is, $\frac{\partial \mathbf{C}}{\partial \pi^H} > \frac{\partial \mathbf{C}}{\partial p}$, which yields $p > 1 - \pi^H$ since $\frac{\partial \mathbf{C}}{\partial \pi^H} = \frac{pk\pi^L}{\Delta^2}$ and $\frac{\partial \mathbf{C}}{\partial p} = \frac{-(1-\pi^H)k\pi^L}{\Delta^2}$.

This assumption ensures that the firms in H sector will increase their utilization rate when they have a higher degree of market power. This assumption is different from a well-known inverse relationship between market power and capacity utilization. However, this can be justified when one considers the U-shaped distributive curve (Nikiforos and Foley, 2012) which depicts that there can be a positive relationship between profit share and utilization during the first half of a macroeconomic cycle. During this period, as profit share increases, the utilization rate may also rise. However, as the rate of utilization goes above one, the profit share is expected to decrease.

In terms of a linear relationship between capacity utilization of H industry and that of L industry (i.e., $\frac{\Delta u^H}{\Delta u^L}$), their different slopes show that u^H responds to the increase in u^L with higher sensitivity in L sector than in H sector. This difference partly explains the different degree of dependence between the two industries. Since firms in L industry is solely dependent upon the domestic H industry, the increase in the u^L has a greater effect on u^H in L industry, making the slope steeper. In addition, in equilibrium, u^H varies directly with u^L (direct variation). A simple proof is presented in the following proposition.

Proposition 1. *u^{H^*} varies directly with u^{L^*} in equilibrium.*

Proof. In equilibrium, equation (2.21) and equation (2.22) yield: $u^{H^*} = \bar{k} \cdot u^{L^*}\mathbf{C}$, and it is true that $\frac{du^{H^*}}{du^{L^*}} = \bar{k} \cdot \mathbf{C} > 0$. □

The following section shows how industrial policy generates the dynamics of sectoral capacity utilization under the HCI promotion regime are shown in the section that follows. By including the export function and industrial reliance in the model, it is possible to think more practically about how different industries react to market

changes by utilizing different aspects of industrial strategy. Since their export is the inverse function of the price of their output, firms in the heavy industry sector, for instance, may not be able to fully exercise their market power by raising their markups μ^H. The present model helps one to see the result by considering the situation when the firms in the heavy industry sector charge different prices for the domestic and international markets. In this way, the model can not only differentiate the effects of the increase in the market power of domestic firms ($\mu^H \uparrow$) and external price shock (e.g., $p^{m*} \uparrow$) on the economy but also depicts the subordinate connection between the heavy and light industry sectors under the HCI promotion regime in a more realistic manner.

2.3.2 Comparative Dynamic Analysis of Sectoral Economy

2.3.2.1 Positive Effects of HCI Promotion Policy 1) Preferential Interest Rate Effect

During the HCI promotion in Korea, the preferential/lower interest rate policy was implemented to induce selected firms to stimulate investment and promote economic expansion. This policy also coincided with the growth of large business conglomerates, or *chaebols*, which benefited from preferential rates to expand the scale of their business operations. The preferential interest rate policy can have a positive effect on the increase in the capacity utilization through the aggregate demand effect: preferential interest rates make it less expensive for firms to finance investments in capital goods. This in turn allows firms to increase their production capacity to meet the growing aggregate demand, as captured by equation (2.10).

Figure 2.5 (left) illustrates the positive effect of the preferential interest rates (i.e., $i^H \downarrow$), which is an exogenous variable. The decrease in the interest rates for the firms in the targeted H sector will shift up the intercept of equation (2.19). As a result, the utilization of both sectors will rise. The outcome is encouraging in the sense that providing cheap credit for the firms in H sector through preferential interest rates are one of the most representative instruments of HCI push.[16] The major

[16]The growth implication from the two-sector model regarding the lower interest rate policy under

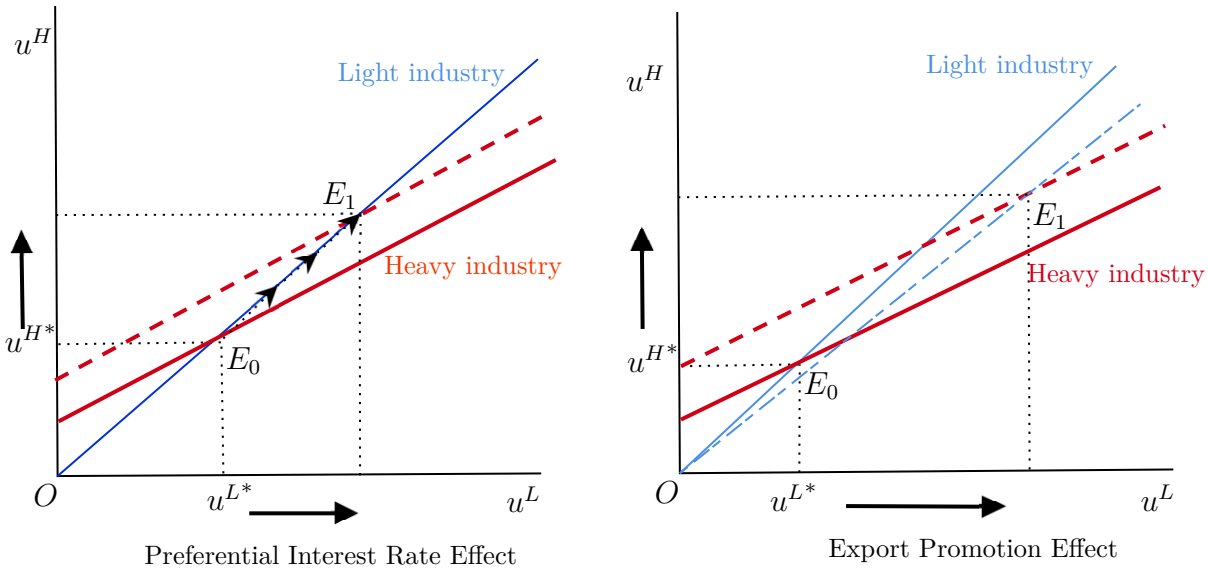


Figure 2.5: Short-run Equilibrium of Sectoral Capacity Utilization and the Impact of Preferential Interest Rates ($i^H \downarrow$) (left) and Export Promotion (ϵ = Won/USD $\uparrow$) (right)

benefit of preferential interest rate policy during the 1970s Korea's HCI promotion was that it provided an incentive for large business groups to invest in heavy and chemical industries. These industries required significant capital investments and were considered high-risk ventures, and so the preferential interest rates helped to offset some of the risks and incentivized the large business groups to invest in them. At the same time, the policy also helped the subordinate small and medium-sized firms grow in terms of capacity utilization. This was because the large business groups that invested in heavy and chemical industries often relied on these smaller firms as subcontractors. By investing in these industries, the large business groups created demand for the products and services provided by the smaller firms, which in turn helped to increase their capacity utilization.

Thus, the lower interest rate policy is generally expected to increase capacity utilization, as it reduces the cost of borrowing for firms and incentivizes investment in new projects or the expansion of existing ones. However, in the case of the HCI promotion in Korea, the lower interest rate policy was implemented selectively, only for firms in certain sectors. This policy, combined with other features of the HCI

financial repression contrasts sharply with that of the higher interest rate regime through financial market liberalization proposed by the McKinnon-Shaw school.

promotion, led to both an initial increase in capacity utilization, as well as a subsequent decrease in utilization and a rise in idle capacity.

The initial increase in capacity utilization was due to the fact that the lower interest rate policy allowed firms in the selected sectors to invest more in new projects or expand existing ones. This increased production and employment, which in turn led to a higher level of capacity utilization. However, the subsequent decrease in utilization was caused by several factors, including the overcapacity that resulted from the rapid expansion of heavy and chemical industries, as well as the stagnation of the Korean economy in the late 1970s. Therefore, while the lower interest rate policy generally has a positive effect on capacity utilization, its impact can be complex and depend on various factors such as the specific industries or sectors targeted by the policy, as well as broader macroeconomic conditions.

2) Export Promotion under a (*de facto*) Dollar Peg Regime

The foreign exchange policy measure for export promotion under the HCI promotion policy was to devaluate the Korean Won by nearly 100 percent (Kim, 1994). Here I want to examine the effect of the government involvement in the foreign exchange rate. Korea's exchange rate system was classified by the IMF as a unified floating exchange rate system, but in fact the Korean Won was pegged to US Dollar until the end of the 1970s (Nam and Kim, 1999). Whether it is intended by the government is not certain, but the initial exchange regime seems to significantly improve the competitiveness of exporting goods, facilitating the transition from import substitution to export promotion. In the model, the export is mainly determined by price competitiveness or terms of trade whose components are the exchange rate denoted by ϵ and the price ratio between the similar goods produced in foreign countries and those from the H sector, $\frac{p^{H^*}}{p^H}$. Figure 2.5 (right) illustrates the dynamics generated by export promotion via the exchange rate effect alone.

2.3.2.2 Unintended Consequences 1) Unilateral/Sectoral Dependence Effect

The import substitution features prominently in the HCI promotion. This is a strong

measure for the government to carry out the protectionist policy. As a result, firms in the L sector tend to increasingly depend on the output (intermediate good) from H sector. The present model uses ϕ to represent the degree of sectoral dependence of light industry on heavy industry. As the value of ϕ increases, both the slope of H industry's utilization **A** and the slope of L industry's utilization get steeper according to the following mechanism: $\phi \uparrow \rightarrow p^L \uparrow$ or $p \downarrow$ and $\pi^L \uparrow$.

Figure 2.6 illustrates the effect of higher degree of sectoral dependence. The dynamics in the following figure, the higher dependence of L sector on H sector tends to cause utilization rate in both sectors to decrease.

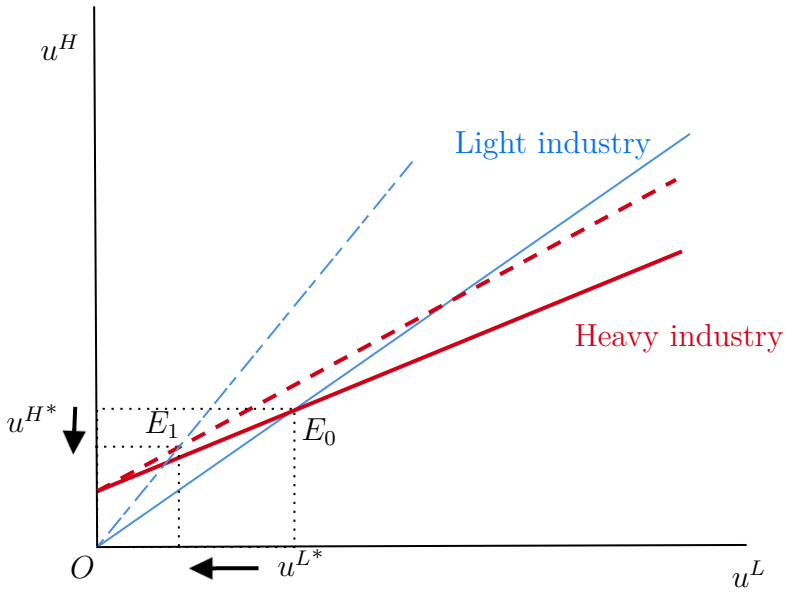


Figure 2.6: Short-run Equilibrium of Sectoral Capacity Utilization and the Impact of Higher Sectoral Dependence under Protectionism ($\phi \uparrow$)

2) The Effect of Market Power through Industrial Policy

A rise in the markup ratio ($\mu^H \uparrow$) has an impact on the economy with two channels: the rise in the domestic relative price and the decrease in the export due to the reduced price competitiveness in the international market as shown in Figure 2.7. The markup rate is a critical determinant of income distribution in the traditional Kaleckian economy. However, in a two-sector open economy under the selective industrial policy regime, firms may not be able to fully exercise the market power as long as they are mainly concerned about the price competitiveness in international

market. Thus, with the higher degree of market power and the price discrimination between domestic and foreign goods markets, firms in the HCI sector keep their export prices competitive in the international market to sustain their export performance (i.e., E^H). This is a highly feasible option for them under the HCI promotion regime due to the preferential interest rates, which can also serve as a subsidy for those who participate in the intense price competition in the international market.

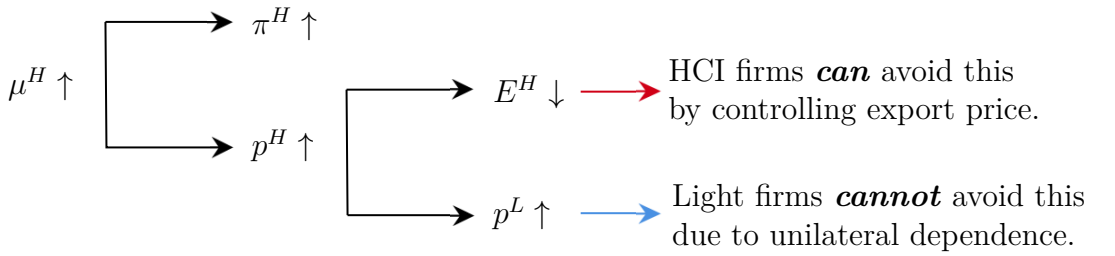


Figure 2.7: The Channel of the Markup Effects

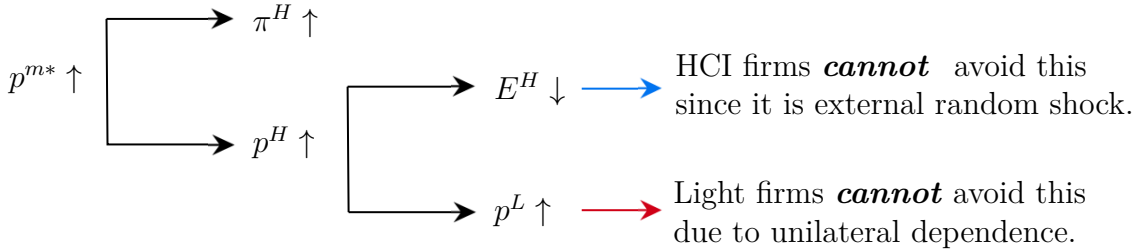


Figure 2.8: The Channel of the Oil Price Shock ($p^{m*} \uparrow$)

Thus the increase in the profit share in the firms of H sector ($\pi^H \uparrow$) will make the slope of equation (2.19), **A**, steeper as the denominator of **A** decreases. The intercept of equation (2.19), **B**, will also increase when they manage to stay price competitive in the export market. Given assumption 2, the slope of equation (2.20), **C**, will also increase as π^H rises,[17] implying that light industry responds to the change in the market power of firms in the heavy industry sector. As a result, the rate of utilization in H sector becomes more sensitive to the change in the rate of utilization in L sector. Finally the economy reaches the new equilibrium E_1 as shown in Figure 2.9 (left). A

[17] Recall $\frac{\partial \mathbf{C}}{\partial p} = \frac{\pi^H - 1}{\Delta^2} < 0$.

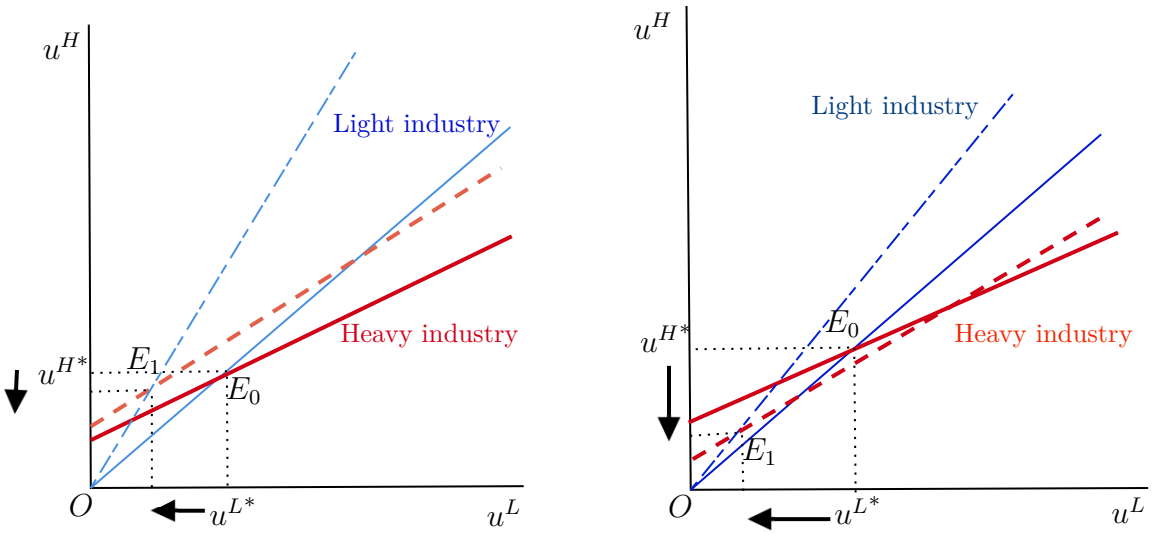


Figure 2.9: Short-run Equilibrium of Sectoral Capacity Utilization and the Impact of Increased Market Power ($\mu^H \uparrow$) (left) and Oil Price Shock ($p_m^* \uparrow$) (right)

potential equilibrium position, denoted as E_1, suggests a reduction in the utilization rates of firms in both sectors.

3) Oil Price Shock Effect

Finally, let us consider an external price shock or the increase in the resource price in the international commodity market. In equation (2.6), the oil shock can simply be incorporated in the model by identifying it as the increase in the cost of imported material ($p_m^* \uparrow$), which will increase p^H, the price of intermediate goods produced by firms in HCI sector, thus eventually allowing $p = \frac{p^H}{p^L}$ to increase. Figure 2.8 shows that the impact of the oil price shock is identical to that of the increase in the markups. However, unlike the case of the increase in the markup rate, this case has not much leeway for the firms in H sector to circumvent the shock.

As a result, all the values of $\mathbf{A}, \mathbf{B}$ (the slope and the intercept of u^H equilibrium path, respectively in equation (2.19)) and $\mathbf{C}$ (the slope of u^L equilibrium path in equation (2.20)) will change. In particular, $\mathbf{A}$ will increase, $\mathbf{B}$ will decrease, and $\mathbf{C}$ will increase. In sum, oil price shock will decrease the capacity utilization in both sectors. The present model shows that the oil price impact is the most devastating

and the HCI promotion regime is vulnerable to the external shock such as commodity price shock.

Now we may consider the macroeconomic implications of both increased profit share and the impact of price shock. We first need to note that capacity utilization and sectoral (or aggregate) demand are closely linked. That is, as the sectoral capacity is utilized at a full level, the economy is experiencing strong and sustained growth of sectoral demand. This unintended effect of industrial policy instrument or external shock lead to further engagement of the government, justifying the argument for the larger role of the state in the process of industrialization of many developing countries including South Korea.

Table 2.1 is the summary of the effect of industrial policy based on the figures above. Later, we will examine whether simulations generate consistent results to this prediction.

Table 2.1: The Summary of Short-run Impacts of Industrial Policy Measures (Model Prediction)

		Endogenous variables			
Industrial policy regime		u^H	u^L	z	g_A
Policy instruments	$i^H \downarrow$	$+$	$+$	$+$	$+$
	$\phi \uparrow$	$-$	$-$	$+$	$-$
	$\epsilon \uparrow$	$+$	$+$	$+$	$+$
External shock (Oil shock)	$p_m^* \uparrow$	$-$	$-$	$+$	$-$
Market power	$\mu^H \uparrow$	$-$	$-$	$+$	$-$

Note: u^H: capacity utilization rate in H sector; u^L: capacity utilization rate in L sector; z: relative labour input cost ratio; g_A: aggregate growth rate

2.4 Short-run and Long-run Dynamics Analysis

This section proceeds to obtain the condition for the existence of steady-state of key endogenous variables: sectoral capacity utilization rate, u^H, u^L and relative unit labour cost, z. More importantly, this section derives the local stability conditions for the steady states, substantiating the previous illustrative discussion of comparative

statics of the equilibrium of two rates of sectoral capacity utilization. In other words, without considering the local stability of the steady state or if the steady state is locally unstable, the exercise does not make sense. The first part of the section will derive the equations for the steady states of the short-run dynamics system. The second part will figure out the conditions for the existence of unique solution to steady-state economy as well as its stability based on the Routh-Hurwitz condition, which proposes a necessary and sufficient condition for the local stability of the dynamic system. We will also state a couple of propositions based on the same condition.

2.4.1 Short-run Dynamics

Steady state of Two-sector Economy The dynamics of capacity utilization in each sector depends on the difference between excess demand and utilization: when excess demand exceeds utilization, a rise in the capacity utilization occurs in both sectors, and vice versa. The dynamics of each state variable is represented as its time-derivative:

$$\begin{aligned}\dot{u}^H &= \theta^H\left(\frac{ED^H}{K^H}\right) \\ &= \theta^H\Bigg((\phi + \alpha_1^L\pi^L + \alpha_2^L)ku^{L^*} + (\alpha_1^H\pi^H + \alpha_2^H - 1)u^{H^*} \\ &+ \alpha_0^H - \alpha_1^H i^H + \alpha_0^L k - \alpha_1^L i^L k + \zeta_0 + \zeta_1\epsilon\Big(\frac{p^{H^*}}{p^H}\Big)\Bigg)\end{aligned} \tag{2.23}$$

$$\begin{aligned}\dot{u}^L &= \theta^L\left(\frac{ED^L}{K^L}\right) \\ &= \theta^L\left((1-\pi^H)\frac{pu^{H^*}}{k} - \pi^L u^{L^*}\right)\end{aligned} \tag{2.24}$$

where $\theta^x > 0$ denotes the parameters of the speed adjustment of the changes in the capacity utilization rate in response to the disequilibrating perturbation in each sector. In order to express p in terms of income distribution share z, defined as

$\frac{w^H a_N^H}{w^L a_N^L} = \frac{\pi^L(1-\pi^H)\mu^H \gamma p_m^*}{\pi^H(1-\pi^L)\mu^L \phi p^H}$,[18] I use the proxy of price ratio used in Nishi (2020) by assuming that the relative price is mainly determined by relative income distribution $\frac{1-\pi^L}{1-\pi^H}$ and relative unit labour cost z and that the influence of sectoral intermediate good's price γp_m^* and ϕp^H are not significant. That is,

$$p = \frac{p^H}{p^L} = \frac{(1+\mu^H)(w^H a_N^L + \gamma p_m^*)}{(1+\mu^L)(w^L a_N^H + \phi p^H)} \approx \Big(\frac{1-\pi^L}{1-\pi^H}\Big) z \tag{2.25}$$

Thus, equation (2.24) can be rewritten as

$$\dot{u}^L = \theta^L \left((1-\pi^L) z \frac{u^{H^*}}{k} - \pi^L u^{L^*} \right) \tag{2.26}$$

Finally, taking the logarithm of relative unit labour cost z and its time derivative yields:

$$\begin{aligned} \dot{\hat{z}} &= z\Big(\hat{w}^H - \widehat{1/a_N^H} - \hat{w}^L + \widehat{1/a_N^L}\Big) \\ &= -z\Big((1-\eta^H)\cdot \widehat{1/a_N^H} - (1-\eta^L)\cdot \widehat{1/a_N^L}\Big) \\ &= z\Big((1-\eta^L) q^L(\pi^L, u^L) - (1-\eta^H) q^H(\pi^H, u^H)\Big) \end{aligned} \tag{2.27}$$

where the second and third expressions are derived from equation (2.17) and equation (2.18), respectively.

The steady state of the short-run dynamics system is defined by $\dot{u}^H = \dot{u}^L = \dot{z} = 0$, which yields the following conditions:

$$(\phi + \alpha_1^L \pi^L + \alpha_2^L) k u^{L^*} + (\alpha_1^H \pi^H + \alpha_2^H - 1) u^{H^*} + \alpha_0^H - \alpha_1^H i^H + (\alpha_0^L - \alpha_1^L i^L) k + \zeta_0 + \zeta_1 \epsilon \Big(\frac{p^{H^*}}{p^H}\Big) \tag{2.28}$$

$$(1-\pi^L) z \frac{u^{H^*}}{k} - \pi^L u^{L^*} = 0 \tag{2.29}$$

[18] See Appendix Section A.2 for the algebraic notes for the derivation of the relative unit labour cost ratio.

$$(1-\eta^L)q^L(\pi^L,u^L)-(1-\eta^H)q^H(\pi^H,u^H)=0 \tag{2.30}$$

In the following section, I will investigate the conditions for the existence of unique solution to this economy and derive meaningful propositions from steady-state local stability conditions which are obtained based on the three equations above.

2.4.2 Conditions for the Existence of Unique Solution to Steady-state Economy and its Stability

Stability Conditions To obtain the condition for the local asymptotic stability of the steady state, the system needs a linearization around the sectoral steady state as follows:

$$\begin{bmatrix}\dot{u}^H\\ \dot{u}^L\\ \dot{z}\end{bmatrix}=\underbrace{\begin{bmatrix}j_{11} & j_{12} & 0\\ j_{21} & j_{22} & j_{23}\\ j_{31} & j_{32} & 0\end{bmatrix}}_{\mathbf{J}}\begin{bmatrix}u^H-u^{H^*}\\ u^L-u^{L^*}\\ z-z^*\end{bmatrix}$$

where **J** is the Jacobian matrix for the long-run dynamic system whose non-zero elements of **J** and their signs are determined as follows:

$$j_{11} = \frac{\partial \dot{u}^H}{\partial u^H} = \theta^H(\alpha_1^H \pi^H + \alpha_2^H - 1) < 0. \tag{2.31a}$$

$$j_{12} = \frac{\partial \dot{u}^H}{\partial u^L} = \theta^H k(\phi + \alpha_1^L \pi^L + \alpha_2^L) > 0. \tag{2.31b}$$

$$j_{13} = \frac{\partial \dot{u}^H}{\partial z} = 0. \tag{2.31c}$$

$$j_{21} = \frac{\partial \dot{u}^L}{\partial u^H} = \theta^L(1 - \pi^L)\frac{z}{k} > 0. \tag{2.31d}$$

$$j_{22} = \frac{\partial \dot{u}^L}{\partial u^L} = -\theta^L \pi^L < 0. \tag{2.31e}$$

$$j_{23} = \frac{\partial \dot{u}^L}{\partial z} = \theta^L\left((1 - \pi^L)\frac{u^H}{k}\right) > 0. \tag{2.31f}$$

$$j_{31} = \frac{\partial \dot{z}}{\partial u^H} = -z^*(1 - \eta^H)q_{u^H}^H < 0. \tag{2.31g}$$

$$j_{32} = \frac{\partial \dot{z}}{\partial u^L} = z^*(1 - \eta^L)q_{u^L}^L > 0. \tag{2.31h}$$

$$j_{33} = \frac{\partial \dot{z}}{\partial z} = 0. \tag{2.31i}$$

The following is the characteristic equation based on the 3×3 Jacobian matrix $\mathbf{J}$.

$$p(\lambda) = \det(\lambda \mathbf{I} - \mathbf{J}) = \lambda^3 + c_1\lambda^2 + c_2\lambda + c_3 = 0 \tag{2.32}$$

where λ denotes a characteristic root, $c_1 = -\operatorname{Tr}\mathbf{J}$ (where Tr denotes the trace of the matrix $\mathbf{J}$), c_2 is the sum of the principal minors' determinants of $\mathbf{J}$, and $c_3 = -\det\mathbf{J}$ (where det denotes the determinant of matrix $\mathbf{J}$). Each coefficients are computed as follows:

$$c_1 = -\operatorname{Tr}\mathbf{J} = -j_{11} - j_{22} = \theta^H(1 - \alpha_1^H \pi^H - \alpha_2^H) + \theta^L \pi^L > 0$$

$$c_2 = \begin{vmatrix} j_{22} & j_{23} \\ j_{32} & j_{33} \end{vmatrix} + \begin{vmatrix} j_{11} & j_{13} \\ j_{31} & j_{33} \end{vmatrix} + \begin{vmatrix} j_{11} & j_{12} \\ j_{21} & j_{22} \end{vmatrix} = -j_{23}j_{32} + j_{11}j_{22} - j_{12}j_{21}$$

$$= -\theta^L \underbrace{(1-\pi^L)\frac{u^H}{k} z q^L_{u^L} \eta^L}_{\Omega_1} + \theta^H \underbrace{(1-\alpha_1^H \pi^H - \alpha_2^H)\pi^L}_{\Omega_2} - \theta^H \theta^L (\underbrace{\phi + \alpha_1^L \pi^L + \alpha_2^L}_{\Omega_3})(1-\pi^L) z$$

and

$$\begin{aligned} c_3 &= -\det \mathbf{J} = j_{23}(j_{11}j_{32} - j_{12}j_{31}) \\ &= \theta^H \theta^L \left(\Omega_3 u^H q^H_{u^H} - \Omega_1 \Omega_2 \right) \end{aligned}$$

On the basis of Routh-Hurwitz condition, the necessary and sufficient condition for the local stability of steady state of the system requires all eigenvalues have negative real part if and only if

$$c_1 > 0, c_2 > 0, c_3 > 0 \text{ and } c_1 c_2 > c_3.$$

(i) $c_1 > 0$ is confirmed by equation (2.31a), equation (2.31e) and equation (2.31i).
(ii) $c_2 > 0$ requires $\theta^H \Omega_2 > \theta^L \Omega_1 + \theta^H \theta^L \Omega_3$.
(iii) $c_3 > 0$ requires $\Omega_3 u^H q^H_u > \Omega_1 \Omega_2$.
(iv) $c_1 c_2 > c_3$ requires $[\theta^H(1 - \alpha_1^H \pi^H - \alpha_2^H) + \theta^L \pi^L](\theta^H \Omega_2 - \theta^L \Omega_1 - \theta^H \theta^L \Omega_3) > \theta^H \theta^L (\Omega_3 u^H q^H_{u^H} - \Omega_1 \Omega_2)$. Condition (iv) is confirmed by the requirements of (i), (ii), (iii) and a specific value of θ^{H^*} for which a Hopf bifurcation occurs.[19]

The condition generates the following propositions given that $\Omega_1 > 0, \Omega_2 > 0$ and $\Omega_3 > 0$.

Proposition 2. *After a certain threshold ($\theta^H = \frac{\Omega_2 - \Omega_1}{\Omega_3}$), the adjustment speed of the capacity utilization in HCI sector needs to be sufficiently faster than that of L sector for the local stability of the unique steady state in the short-run economy to exist.*

[19]Thus, Routh-Hurwitz criterion provides a necessary condition for a Hopf bifurcation to occur. For a similar example, see Sasaki (2013).

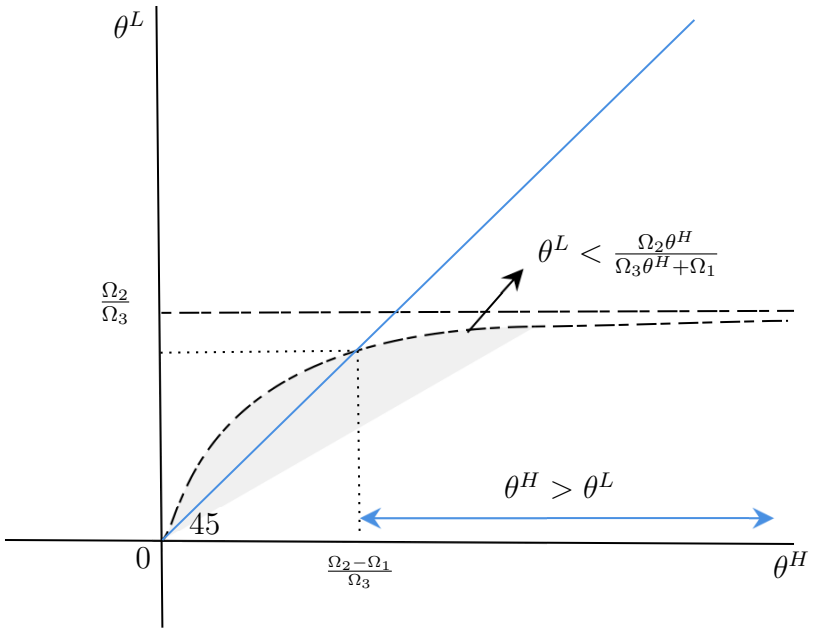


Figure 2.10: Existence of the Upper Bound for Adjustment Speeds of L Sector's Demand given $\theta^H > 0$ and $\theta^L > 0$

Equivalently, θ^L has an upper limit so that $\theta^H > \theta^L$ to hold for the stability.

Proof. Given $\theta^x > 0$, $\theta^H\Omega_2 > \theta^L\Omega_1 + \theta^H\theta^L\Omega_3$ has an equivalent functional form of $\theta^L < \frac{\Omega_2\theta^H}{\Omega_3\theta^H+\Omega_1}$ with asymptotic lines $\theta^H = -\frac{\Omega_1}{\Omega_3}$ and $\theta^L = \frac{\Omega_2}{\Omega_3}$. The latter works as an upper limit for θ^L to hold the local stability condition for the steady state. For $\theta^H > \frac{\Omega_2-\Omega_1}{\Omega_3}$, the adjustment speed for the HCI is always faster than that of L sector as the upper limit of θ^L is effective (see Figure 2.10).

□

Proposition 3. *For the short-run economy's local stability, the growth rate of labour productivity in H sector has to increase as the capacity utilization rate in H sector grows given $\Omega_1 > 0$, $\Omega_2 > 0$ and $\Omega_3 > 0$.*

Proof. Since the local stability condition requires $\Omega_3 u^H q_u^H(u^H) > \Omega_1\Omega_2$, we have $u^H q_u^H(u^H) > \frac{\Omega_1\Omega_2}{\Omega_3} > 0$. Thus, $q_u^H(u^H) > 0$ with $u^H > 0$. □

2.4.3 Long-run Dynamics

The growth rate of the stock of capital is defined as the difference between the growth rate of the capital stock of each sector. All the capital goods or investment

goods in HCI sector are either consumed by the domestic firms in the light industry or exported and consumed by the foreign firms. So using equation (2.10), the changes in the domestic capital stock is defined as

$$\begin{aligned}
\dot{k} &= (g_I^L - g_I^H)k \\
&= \Big[\alpha_0^L + \alpha_1^L(R^L - i^L) + \alpha_2^L u^{L^*}(k) - \alpha_0^H - \alpha_1^H(R^H - i^H) - \alpha_2^H u^{H^*}(k)\Big]k \\
&= \Big[\alpha_0^L + \alpha_1^L(\pi^L u^{L^*}(k) - i^L) + \alpha_2^L u^{L^*}(k) - \alpha_0^H - \alpha_1^H(\pi^H u^{H^*}(k) - i^H) - \alpha_2^H u^{H^*}(k)\Big]k \\
&= \Big[\alpha_0^L - \alpha_1^L i^L + u^{L^*}(k)\Big(\alpha_1^L \pi^L + \alpha_2^L\Big) - \alpha_0^H + \alpha_1^H i^H - u^{H^*}(k)\Big(\alpha_1^H \pi^H + \alpha_2^H\Big)\Big]k
\end{aligned} \tag{2.33}$$

The long-run steady state condition states that $\dot{u}^H = \dot{u}^L = \dot{z} = \dot{k} = 0$ so that $g_L^{*^H} = g_L^{*^L}$ and the long-run steady-state is defined as a set of $(u_L^{*H}, u_L^{*L}, z_L^*, k_L^*)$ in which subscription L refers to the long run values. The long-run steady state is described as:

$$\begin{aligned}
0 &= (\phi + \alpha_1^L \pi^L + \alpha_2^L)k u^{L^*} + (\alpha_1^H \pi^H + \alpha_2^H - 1)u^{H^*} + \alpha_0^H - \alpha_1^H i^H + (\alpha_0^L - \alpha_1^L i^L)k + \zeta_0 + \zeta_1 \epsilon\Big(\frac{p^{H^*}}{p^H}\Big) \\
0 &= (1 - \pi^L) z \frac{u^{H^*}}{k} - \pi^L u^{L^*} \\
0 &= \eta^L q^L(\pi^L, u^L) - \eta^H q^H(\pi^H, u^H) \\
0 &= \alpha_0^L - \alpha_1^L i^L + u^{L^*}\Big(\alpha_1^L \pi^L + \alpha_2^L\Big) - \alpha_0^H + \alpha_1^H i^H - u^{H^*}\Big(\alpha_1^H \pi^H + \alpha_2^H\Big)
\end{aligned} \tag{2.34}$$

For the long-run steady state to be economically meaningful, the following condition must be satisfied.

$$\begin{aligned}
\frac{du_L^{H*}}{dk} &< 0 \\
\frac{du_L^{L*}}{dk} &< 0 \\
\frac{d\dot{k}}{dk} &< 0
\end{aligned} \tag{2.35}$$

In order to understand the long-run trend of key variables derived from the model, we need to note that in the long-run, the economy can stagnate for two reasons: the increase in market power of the firms in the targeted industries and negative external (price) shock. The former is based on Steindl (1952)'s discovery that there is a trend toward stagnation in the markups. Under the current model, however, the economy can still expand despite sectoral disparity in the market power as long as other benefits from other instruments such as higher saving rates and preferential interest rates exceed it. In sum, the current study shows that only the markup differential (difference in the market power) across the sectors makes a significant difference in term of sectoral utilization whereas the interest rate differential does not. The model also demonstrates how the oil price shock dampens the economy in the absence of any protective measures. Thus, the model suggests that industrial policy require further redistribution measures for the stabilization of the economy against the external price shock such as oil price shock. The findings above are consistent with the Korean episode in which *chaebols* prospered, the wage share (real wage) was suppressed, and the economy suffered from stagnation in the final stage of HCI promotion.

2.5 Numerical Analysis and Simulation

This section presents numerical examples to show how the short-run and long-run solution paths of the economy behave under different sectoral growth regime. Table A.1 in Appendix Section A.4 shows parameter values.

2.5.1 Short-run and Long-run Behaviours of Key Variables

Table 2.2 and Table 2.3 show both short-run and long-run steady-state values of key variables depending on each sector's productivity growth regime. The profit-led productivity regime is represented by the positive value of productivity growth rate ($q_\pi^H > 0$) whereas the wage-led productivity regime is represented by the negative value of productivity growth rate ($q_\pi^H < 0$). The results show that the steady-state value of each variable significantly hinges on the productivity regime.

Table 2.2: Steady State Values of Key Variables with Profit-led Productivity Growth Regime

	Short run steady state		Long run steady state	
	Profit-led H sector +profit-led L sector	Profit-led H sector +wage-led L sector	Profit-led H sector +profit-led L sector	Profit-led H sector +wage-led L sector
$\mathbf{u^{H^*}}$	0.314	0.297	0.227	0.218
$\mathbf{u^{L^*}}$	0.676	0.627	0.229	0.220
$\mathbf{z}^*$	0.359	0.352	0.308	0.301
$\mathbf{k}^*$	NA	NA	0.458	0.448

Table 2.3: Steady State Values of Key Variables with Wage-led Productivity Growth Regime

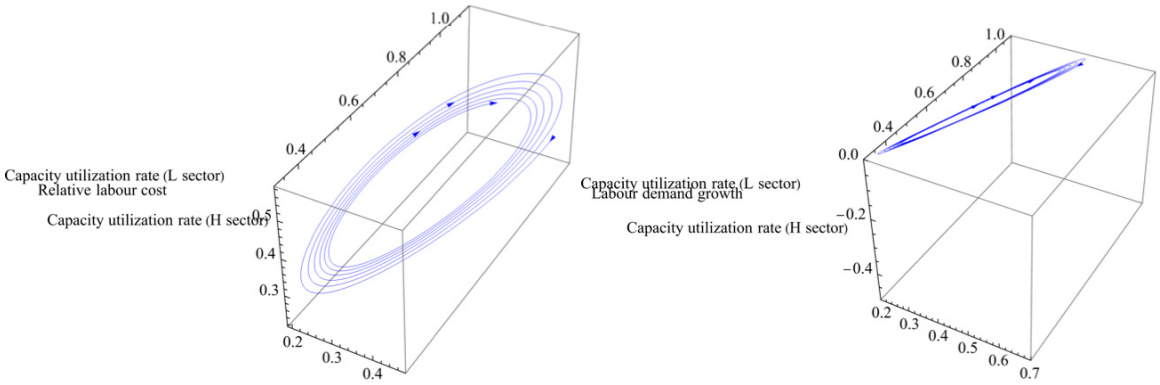
	Short run steady state		Long run steady state	
	Wage-led H sector +profit-led L sector	Wage-led H sector +wage-led L sector	Wage-led H sector +profit-led L sector	Wage-led H sector +wage-led L sector
$\mathbf{u^{H^*}}$	0.334	0.315	0.239	0.228
$\mathbf{u^{L^*}}$	0.733	0.675	0.241	0.229
$\mathbf{z}^*$	0.366	0.357	0.305	0.305
$\mathbf{k}^*$	NA	NA	0.470	0.456

The findings of the simulation reveal that, irrespective of the productivity regime adopted by the L sector, the H sector operating under a wage-led productivity regime exhibits higher capacity utilization rates in both short-run and long-run. Furthermore, the results suggest that in the short-run, the capacity utilization rate of the H sector is notably lower than that of the L sector. This relationship remains constant in the long-run, although the disparity between the two sectors decreases significantly. The long-run findings also indicate a notable reduction in capacity utilization rates compared to the short-run outcomes. This decrease supports the fact that Korea's economy suffered from significant capital misallocation problem in the final stage of the HCI promotion, particularly in the H sector.

2.5.2 Dynamic Solution Paths

This subsection examines the short-run paths of sectoral economy and association between the increase in the market power and sectoral capacity utilization rates, so called the short-run demand regime. Figure 2.11 and Figure 2.12 illustrate the cyclical

behaviour of solution paths sectoral capacity utilization rates, relative labour cost, and labour demand growth rate for each different sectoral growth regime. The cyclical path is generated in the following sequence: the increase in the profit share of the H sector in the context of industrial policy regime boosts investment demand in the H sector and its capacity utilization rate. At the same time, it accelerates the labour productivity growth through increasing returns to scale. This productivity growth leads to the fall in the unit labour cost in the H sector ($z = \frac{w^H a_N^H}{w^L a_N^L} \downarrow$). Consequently, the effective demand for the product (consumption goods) will significantly fall and dampen the investment demand (demand for goods produced in the H sector), suggesting that overall economy follows the wage-led regime. This finding turns out to be consistent with the empirical evidence found in Onaran and Stockhammer (2005) that supports wage-led tendency in Korea's growth regime.

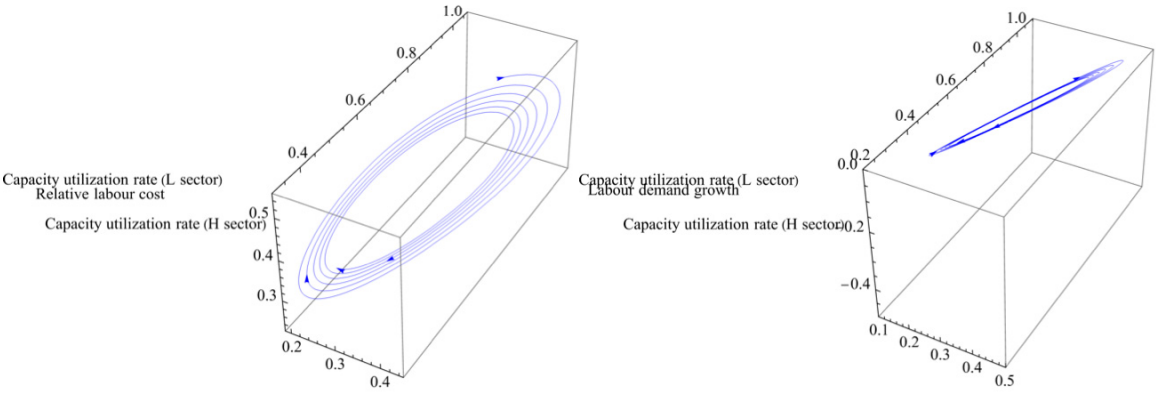


(a) Cyclical Path with Labour Cost **(b)** Cyclical Path with Labour Demand Growth

Note) Each path is generated from $t = 10,000$ to $t = 25,000$.

Figure 2.11: Short-run Behaviour of Sectoral Capacity Utilization Rates with profit-led Growth in the L sector

All the series show synchronized patterns with other series. However, the patterns are different depending on the L sector's growth regime. First, the cyclical path with profit-led L sector has higher frequency and capacity utilization rate than its counterpart regime does. Secondly, in general, the capacity utilization rates for both sectors are higher with the profit-led L sector while the relative labour costs are not different with the different L sector's regime. The finding implies that income distribution between workers in H and L sectors is not much affected by the



(a) Cyclical Path with Labour Cost **(b)** Cyclical Path with Labour Demand Growth

Note) Each path is generated from $t = 10,000$ to $t = 25,000$.

Figure 2.12: Short-run Behaviour of Sectoral Capacity Utilization Rates with Wage-led Growth in the L sector

characteristics of L sector's demand regime, but the capacity utilization rates between the production sectors are affected by the L sector's regime. This distinction is due to the fact the higher profit share relative to wage share negatively affects the aggregate demand in the wage-led L sector, reducing the rate of capacity utilization in both sectors. This conflicting feature of the sectoral economy under industrial policy regime can be detected only when we consider a two-sector economy.[20]

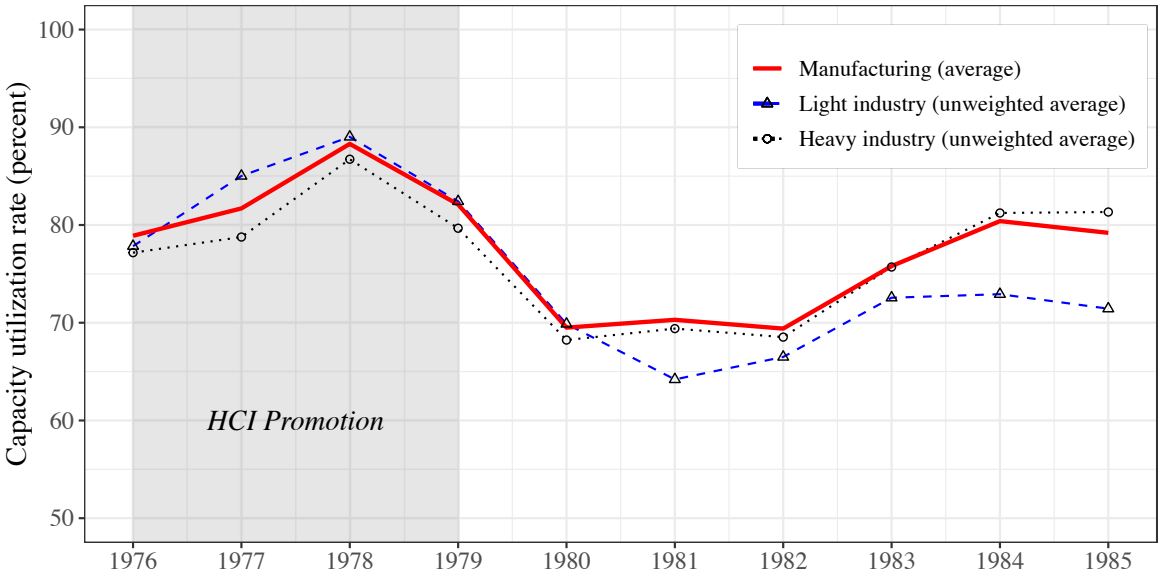
Nishi (2020) finds that once the economy follows a cyclical pattern, even when the labour supply is constantly growing, the labour demand (employment rate) also follows the cyclical trend, which is harmful to both firms and workers. The simulations show the same patterns as his finding, which presents a counterexample to Baumol (1967)'s argument that structural change and thus a shift in the labour force from lower to higher productivity sector (in the current paper's context, from L sector to H sector) leads to monotonous decline in the economic growth.

Another insight from the sectoral economy's periodic route is how specific aspects of industrial policy regimes impact the economy. For instance, we previously addressed how the subordinate relationship between the H and L sectors will impact the cyclical behaviour of the economy. In order to cope with this issue, we need to recognize that the two sector connection used in this research is neither fully interdependent nor fully

[20]See Figure A.1 in Appendix Section A.1 for the long-run behaviour of key Variables.

subordinate. In other words, the degree to which the L sector is dependent upon the L sector, which is represented by the value of ϕ, also affects the macro behaviours. Industrial strategy tends to make the L sector even more dependent on the H sector's output. As a result, the H sector's capacity utilization rate rises, labour productivity increases, and the H sector's profit share increases. Therefore, under the industrial policy framework, this detrimental economic impact tends to be amplified through the interplay across the sectors, resulting in macroeconomic instability. The net effect is an empirical issue.

2.5.3 Discussion: Fitting Together the Pieces of the Puzzle



Source: Author's calculation based on Kim (1990)

Figure 2.13: Sectoral Capacity Utilization Rate

Matching with the Real Data Figure 2.13 presents the actual trends in the rate of sectoral capacity utilization. First, it highlights that both rates of sectoral capacity utilization follow a similar trajectory. Second, during the period of HCI promotion, the rate of heavy industry is lower than that of light industry. Finally, it shows that both variables had been increasing until 1978, when a fall began to occur, demonstrating the dual consequences of the HCI promotion policy. The findings of the comparative statics analyses presented in the preceding figures in which both u^H

and u^L move in the same direction align with the observed co-movement of the two trends in the figure.

The situation when the two rates move in tandem can be normal in the new equilibrium following a positive shock such as preferential interest rate policy or export promotion policy as we discussed earlier. In the new final equilibrium, both rates will be higher or both rates will be lower when both sectors have spare capacity, so any positive shock in one industry will have a positive feedback effect in the other industry. In other words, Kaleckian models assume away the assumption of full utilization or full employment, which would require a reproportioning of economic activity (labour and capital), from one industry to the other.[21]

As we previously discussed, to facilitate an increase in overall capacity utilization and economic expansion, it is necessary for the effects of preferential interest rates and export promotion to dominate those of price shocks, increased profit share and subordinate corporate structure. However, it is still unclear whether the decrease in utilization rates in both industries during the second half of the HCI promotion period was due to the increased market power, the price effect or their mixed effect. While the economy nearly recovered from the first oil shock in 1973, cost-push inflation resulting from the increased level of oil prices may have had an adverse impact on overall capacity utilization, leading to a marked rise in idle capacity in the heavy industry sectors.

The inefficiency of capital allocation, a more direct cause of the increase in the idle capacity under the HCI promotion, is further supported by Auty (1992) who points out that *Big Push* theorists neglected the possibility of inadequate implementation capacity when the HCI promotion transformed from HCI Drive to HCI Big Push.[22] which triggers inflation and a real appreciation of the exchange rate. This in turn causes the higher import demands of the Big Push stage of the HCI promotion and

[21] In the model presented in Lavoie and Ramírez-Gastón (1997), it may be that during part of the transition the two rates will not move in the same direction.

[22] According to Auty (1992), The HCI Drive seeks to accelerate the sequence of backward integration from light industry through capital-intensive intermediates into skill-intensive machinery and engineering. An HCI Big Push is even more ambitious since it seeks to capture the externalities arising from simultaneous entry into HCI sectors at different stages in the production chain.

lagged output from the long-gestation HCI projects to push the trade balance into deficit. In addition, the impact of market power of the firms in the heavy industry on macroeconomy should be noted based on Kim (1990) and Park (1986) who argue that the gap between the increasing domestic demand and the down-scaled support for the capacity of light industries was the main cause of inflation and that the concentration of investment on HCI triggered inflation, respectively. Figure 2.14 is the illustration of inflation effect driven by the domestic factors feature the HCI Big Push stage.

Furthermore, increased profit share of firms in the H sector and higher sectoral dependence also contribute to the accumulation of idle capital capacity. Although industrial policy may successfully coordinate investment projects between firms, it generates a strong incentive for over-investment due to the negative borrowing cost of the preferential credit. The efficiency of capital allocation is a critical factor in determining the success of industrial policies aimed at promoting key industries or firms in those industries. However, some scholars have pointed out that the transition from HCI Drive to HCI Big Push neglected the possibility of inadequate implementation capacity, leading to inflation and a real appreciation of the exchange rate. Auty (1992) notes that the HCI Big Push seeks to capture the externalities arising from simultaneous entry into HCI sectors at different stages in the production chain, which may trigger higher import demands and a trade balance deficit. The concentration of investment on HCI and the market power of firms in the heavy industry can also contribute to inflation, as argued by Kim (1990) and Park (1986), respectively.

Figure 2.14 illustrates the inflation effect driven by the domestic factors of the HCI Big Push stage. Furthermore, preferential interest rates may lead to an investment spike and trigger massive idle capital capacity, as industrial policy generates a strong incentive for over-investment due to the negative borrowing cost of preferential credit. Therefore, policymakers must carefully consider the efficiency of capital allocation and the potential market power of firms in the heavy industry when designing industrial policies aimed at promoting key industries.

2) Distributional Implication

Understanding how output is distributed between labour and capital in the different

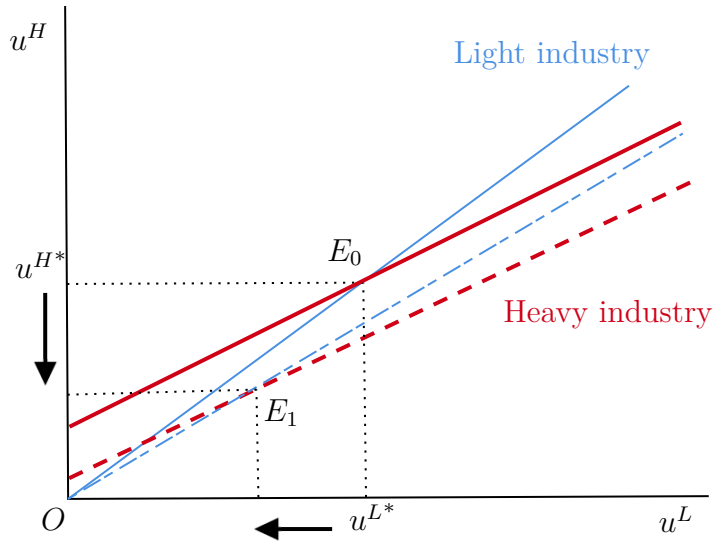


Figure 2.14: Short-run Equilibrium of Sectoral Capacity Utilization and the Impact of Inflation under the Assumption of Inadequate Implementation Capacity ($p^H \uparrow \rightarrow p \uparrow$)

phases of the business cycle, is more challenging. There are two conflicting views on the relationship between capacity utilization and labour share. The first view is established by the early Cambridge School scholars such as Robinson (1962, 1969); Harcourt (1972); Kaldor (1985), arguing that firms' markup pricing decreases wage share as capacity utilization increases beyond its normal level (Nikiforos and Foley, 2012). In contrast, a notion adopted by Goodwin (1967); Davidson (1972); Shapiro and Stiglitz (1984); Bowles and Boyer (1988); Kurz (1994); Foley (2003); Taylor (2004); Barbosa-Filho and Taylor (2006) states that the real wages and the labour share increase with economic growth with which the level of capacity utilization increases and the economy gets closer to full employment.

Nikiforos and Foley (2012) offer a strong case for a U-shaped distributive curve based on U.S. data, utilizing the Kaleckian theory that markup price is the major predictor of the income distribution and the effect of overhead costs and the negotiating process also affect the wage share. Therefore, the first connection was dominating given the low level of utilization: as capacity utilization rises, the wage share falls. However, when the economy experienced the (second) oil shock, employees' bargaining power was diminished and more capital capacity went idle. This means that rather than industrial policy in and of itself, the significant shift in the trend of utilization in

1978 is thought to have been caused mostly by external factors including the increasing commodity prices.

The difference between labour productivity and capital productivity, particularly among businesses in the H sector, is another factor for the drop in the wage share. The capital stock has grown dramatically, but the labour productivity does not appear to have increased. Positive externality, which was anticipated by the HCI-specific big push, may not materialize, but instead, labour productivity turns out to be falling behind capital accumulation and the expansion of large business groups. Wage share decreased as a result.

One may also note that the first three policy instruments are distinguished from the oil shock in the sense that they are all embedded in industrial policy scheme whereas the oil shock is external. So the outcome of the oil shock will not change the nature of industrial policy addressed in this chapter and the results of this chapter makes a strong case for industrial policy.

2.6 Conclusion

This study investigates the impact of selective industrial policy on the sectoral economy, with a specific focus on sectoral capacity utilization. The Korean government's promotion of the Heavy and chemical industry (HCI) is taken as a case study to examine the effectiveness of a selective industrial policy regime where large firms in the targeted sector grow at a faster rate than those in non-targeted sectors. The paper analyzes the key policy tools used by the Korean government, including (i) protectionist policies that create unilateral dependence between heavy and light industries, (ii) preferential interest rate policies that provide discriminatory access to cheap credit, and (iii) transitioning from import substitution to export promotion under a dollar peg regime.

The study identifies the primary sources of unintended consequences of the HCI promotion. First, large business conglomerates, known as *chaebols*, experienced a rapid surge in market power, creating a subordinate corporate environment between big business groups in the targeted sectors and small and medium sized firms in the

non-targeted sectors in Korea. Second, the economy became vulnerable to external price shocks, possibly leading to recession and the increase in the excess capacity. The rise in the profit share of the firms in the heavy industry ($\pi^H \uparrow$) reduces the capacity utilization rate in both sectors, but each rate follows a cyclical pattern. Therefore, the model explains that the success of an industrial push hinges on the government's initiative to ensure that beneficial effects outweigh unfavorable ones. In the case of Korea, export promotion policy played a key role in boosting economic growth. Thus, for successful implementation of industrial policy with minimized harmful effects, the government not only should be able to promote firms' export performances not also curb unbridled monopoly power of big business groups or firms in the targeted sector.

In conclusion, this chapter highlights the impact of selective industrial policy on sectoral dynamics of capacity utilization and its macroeconomic consequences. Careful consideration of the unintended consequences is necessary to achieve successful implementation of the strategic industrial policy. The paper contributes to the existing literature by providing insights into the impact of selective industrial policy on the sectoral economy and the cyclical nature of the sectoral capacity utilization rate. Further research can focus on identifying optimal industrial policies for developing or advanced economies, taking into account the challenges associated with sectoral coordination and addressing the potential for reinforcing oligopolistic or monopolistic power of selected firms.

3 Big Business Promotion and Income Inequality Dynamics: A Case Study of Korea

3.1 Introduction

While the positive association between industrial policy and economic takeoff/growth has been well-documented (e.g., Rosenstein-Rodan, 1943; Nurkse, 1953; Myrdal, 1957; Hirschman, 1958; Gerschenkron, 1962; Baran, 1968; Westphal, 1990), the literature on its distributional impact is surprisingly rare and has been less emphasized.[23] In the literature, industrial policy is often praised for enabling postwar economies to escape from long-ridden poverty to economic prosperity. However, selective industrial policy by nature may be accompanied with serious income inequality in the sense that the government's support – in particular credit supply – is concentrated on a particular income group or social class. Over the past decades, it has been known that rising inequality not only impedes sustainable growth (Galor and Zeira, 1993; Galor et al., 2009) but triggers economic crises (Kumhof et al., 2015; Stockhammer, 2013). This chapter revisits the timely issue on the evaluation of industrial policy in terms of income inequality. One of main goals of this chapter is to explore the mechanisms and dynamics of income inequality inherent in the industrial policy whose important features lie in the *selectivity* of particular firms or target industries with full-fledged supports[24] including favourable access to credit markets.

This chapter takes a notably distinct approach from the previous chapter, which employed the Kalecki-Steindl distributional framework. In the present study, a stock-flow consistent agent-based model (SFC-ABM) serves as the primary analytical

[23] Hirschman (1958) highlights the role of external economies in industrial promotion and its spillover effects through backward linkages. Gerschenkron (1962) explores the effect of a latecomer's catch-up strategy on industrialization and economic growth. As for Korea, Westphal (1990); Hong (1998) stress that state's selective intervention significantly contributed to the economic growth without hurting the systematic efficiency. More recently, Lane (2018) illustrated the HCI promotion as 'manufacturing revolution' with the presence of mixed effect (both forward and backward linkages) of industrial policy on the growth of manufacturing sectors.

[24] This is often referred to as *big push*, a simultaneous and coordinated implementation of numerous investment projects across sectors. Murphy et al. (1989) documented on how the government can push the economy to a 'better' equilibrium with the emergence of both upstream and downstream firms.

framework. The model effectively incorporates the financial sector, identifying the clear flow of funds and accounting for macroeconomic outcomes, such as the form of personal or corporate savings, where investment finance originates, and how budget deficits are financed. The agent-based approach enriches stock-flow consistency by incorporating micro-behaviors between and within sectors. In other words, the SFC-ABM captures complex interactions among heterogeneous agents, rather than imposing strict rules of rationality on each representative agent. For example, unemployed workers will demand lower wages than currently employed workers, which will vary depending on the unemployment rate in the previous period. Therefore, the pattern of their behaviour may differ by each individual, and the micro-behaviors ultimately generate aggregate outcomes, including economic growth and income distribution. I simulate the economy to derive the specific distributional feature of the HCI promotion period.

One of the novel features of this chapter is to explore the complexity involved in the generation of income inequality; how complex interactions within and between each sector or market – credit market in the financial/banking sector, labour market and goods market in the production/manufacturing sector under the particular industrial policy regime – generate unique dynamics of income inequality. This chapter constructs the model based on the following mechanism of income inequality generation. First, the unequal access to the preferential credit or interest rates rapidly generates a skewed firm size distribution with concentrated market power of firms in the specific sector. Second, the shift in the bargaining power between entrepreneurial or managerial group and workers further influences the shape of the income distribution (Kaldor, 1955)[25] as well as income inequality. Kim (1990) addresses that capital-intensive projects result in a wider wage differential between high-skilled and low-skilled workers. Furthermore, higher prices through higher markups redistribute income in a regressive way as poor households spend higher portion of their income on consumption than rich households

[25]Under Kaldor's framework, the variation in the relationship between prices and costs matters in the functional distribution. The entrepreneurial income is determined by the markups, combined effect of prices and costs. Under the full employment condition, changes in investment will affect income by investment multiplier effect with an assumption of trivial crowding-out. The consequent price change in the goods market would be much faster than that of wage even in the long run in which there is no fixed capital with full employment condition.

do.

This study finds that preferential interest rates for the capital-intensive HCI sector have a significant impact on income inequality. Most notably, the model shows that the industrial policy regime tends to generate more inflationary pressure than the baseline model (without industrial policy). This finding is to some extent consistent with Tcherneva (2012) who argues that large credit injection to investment-good sector can put an inflationary pressure on consumption-good sector, undermining the welfare of wage workers. In the previous chapter of this thesis, I argue that the industrial policy regime is vulnerable to external price shock. This chapter complements this finding by showing that the regime has its own source of inflationary force. Additionally, the work of Shin and Chang (2003) and Chang and Park (2004) is relevant, as they argue that *chaebols* are inefficient firms suffering from the lowest profitability level in the world. Chang and Park (2004) note that *chaebols* only survive due to governmental favoritism with unconditional financial support and insider financing. In this study, it is argued that under the HCI promotion regime, *chaebols* are inclined to pursue not only profit-seeking behaviors but also rent-seeking behaviors through higher markups to meet political requests from the authoritarian government. The income inequality spike is inherent in the big business promotion regime.

As a result, HCI promotion not only lowers the profitability of large firms but also generates more skewed income distribution in both functional (declining wage share) and personal ways (Gini index spike), despite the remarkable growth performance of the national economy. Second, Korea's HCI push during industrialization represents massive deficit spending on industrial infrastructure, mainly benefiting major large enterprises (which turn out to be *chaebols*) instead of small or medium-sized firms. Again, this is because investment-led spending tends to be more inflationary, pressing markup prices of beneficiary firms (*chaebols*) upward further. In summary, preferential interest rates lead to massive capital investment within big business groups, a major driving force of firm dynamics and income distribution.

This chapter represents the first attempt to evaluate the distributional impact of industrial policy or big business promotion using an SFC-AB macroeconomic framework

with a special interest on the relationship between preferential interest rates and income inequality. Using the agent-based modeling (ABM) framework. This study evaluates the effect of Korea's HCI drive on effective demand from a distributional perspective by running several policy experiment simulations, enriching the discussion on the industrial policy presented in the previous chapter. The simulations demonstrate how financial market discrimination can generate a highly skewed firm size distribution, leading to a widening growth gap between selected firms (i.e., *chaebols*) and non-selected firms and ultimately exacerbating income inequality.

The rest of the paper is structured as follows. Section 4.2 presents a theoretical argument on income distribution dynamics associated with markup pricing, investment and wage suppression. This section mainly reviews not only traditional ideas but also recent development of distributional consequence of preferential interest rates regimes and markup price. Section 3.3 contextualizes the rise of big businesses under the HCI promotion policy and its association with the increase in the income inequality. Section 3.4 briefly introduces the principle of the SFC-ABM and presents the model. Section 3.5 implements simulations not only with the baseline model but also with various policy experiments on key variables with a sensitivity analysis. Section 4.8 concludes the study and discusses plausible policy implications and future studies.

3.2 Related Literature

In the following, I will discuss the transition mechanism and the role of credit market regime and investment in the dynamics of income distribution discussed in the literature.[26]

[26]Discussing a country's economic growth and distribution, one cannot overlook the relevant institutional context. Indeed Korean industrialization was carried out under a highly repressed financial regime that allowed an enormous flow of credit into emerging large corporations. Therefore, how the financial and real sectors are connected in macroeconomy and what is the underlying mechanism that transmit the impact arising in the financial sector into the real sector is a crucial part of this study. Hicks (1974) breaks down the financial systems into two sectors: *overdraft sector* and *auto-sector*. In the overdraft sector, money is said to be endogenous, suggesting that commercial banks are indebted towards the central bank whereas in the counterpart sector, money supply is exogenously determined by the central bank. The former would pertain to the continental Europe and Asia, and the latter more to today's Anglo-Saxon world (Lavoie, 2014). The dichotomy helps us understand the financial regime of Korea, in particular the firm-bank link via credit rationing during the HCI promotion period.

Earlier literature to understand the effect of industrial policy concentrates on the financial regimes (i.e., repressed financial regime vs. liberalized financial regime) or the interest rate policy regime, which is deemed an essential part of selective industrial policy (e.g., McKinnon, 1973; Cho, 1984; Piketty, 1997; Ghosh et al., 2000). One of conventional views (e.g., McKinnon, 1973) states that a financially repressed regime that often puts a ceiling on interest rate tends to increase income inequality.[27] McKinnon (1973) and Shaw (1973) holds that repressed interest rates with industrial drive deter allocative efficiency of credit whereas higher interests induce higher savings and improve both the efficiency of credit allocation and income distribution without causing higher inflation. In particular, they see a dual economy between modern and traditional industries as a necessary outcome of financial repression, and preferential credit (credit rationing) induces less optimal investment and income inequality. Krugman (1978) agrees with their notion without acknowledging the idea of economic dualism.

In the Korean context, Cho (1984) states that income inequality will be more rampant in the economy where the borrowing firms are predominantly family-owned companies because a large portion of economic rent tends to accrue to large firms. In the same vein, Galor and Zeira (1993) and Aghion and Bolton (1997) build the model of credit market imperfection by which only rich agents can borrow for human capital investment and thus income inequality persists. These studies show how discriminatory credit allocation can generate higher income inequality.

In contrast, Greenwood and Jovanovic (1990) show that financial development process can lead to even worse inequality than financial repression. Ang (2010) argues that although financial development may reduce income inequality with broader credit market access, the removal of interest rate ceiling (financial liberalization) may worsen inequality. Akyüz (1995) argues that the effect of interest rates on the savings of household sector may not be consistent, suggesting that changes in the financial regime or policy may result in a perverse relationship between income distribution and interest rates. Unorthodox school's disagreement is even more pronounced. Notably, Dutt

[27] See Fry (1995) for comprehensive surveys of the literature on this issue.

(1990) presents a post-Keynesian critique on higher interest rate regime, cautioning that the higher rates may reduce the level of effective demand with adverse effects on the income distribution and economic growth. In fact, income inequality in Korea did not deteriorate during the early stage of financial repression and labour-intensive export-led industrialization (1960s).

Furthermore, Dutt (1990) argues that the neoclassical argument is valid only when the economy fully utilizes its capital capacity, and thus their model fails to represent less developed countries. Lavoie (1995) presents more heuristic and comprehensive analysis on the interest rate issue with surprises: real interest rates are an exogenous distributive variable and higher rates could either encourage or discourage growth in the Minsky-Steindl model. More recently, the literature on the rising income inequality in relation to firms' growth addresses the concentration of mega-firms' ownership (Kim, 1990), the impact of market power of large firms on wages (Mueller et al., 2017; Song et al., 2018; Autor et al., 2020) and markups (De Loecker et al., 2020), the widening productivity-wage gap (Stansbury and Summers, 2017), and the role of rents or rent-seeking behaviours among large firms (Furman and Orszag, 2018). Most recently, İşcan and Lim (2022) quantify the distributional impact of structural transformation along with age structure, labour market structure and farmland distribution. Given the ongoing debate on the issue, this study seeks to shed further light on the topic by examining the impact of preferential interest rate regimes on income inequality in the context of big business promotion or industrial policy.

In this study, I add the following features to the existing literature, particularly on how big business promotion affects income inequality and aggregate economy: (i) firm size as a main determinant of access to preferential interest rates and the resulting firm-bank network; (ii) investment and its distributional implication; (iii) credit market interactions under HCI promotion.

Firms' Size and Investment Steindl (1945) challenged the notion of Marshallian representative firms that unpropertied worker can "easily" accumulate capital stock to build up a small enterprises and even further to a big business thanks to their ability to find "easy" capital. Moreover, Kalecki (1971b) saw the clear

distinction coming from the burden of financial constraints with which both groups are facing up. Large enterprises have an easy access to credit while SMEs find it more difficult to build up capital stock in a less developed country (LDC). So Kalecki (1971b) and Steindl (1945) together postulate two notions regarding the corporate differences. First, the ability of firms to make use of finance for their operations is simply a function of their sizes. Second, the impact of financial development on an economy depends not only on the dynamics of institutional change but also the composition of the corporate sector (Penrose, 2015).

Based on two major criticism of neoclassical approach, I extend the baseline Keynesian framework rooted in the early view of Keynesian theory that investment is a primary determinant of income distribution. As an extension, I augment the following three components to the model: 1) firm heterogeneity in size and market power; 2) different credit access 3) firm-bank interactions/networks.

With regard to the real sector side, this study adopts two major ideas suggested by Kalecki (1971b) and Steindl (1945). They argue that the varying amount of available credit for firm's investment projects tends to depend on its size or market power. Furthermore, Penrose (2015) points out that the size differences among firms reflect the heterogeneity in financing, ability to convert short-term liabilities into long-term liabilities and liquidity management strategies. Their ideas suggest that the financial structure of firms and the nature of the investments they conduct will vary according to the financial institutions available to them. Then the fate of industrial development in the countries with financial backwardness depends on how to finance the operations of firms including both large enterprises and small enterprises. Thus, the government policy on central banking as well as regulations on commercial banking sector is a key determinant of economic development (Cho, 1989; Fry, 1995; Hong, 1998). The size heterogeneity of firms plays even more a critical role in determining the level of investment in those countries, thereby affecting the income distribution through the industry-banking nexus or the financial and real sector link. Thus, this study also attempts to investigate how the profitability factors such as markup rate, loan interest rate, and wage rate - this would eventually determine the entrepreneurial investment

spending - affect income inequality. In addition, this model will also evaluate the Kaleckian statement that the degree of monopoly is a primary determinant of income distribution even under the strong government intervention in the financial market, namely financial repression or credit rationing.

To test the hypotheses, behavioural equations include r, μ, w (interest rate, markup rate, and wage rate respectively), which affect the investment level significantly in the sense that they also work as a key variable of the profit function. Each variable affects the investment through different channels. In this model, the major role of loan interest rate, for example, not only determines profit but also connect firms and banks in the credit market, governing the interactions and forming a peculiar credit network. So the change in the interest rate policy would shape the credit network as well as the level of investment, thus income distribution. Similarly, markup μ and wage rate w not only work in the pricing mechanism but also govern the interactions in labour market and goods market. So in this sense income inequality would rather be seen as an *emergent* event occurring from numerous interactions in a complex economy. An additional task would be to impose what kind of rule of interactions on each market through the careful calibration of policy and behavioural parameters in corresponding policy function and behavioural equations.

Investment and Distributional Implication In Keynesian economy, unequal income distribution between capital share and labour share is inevitable under the assumption of diminishing returns and fixed stock of production capacity. In their early works on the association between corporate sector and income distribution, Kaldor (1955) and Pasinetti (1962) advanced the Keynesian notion to emphasize the role of entrepreneur's investment decision in the distribution of national income. Three distinctive features of the income distribution can be found in their legacy: first, profits are mainly determined by the level of investment (Kregel, 1978; Asimakopulos, 2012); second, as a huge separation from neoclassical assumption, they assume that, at least over a wide range, investment leads to saving not the other way around. So saving adapts to investment; thirdly, probably as the most crucial assumption, capitalists' saving propensity is greater than that of labour workers. In sum, investment is one of

the most crucial factors in the determination of income distribution. Consequently, markups (equivalently profitability) and loan interest rates play a critical role in the determination of investment level and thus functional income distribution.

Credit Market Interactions under HCI Promotion The firm-bank link or relationship occurs when banks agree to grant a loan to firms who need to finance their operations including production and investment. The model tries to capture two major features of repressed financial regimes. First, the government's *chaebol*-friendly policy without a relevant monitoring system may lead to an investment frenzy among megacorps, thereby boosting growth with inflation but worsening the income distribution between firms/capitalists and workers. This is real sector effect. Second, the presence of credit network may lead to the wave of firms' bankruptcies in case when the favoured firms encounter any unexpected credit crunch or the failure of rollover on their short-term debt. Riccetti et al. (2013) and Delli Gatti et al. (2010) devise "network-based" accelerator, a transmission mechanism from the real sector to financial sector: as a series of firms become insolvent on their debts, causing bad debt problem to commercial banks. The presence of the firm-bank link explains the macroeconomic fluctuations that may lead to financial instability of the national economy. The interactions between firms and banks not only affect income distribution but also lead to financial instability, which again turns into non-financial sector fragility due to the fact that banks will increase the interest rate to all the borrowers. This means a vicious cycle is generated by this firm-bank interactions (Bargigli et al., 2016). The main point of my study is whether the government's big financial push for big corporations reinforces the negative effect on the income inequality and financial instability.

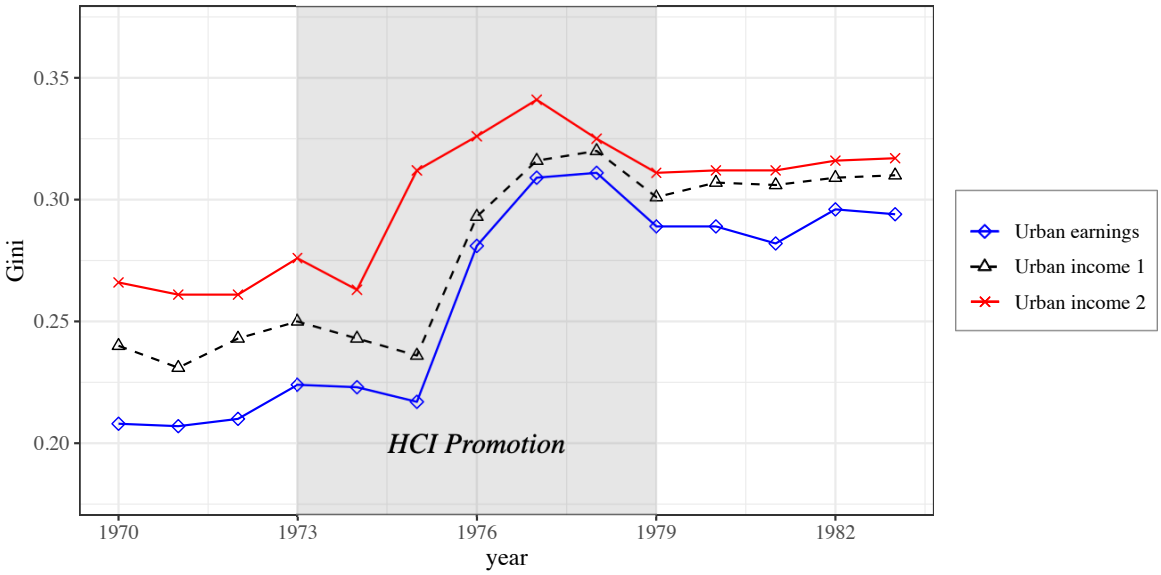
Bernanke and Gertler (1989) and Bernanke et al. (1999) proposed the financial accelerator as a feedback mechanism that shows how aggregate or idiosyncratic shocks on firms' output could enlarge business fluctuations through feedback of banking sector; negative aggregate shocks on firms' output could encourage banks to charge higher loan rates, which will reduce firm's investment and thus output. The financial accelerator usually shows a critical defect in a capitalist financial system in which real shocks in the industry could enlarge business fluctuations and dampen the corporate

production activities. My model uses a network-based financial accelerator proposed by Delli Gatti et al. (2010), which fits to agent-based simulations that generate interactions among heterogeneous firms and banks while the earlier models of the financial accelerator are based on the representative agent assumption (Delli Gatti et al., 2010).

3.3 Background

The need for big business promotion had already been discussed among policymakers in the early 1960s due to economic challenges that the Korean War (1950-1953) caused. One of them was hyperinflation as a result of immense war spending. Many policymakers expected that fast industrialization would resolve the concern, hoping that the increased supply would lower inflation. The role of *chaebols* were often emphasized in the sense that the war-torn economy required an extremely powerful economic engine to stimulate economic growth as well as to stabilize the price level.[28]

[28]However, Khatkhate and Villanueva (1978) argue that selective credit controls may generate inflation due to the differential rediscount rate mechanism; money supply increases because the favoured sector draw away real resources from non-favoured sectors, raising the price level. Later Lane (2018) finds that Korea's industrial interventions caused the output prices of targeted sector 11 percent lower than non-targeted manufacturing products as well as a rise in labour productivity in the targeted sector.



Data sources: Urban income, Earnings: Kwack(2007), Urban income: Yoon(1997)
Note: Urban earning was measured based on labour income of workers from urban households whereas urban income includes both labour income and capital income. Urban income 1 does not include the income of the self–employeed.

Figure 3.1: Gini Index Trends

The *Heavy and Chemical Industry (HCI) Promotion* (1973-1979), one of the most iconic industrial drives in history of South Korea (henceforth Korea), was accompanied by a notable surge in income inequality as evidenced by data and scholarly research (e.g., Koo, 1984; Choo, 1992; Kim, 1990; Auty, 1992; Ahn, 1992, 1997; Whang and Lee, 2013). As depicted in Figure 3.1, there was a sharp increase in urban income during the HCI promotion period, contributing to a rise in income inequality. All the studies on this regard over the 1970s highlighted a substantial surge in income inequality, particularly during the years 1970-1976 (see Table 3.1). With the exception of Choo (1992), the statistics indicated that this inequality persisted until 1982. Fields and Yoo (2000) also argued that this upward trend continued until 1979 when the regime ended. This chapter proposes underlying mechanisms of the apparent increase in income inequality resulting from the state's industrial policy, focusing on firm dynamics through interactions between and within goods market, labour market, and credit market under a preferential credit policy regime.

The impact of the Korean HCI Promotion on income inequality has yet to be definitively established due to variations in the measures of income inequality and the limited availability of data. Nevertheless, the estimates presented in both

Table 3.1: Estimates of Gini Coefficients (1965-1986)

Year	*Choo* (1992)	*Kim and Ahn* (1987)	*Ahn and Kang* (1990)	*Ahn* (1997)
1965	0.344	0.365	n.a	0.337
1970	0.332	0.346	0.314	0.313
1976	0.391	0.408	0.391	0.346
1982	0.357	0.406	0.385	0.377
1985	0.345	0.411	n.a.	0.380
1986	0.337	n.a.	0.393	0.377

Sources: Whang and Lee (2013)

Figure 3.1 and Table 3.1 suggest a consistent pattern of income inequality trends during the period of interest. Specifically, all the available estimates indicate a substantial increase in income inequality during the early stage of the HCI promotion, followed by some degree of worsening of income inequality over the promotion period. Notably, Ahn (1997) estimated that overall income inequality increased by more than 17 percent immediately before the HCI initiative was launched. These findings highlight the importance of examining the distributional effects of industrial initiatives on income inequality, particularly given the potential for such initiatives to exacerbate existing inequalities. Further research is needed to better understand the mechanisms underlying the observed trends and to develop effective policy interventions to promote greater equity in income distribution.

This chapter presents three major channels of the inequality hike: (i) the upsurge in the investment among large firms in the target industry induced by preferential interest rates and debt guarantee program (Amsden, 1992; Cho, 1989, 2002); (ii) the expansion of large business groups called *chaebols*[29] and the dominance of their market power in wage bargaining; (iii) the wage differential between previously employed and unemployed workers through a search and matching mechanism in the labour market.

[29]The Korean *chaebol* is often compared with the Japanese *zaibatsu* or *keiretsu*. Unlike the *chaebol*, the *keiretsu* is usually structured with an affiliated bank, giving the associated companies almost unlimited access to credit. *Chaebols* are more precisely identified as highly diversified private business groups, owned and run by family members. Most importantly, they have been politically promoted and financially supported by the government through discretionary credit allocation.

3.4 The Model

3.4.1 Constructing a SFC-ABM Framework

Kirman (1992) points out that it is paradoxical that a large body of standard macroeconomic models fail to include activities that needs such coordination by assuming that all different individuals' choices can be considered as the outcomes of one representative agent's optimization and coincide with the aggregate decisions of heterogeneous individuals.

These two major modeling issues suggest that the capability of representative agent model depends on highly stringent conditions such as quasi-homotheticity, and in fact the model is valid only under linear expansion income and wealth path. In order to not only reflect the heterogeneity within households but also effectively capture interactions among agents. This chapter uses the SFC-ABM as a response to the limitation of the representative agent frameworks. The following section briefly addresses the rationale behind the SFC-ABM: first, brief review of the agent-based features and then move on to the stock-flow consistency.

Why is the SFCM useful in this study? Another important feature of my modeling is the stock-flow consistent approach (hereafter SFCM), which was inspired by Kalecki, Minsky and Tobin (1969) and developed by Godley (1996); Godley and Lavoie (2016). It has gained much more attention since the Great Recession in 2008.[30] The SFCMs in Godley and Lavoie (2016) are accounting or flow-of-funds models in the sense that they represent households', firms', and government's balance sheets and their interactions, and that accounting identities play a major role in the model structure and outcomes (Lavoie and Zezza, 2011). As its name suggests, the SFCM helps to anticipate the credit crisis and economic recession which most mainstream general equilibrium models fail to predict. In addition, as Godley (1996) indicate, the main source of misleading results from conventional macroeconomic models is that they have failed to show a consistency between investment flows and their corresponding capital stock changes, credit flows and their corresponding debt stock changes, etc.

[30]For a brief version of historical review and related articles on stock-flow consistent macroeconomics, see https://academic.oup.com/cje/pages/sfc_macro_economics.

Therefore, the SFCM was designed to take full account of stock changes and effectively trace those transactions by adopting accounting identities. So the major purpose of SFCM is to show how the whole macroeconomic system fits together and illuminate banking sector as a realistic and key economic player in the system (Godley, 1996).

SFC-ABMs: the combination of the ABM and the SFCM One motivation to integrate the SFCM with the agent based approach is that some drawbacks are inherent in traditional SFC models. Caiani et al. (2016) and Kinsella et al. (2011) point out that it is difficult for SFC models to track the flows within the sector which allows to analyze the emergence of agents' heterogeneity within and across sectors. Thus, complex credit networks can only be effectively represented with the help of ABM. In sum, the SFC-ABMs can allow us to depict the distributional dynamics even with a proper aspect of business cycle dynamics and financial fragility.

Recently, several studies have proposed more comprehensive SFC-ABMs which attempt useful innovations. Caiani et al. (2016) present a benchmark model that considers the complex adaptive nature of market interactions and money endogeneity. In sum, their model emphasizes the importance of linkage between real and financial sector in the macroeconomic modeling to validate the strong candidacy of the policy analysis applications of AB-SFC approach with some of satisfactory outcomes and detailed description of calibration of key behavioural parameters in the model. However, the model still lacks a reality in a couple of places such as firm's investment decision, wage contract and markup determination. Especially, the current existing models have a difficulty in representing developing countries due to their prevalent financial backwardness. This chapter hence distinguishes itself from other studies by adding unique institutional features to the model to show the distortion in the investment and lending decisions from credit markets.

In sum, the SFC-ABM has three primary merits: (i) the agent-based model (ABM) enriches the heterogeneity of agents and their interactions, thus well establishing a microfoundation of the complex macroeconomic model. This ABM framework will be more suitable tool to address both personal and functional distribution of national income; (ii) SFC approach provides a rigorous accounting framework to guarantee the

consistency between the stock and flow variables and treat the real and the financial sides of the economy in an integrated way (i.e., $\Delta stock_t = flow_t + capital\ gain_t$).[31] This approach is advantageous from a distributional perspective because it allows for a clear connection between changes in a flow variable such as household income and changes in stock variables such as net worth or net savings. Simply put, wealth inequality is closely connected to individual income change that may hinges on key variables or parameter values such as interest rates and markups rates. (iii) my model facilitates the macroeconomic quasi-experiments through Monte Carlo simulation so that the results may enrich the narratives on the industrial dynamics.

3.4.2 Environment of Baseline Model

The economy is run through four primary markets: the goods market, the labour markets, the credit markets and the deposit markets and evolves over a finite time span $t = 1, 2, ..., T$. The economy is populated by N workers, indexed by $n = 1, 2, ..., N$, F firms, indexed by $f = 1, 2, ..., F$, and B commercial banks, indexed by $b = 1, 2, ..., B$. Households are assumed to be composed of workers only. The workers' income source is either wage earnings from firms or unemployment benefits from the government. Their net worth evolves as they save. Workers' wage earnings follow behavioural equation for job seeking and match. The consumption is based on their disposable income and net worth or cash transferred from the previous period. Workers are uniformly distributed among firms. Simply, firms are capitalists. All the credits for F firms are assumed to be supplied by banks based on their asset sizes under the preferential interest rate policy regime.

The model captures major features in the history of Korea's big business promotion: i) heterogeneity between and within the HCI (investment good production industry) and light industry (consumption good production industry), differentiated investment and markup decisions of *chaebols*; ii) peculiar firm-bank networks or interactions under different selection mechanisms within the repressed financial regime; iii) the role of firm's size in credit allocation and income distribution. The model

[31] More formal presentation for SFC principle can be found in Nikiforos and Zezza (2017).

addresses two components of firm heterogeneity in Korea's modern industrialization. This view is consistent with (Kalecki, 1942, 1971b; Steindl, 1945; Penrose, 2015) who posit that the firm's size determines the financing method as well as markups, reinforcing the heterogeneity in both between firms and between individual households.

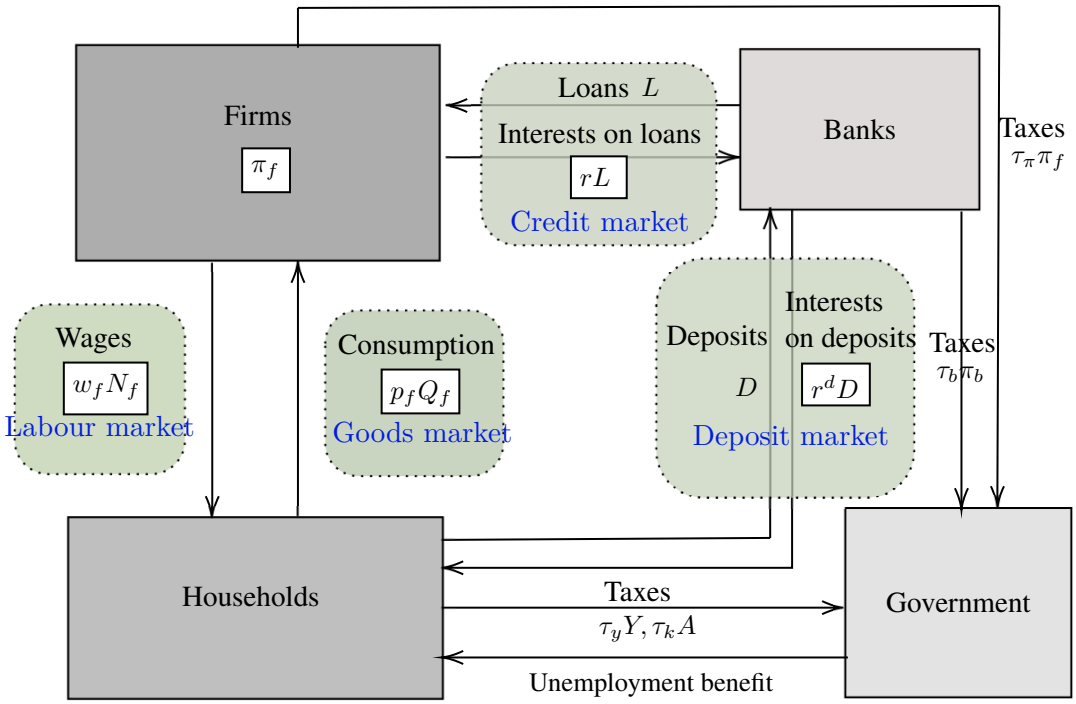


Figure 3.2: Flow Diagram of the Model: Corresponding Market Interactions and Transactions

Figure 3.2 is a diagram of the market interactions occurring in each market. Firms' decisions are not necessarily governed by profit maximization but rather heavily depend on institutional factors such as the oligopolistic market structure that encourages markup pricing. Banks' decisions are also mainly determined by the government preferential credit policy or credit rationing. The government determines the level of spending from the private sector, injecting so-called high-powered money into the economy and thus generating household income for its consumption. Income and wealth distribution in the corporate sector is driven by markup dynamics. Markup is usually to be determined endogenously by firm-specific bargaining power of workers, but in this model it is assumed to follow a random walk process with a lower bound for simplicity. Complex interactions occur between agents from each sector in each different market depending on the kinds of their transactions.

3.4.3 The Baseline Model (without Credit Market Intervention)

3.4.3.1 Firm Behaviour Production: In the production sector, firms are assumed to adopt the Leontief technology indicating there is no substitutability or perfect complementarity between labour and capital inputs. That is,

$$Q_{f,t} = \min \left[\frac{N_{f,t}}{a_N}, \frac{K_{f,t}}{a_K} \right] \tag{3.1}$$

where $N_{f,t}$ is the total number of workers employed, and $K_{f,t}$ is the total unit of capital used. a_N and a_K are the quantity of labour required to produce one unit of output and the quantity of capital required to produce one unit of output, respectively. The coefficients are also understood as the inverse of each type of productivity, workers per unit of output and capital input per unit of output, respectively. They are exogenous and fixed, implying productivity of labour and capital is uniform across firms. Finally, a_K is set to one so that $1/a_N$ is the relative labour productivity to capital. This production technology deviates from the function used in the previous chapter by omitting the capacity utilization. The production function with capacity utilization takes into account the actual level of production that a firm can achieve whereas the production function without capacity utilization does not consider the actual level of production that a firm can achieve with its available inputs. However, the production function without capacity utilization can still provide valuable insights into the potential output levels, which is useful for long-term planning and investment decisions, where firms may be considering expanding their production capacity to meet future demand under different policy choices.

Assuming the (1970s' Korean) labour market where workers are abundant and the typical existence of excess capacity, the production function can be further simplified as the function of capital input as follows:

$$Q_{f,t} = \frac{K_{f,t}}{a_K} \tag{3.2}$$

Labour Demand Required labour demand for production at the efficient

production level is

$$N_{f,t} = a_N Q_{f,t} = \frac{a_N}{a_K} K_{f,t} \tag{3.3}$$

where $\frac{a_N}{a_K}$ is the reciprocal of the capital-labour ratio.

Markup Pricing and its Dynamics Following Kalecki (1971b), the markup prices are set upon nominal unit labour costs. This setting shows that labour costs are typically given more weight in the Kaleckian markup pricing theory. The price $p_{f,t}$ is determined as

$$p_{f,t} = (1 + \mu_{f,t}) \frac{\bar{w}_t N_{f,t}}{Q_{f,t}} = (1 + \mu_{f,t}) \bar{w}_t a_N \tag{3.4}$$

where $\mu_{f,t}$ is the markup ratio for each firm, and $N_{f,t}$ is the number of workers employed. $\bar{w}_t$ is average nominal wage across workers hired by firm f. So $\frac{\bar{w}_t N_{f,t}}{Q_{f,t}}$ represents unit labour cost, equivalent to $\bar{w}_t a_N$.

The markup rate in the baseline model is assumed to evolve according to a random walk for the ease of modeling. The markups that follow a random walk allows for a wide range of possible future values for the markup rate, which can be useful when analyzing various different scenarios. Imposing a lower bound prevents the markups from being negative.

$$\mu_{f,t} = \mu_{f,t-1}(1 + \varepsilon_t) \tag{3.5}$$

where ε_t from $U(-0.05, 0.05)$

Equation (3.3) and Equation (4.4) imply the following relationship between wage share and markup rate. That is, the labour share of nominal output is merely a function of markup rate μ:

$$\omega_{f,t} = \frac{w_{f,t} N_{f,t}}{p_{f,t} Q_{f,t}} = \frac{\bar{w}_{f,t} a_N Q_{f,t}}{(1 + \mu_{f,t}) \bar{w}_{f,t} a_N Q_{f,t}} = \frac{1}{1 + \mu_{f,t}} \tag{3.6}$$

In turn, the profit share is

$$\pi_{f,t} = 1 - \omega_{f,t} = \frac{\mu_{f,t}}{1 + \mu_{f,t}} \tag{3.7}$$

This association between profit or labour share is a crucial feature of the Kaleckian framework in which income distribution between factors hinges on the firm's markup pricing decision. In specific, the profit share is a monotone increasing function of markup rate as shown in Figure 3.3.

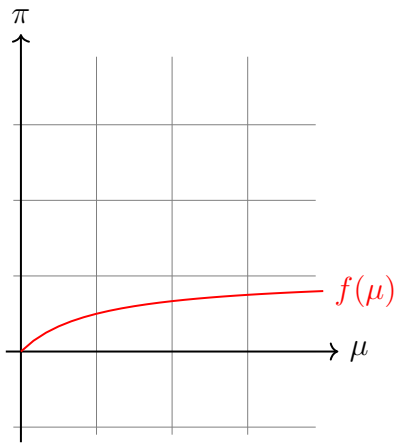


Figure 3.3: A Monotone Increasing Profit Share Function

The gross labour share of total income is

$$\Omega_t = \frac{\sum_f w_{f,t} N_{f,t}}{\sum_f p_{ft} Q_{ft}} = \frac{1}{1+\mu_t} \tag{3.8}$$

, where μ_t denotes the average markup rate, and the gross profit share is

$$\Pi_t = 1 - \Omega_t = \frac{\mu_t}{1+\mu_t}. \tag{3.9}$$

The rate of profit is given as

$$R_{f,t} = \frac{\pi_{f,t} Q_{f,t}}{K_{f,t}} \tag{3.10}$$

Firms' Net Profits and Wealth Evolution:

$$NetProfit_{f,t} = p_{ft} Q_{f,t}(1-\tau_\pi) - w_{f,t} N_{f,t} - r_t L_{f,t} \tag{3.11}$$

where τ_π is corporate income tax. The net worth of each firm in each sector evolves as follows:

$$A_{f,t+1} = A_{f,t} + NetProfit_{f,t} \tag{3.12}$$

Firms' Finance Considering the immense start-up cost for the HCI, the government chooses the firms with large capital asset. Firms that cannot obtain access to both general credit and preferential credit will have to rely on curb lenders with higher cost of borrowing. Firms also need to amortize the payment for the purchase of intermediate goods. Firm's level of debt or demand for credit is determined by the following procedure. The amount of bank loan $L_{f,t}$ depends on its net worth A_t and leverage target Lev_t defined implicitly as:

$$L_{f,t} = A_{f,t} \cdot Lev_{f,t} \tag{3.13}$$

Following Riccetti et al. (2015), I assume that the leverage target follows a stochastic process under the preferential interest rate policy regime, which is designed to supply sufficient funds to the huge investment projects of favoured large business groups. The state's credit market intervention is due to the backwardness of financial market which may lead to credit supply instability and credit crunch. This stochastic process can successfully reflect many features of Korea's credit condition. For example, large firms in HCI sector tend to raise the leverage target since applicable nominal interest rates to their loans are preferential. So even though their profitability is lower than that of non-HCI firms, they will probably raise the leverage target.[32]

$$Lev_{f,t} = \begin{cases} Lev_{f,t-1} \cdot (1 + \phi \cdot U(0,1)), & \text{if } \frac{NetProfit_{f,t-1}}{A_{f,t-1}+L_{f,t-1}} \geq r_{bf,t-1} \\ Lev_{f,t-1} \cdot (1 - \phi \cdot U(0,1)), & \text{otherwise} \end{cases} \tag{3.14}$$

where $Lev_{f,t}$, firm's leverage rate, is defined as $L_{f,t}/A_{f,t}$. ϕ is an adjustment parameter

[32] It is evident that the Modigliani-Miller theorem (Modigliani and Miller, 1958, 1963) does not hold for the firms under HCI regime. Instead, their financing methods may well fit to the pecking order theory (Donaldson, 1961; Myers and Majluf, 1984) or the dynamic trade-off model (Strebulaev, 2007). According to the dynamic trade-off framework, firms' leverage tends to exhibit mean reversion as firms keep updating their target leverage. The pecking order theory suggests that given insufficient internal funds, the firms tend to prefer debt financing to equity financing since the increasing cost of financing due to information asymmetry can be significantly reduced by the government's debt guarantee under financial repression regime. A series of empirical financial literature including Titman and Wessels (1988); Rajan and Zingales (1995) suggests that there is a positive association between firm size and debt-equity ratio; large firms can reduce default risk by business diversification, which features prominently in *chaebols*' operation.

that sets the leverage target, and $U(0,1)$ is a random number drawn from a uniform distribution in the interval between 0 and 1. So the leverage could either increase or decrease depending on profitability or return on asset compared to borrowing cost in the previous period.[33]

Investment and Capital Accumulation

$$I_{f,t} = \gamma \cdot NetProfit_{f,t-1} \tag{3.15}$$

where γ denotes proportion of profit that is used in the purchase of the capital goods. In this model, $\gamma > 0$, sometimes indicating over-investment, heavy dependence on debt financing or high debt-equity ratio.

The firms' investment decision (I) is determined by a fraction of reinvested profit (γ) multiplied by the previous period's net profit. If a firm's profit is negative, the firm does not invest but reduces its capital. The firms' capital accumulation is determined by the previous period's capital (K) and the current period's investment (I) reduced by the depreciation rate ($0 < \delta < 1$). Thus, the capital stock accumulation occurs according to the following law of motion:

$$K_{f,t} = (1 - \delta)K_{f,t-1} + I_{f,t} \tag{3.16}$$

3.4.3.2 Workers' Behaviour

- **Wage determination**: Labour market interaction occurs through a simple labour matching and turnover process. Accordingly, unemployment rates change in accordance with the interactions. Here firms hire workers with lowest wage offer (reservation wage) in a subset of unemployed workers and workers with higher offer are likely to be unemployed. Consequently, lower aggregate demand will slow the economy accompanied by a higher unemployment rate.
- **Labour turnover**: We assume that every period a certain percentage of

[33]Note that following Bargigli et al. (2016), I consider firms whose debt is negative to be self-financed (i.e., $L = K - A < 0 \rightarrow K = A$). In the next stage of computation, I update net worth in the current period by adding the new level of net profit in the current period.

employed workers are fired and replaced. Turnover rate depends on the reservation wage differential between employed and unemployed (The greater the wage gap is, the higher turnover rate will be). However, the income distribution plays a minor role in the determination of total output, unemployment, consumption, etc. due to the linear form of the consumption function that is common to all households.

The main source of household gross income is workers' wage $w_f N_f$. In each period, workers post their wage $w_{f,t}$ which is updated by the following rule:

$$w_{f,t} = \begin{cases} w_{f,t-1} \cdot (1 + \xi \cdot U(0,1)), & \text{if the worker } i \text{ employed at time } t-1 \\ w_{f,t-1} \cdot (1 - \xi \cdot U(0,1)), & \text{otherwise} \end{cases} \tag{3.17}$$

where $0 < \xi < 1$ denotes the persistence parameter and $U(0,1)$ is a random shock uniformly distributed between 0 and 1. Here, the wage determination is a stochastic process that assumes that wages are determined based on the previous period's wage and a random shock. If their current wage offer is below their expected wage offer, they will demand a higher wage to compensate for the lower wage offer in the next period. Conversely, if their current wage offer is above their expected wage offer, they will accept the wage offer since they can expect a higher wage in the next period. If a worker was employed in the previous period, their wage offer in the current period is the sum of their previous wage and a positive random shock, indicating that their wage tends to increase over time. In contrast, if a worker was unemployed in the previous period, their wage offer in the current period is their previous wage minus a negative random shock, indicating that their wage tends to decrease over time until they find employment again. Overall, this wage determination process assumes that workers make rational decisions based on their expectations of future wages and that their current wage offer reflects both their current productivity and the expected evolution of wages over time. However, their decisions do not necessarily reflect the utility maximization.

The consumption function for each household is determined by expected income

and previous period net worth:

$$C_{n,t} = \eta_1 Y^D_{n,t} + \eta_2 A_{n,t} \tag{3.18}$$

where η_1 and η_2 are consumption propensity from income and net worth, respectively with $0 < \eta_2 < \eta_1 < 1$. Disposable incomes of households are broken down into two categories:

$$Y^D_{n,t} = \begin{cases} (1-\tau_y) w_{n,t}, & \text{if worker } n \text{ is employed at time } t-1 \\ ub_{n,t}, & \text{if worker } n \text{ is unemployed at time } t-1 \end{cases} \tag{3.19}$$

where τ_y denotes the tax rate on labour income. $ub_{n,t}$ denotes the non-taxable unemployment benefit. τ_k denotes the tax rate on net worth. The aggregate consumption is given as

$$C_t = \sum_n^N C_{n,t} = \eta_1 \sum_n^N \Big[(1-\tau_y) w_{n,t} + ub_{n,t} \Big] + \eta_2 \sum_n^N A_{n,t} \tag{3.20}$$

Saving of households is given by

$$S_{n,t} = Y^D_{n,t} - C_{n,t} \tag{3.21}$$

Households' net worth evolves according to:

$$A_{n,t+1} = A_{n,t} + S_{n,t} \tag{3.22}$$

3.4.3.3 Bank Behaviour Credit market In the credit market, banks interact with firms, and the government is in charge of allocating credit. In the money market, the money supply is endogenously determined, as banks supply credit according to the demand for credit from the private sector, including firms and households. Hence, from the modeler's perspective, a consumption function of the households needs to address the issue of insufficient funds including income and net worth for purchasing

capital goods or consumption goods by firms and households. Following Caiani (2018), I also assume that households only request loans from their deposit banks, and that loans are repaid with a fixed principal repayment scheme. As new loans are added to the outstanding value of old loans, interest and principal payments are updated accordingly with each repayment cycle.

The determination process of interest rates has two components as shown below: firm's relative net worth size and fixed policy rate, which makes the preferential credit attractive to exporters compared to competitive market rate and unofficial (curb) credit market rate. This mechanism aligns with the ideas presented in Bernanke and Gertler (1995), particularly regarding the relationship between policy rates and risk premiums in the credit channel of the monetary policy transmission mechanism. Higher policy rates may reduce the supply of credit to riskier borrowers, resulting in higher risk premiums and higher borrowing costs. Following Bargigli et al. (2016), a simple form of this representation, the interest rates are given:

$$r_{b,f,t} = \underbrace{\bar{r}^x}_{\substack{\text{Policy rate determined} \\ \text{by the government}}} + \bar{r}^x \underbrace{\left(\frac{L_{f,t}}{A_{f,t-1}}\right)^{\bar{r}^x}}_{\substack{\text{Firm-specific} \\ \text{risk premium}}}, \quad x = \{\text{baseline, preferential}\}. \tag{3.23}$$

Changes in the policy rate set by the central bank (r^x) are transmitted through various channels to affect the economy, including the interest rate channel and credit channel. Here, the interest rate channel is the most direct and important channel, as it affects the cost of borrowing for households and firms. The interest rate determination mechanism described in the model incorporates the policy rate (r^x) set by the government, which is a key component of the interest rate channel in the transmission mechanism of the preferential interest rate policy. By discriminating the policy rate, the government can influence the interest rates in various industries, mainly big business groups and small and medium sized firms, which in turn affects borrowing and investment decisions by firms as well as households.

Additionally, the firm-specific risk premium component of the mechanism reflects the credit channel of the industrial policy transmission mechanism. The credit channel

describes how changes in the policy rate affect the supply of credit to different borrowers in the corporate sectors. Higher policy rates may reduce the supply of credit to riskier borrowers, resulting in higher risk premiums and higher borrowing costs.

The formula for the interest rate determination mechanism also incorporates the asset or net worth of the firm (A) relative to the loan amount (L), which reflects the collateral channel of the monetary policy transmission mechanism. The collateral channel describes how changes in the policy rate affect the value of collateral that borrowers can offer to lenders. Higher policy rates may reduce the value of collateral, which can increase the risk premium and borrowing costs. The denominator shows that credit market prefers large firms (*chaebols*) in terms of asset size, which may imply the lower default risk during the HCI drive. Under HCI promotion, the government would want to further promote the HCI sector with a single-minded commitment to reduce the project gestation periods (Jones and Sakong, 1980). So once selected, the HCI-firms are likely to remain as the beneficiaries of preferential interest rate policy.

This matching mechanism in the credit market is underpinned by the seminal works by Kalecki (1938, 1968, 1971b); Steindl (1945), and Kalecki's statement deserves full quotation in this regard.

> "A firm with large entrepreneurial capital could obtain funds for a large investment whereas a firm with small entrepreneurial capital could not. Differences in the position of firms arising out of differences in their entrepreneurial capital are further enhanced by the fact that firms below a certain size have no access whatever to the capital market." (Kalecki, 1971b, p.106)

The model addresses this notion by displaying a firm-bank network formed with unequal access to the credit market; large firms (*chaebols*) have easy access to credit from multiple banks whereas small firms do not. Unequal access to credit intensifies the disparity of the market power among firms.

Deposit market In the deposit market, banks and individuals interact with

regard to deposit interest rates. Here the banks represent the demand side while the individuals supply the deposit money. Banks offer a deposit interest rate in similar way to Riccetti et al. (2015):

$$r^d_{f,t} = \begin{cases} r^d_{f,t-1} \cdot (1 + \zeta \cdot U(0,1)), & \text{if } D_{f,t} - L_{f,t} < 0 \\ \min\{r^d_{f,t-1} \cdot (1 - \zeta \cdot U(0,1)), \bar{r}\}, & \text{otherwise} \end{cases} \tag{3.24}$$

The condition states that if a bank exhausts the credit supply (deposit) by lending to the corporate sector as a loan, then it decides to raise the deposit rate to attract new supply of credit money, and vice versa. In developing countries trying to mobilize the national saving, the rate tends to be fixed as the given policy rate $\bar{r}$ as an upper bound. I also assume that the deposit interest rates for households are equivalent to those of firms. It is worth noting that the determination process for loan interest rates and deposit interest rates differs in terms of government control. The loan interest rates are subject to government control, while the deposit interest rates are determined through interactions between banks and individuals in need of funds. This distinction is crucial because it underscores the differing levels of influence that government policies and market forces have on interest rates. Government policies can have a direct impact on loan interest rates under the big business promotion regime, while market forces play a relatively larger role in determining deposit interest rates. Under this scheme, the financial soundness of the banks hinges on the relative size between these two forces. As the government control gets more dominant, the banks are more likely to generate bad loans. By understanding the factors that contribute to the determination of interest rates for loans and deposits, we can gain a better understanding of how government policies and market forces interact to shape the financial landscape. This, in turn, can inform policy decisions and help to promote financial stability and economic growth.

As a result of operations in the credit and the deposit markets, the bank b's

profit is given as

$$NetProfit_{b,t} = (1 - \tau_b)\Big[r_t \cdot L_{f,t} - r^d(D_{f,t} + D_{i,t}) - BadDebt_{b,t}\Big] \tag{3.25}$$

where r^d is interest for bank deposit assumed to be equal between firms and households.

Finally, the net worth of a bank evolves as

$$A_{b,t} = A_{b,t-1} + NetProfit_{b,t} \tag{3.26}$$

where τ_b is the tax rate on bank's net profit.

3.4.3.4 Government/Central bank behaviour Initially, the government sets its real expenditure G as an exogenous variable including spending on industrial policy and necessary welfare transfer such as unemployment benefits ub_t depending on the budget constraint. In this model, the government is assumed to spend only on unemployment insurance. The state collects taxes on income and profits $(\tau_y, \tau_k, \tau_\pi)$ to finance their spending. For simplicity, therefore, I can assume away the government securities and the central bank that implements monetary policy through open market transaction. Total taxes are:

$$T_t = \tau_y w_{f,t} N_{l,t} + \tau_\pi \pi_{f,t} Q_{f,t} + \tau_b\Big[r_t \cdot L_{f,t} - r^d(D_{f,t} + D_{i,t}) - BadDebt_{b,t}\Big] \tag{3.27}$$

The government spending is

$$G_t = (N - N_{f,t}) p_t ub_{i,t} \tag{3.28}$$

3.4.3.5 Firm Dynamics Firm's Entry-exit Conditions The simple rule of firms default denoted by $def_f = \{0, 1\}$ is that the firm exit the market (i.e., $def_f = 1$) if $A_{f,t} < 0$.[34] I borrow the idea of entry-exit dynamics introduced in Riccetti et al.

[34]This condition can hardly hold at least for the *chaebols* until 1980s when they finally operated under the liberalized financial regime instead of repressed one. As the financial market is liberalized, even the large firm with high debt ratio became vulnerable to external shocks. In 1997, a series of bankruptcies among *chaebols* occurred as a chain reaction, leading to financial crisis.

(2015) for *one-to-one replacement* of defaulted firms with new entrants.

Hence the firm's entry-exit conditions are:

$$NetProfit(A_{f,t} < 0) = 0, \;\; K(A_{f,t} < 0) = 1, \;\; A(A_{f,t} < 0) = 1 \tag{3.29}$$

where the last two conditions show that once the firm exit the market due to $A_t < 0$, new entrant enters, instantaneously initializing capital and asset.

In the context of agent-based models, I impose a disequilibrium condition in which some agents have incentives to change their behavior because their decisions are not consistent with the decisions of other agents. For example, in Gatti et al. (2011), macroeconomic equilibrium is not imposed *ex ante*, and the model allows for the possibility that aggregate output may be absorbed by consumption expenditure or end up in involuntary inventories. When aggregate output is absorbed by consumption expenditure, the model is in equilibrium, and there is no disequilibrium condition. However, when aggregate output ends up in involuntary inventories, the model is in a disequilibrium condition. This is because some agents have produced more output than consumers are willing to purchase, and they have to hold unsold inventories. These agents may have incentives to change their production decisions, lower their output, and avoid accumulating inventories. By construction, aggregate saving is equal to inventories. This implies that if there are involuntary inventories, there will be excess saving in the economy. This excess saving may lead to a decline in aggregate demand, which may further exacerbate the disequilibrium condition. In this way, we allow for the possibility of disequilibrium conditions, which arise when aggregate output is not fully absorbed by consumption expenditure.

3.5 Simulations

The plan for the simulation involves two main stages: first, conducting multiple simulations to generate data that reflects the common or consistent behavior of the system being studied, in this case, the Korean economy, and second, conducting policy experiments to identify the causal effects of different industrial interventions or

policy changes on the economy. In the first stage, the simulations will be designed to model the relevant variables and factors that impact the system under study. These simulations will generate large amounts of data that can be used to identify patterns and trends in the system's behaviour. In the second stage, policy experiments will be conducted by introducing different values of parameter or exogenous policy variables into the simulation process. We will eventually examine whether a significant impact/change occurs through the experiment. By comparing the results of these experiments to the baseline model outcomes/data generated in the first stage, we will be able to identify the causal effects of different policy, in this case the preferential interest rate policy, on the system.

In order to gain insights into the dynamics of big business promotion (HCI promotion industrial policy), in this section, I perform an agent-based simulation that focuses on the interactions of each economic agent within the specified market. Specifically, I choose a total of 1500 households or workers, 50 firms, and 10 banks. Each agent's behaviour is characterized by a set of parameters that includes marginal propensity to consume, labour and capital productivity, persistence parameters, etc. By varying the values of our parameters and observing the effects on the market outcomes, we can gain insights into the factors that influence the income inequality dynamics as well as entry or exit of the firms and banks. Here, the policy interest rate is a key policy variable which is expected to govern the macroeconomic outcomes. Ultimately, the simulation provides a valuable tool for policymakers, researchers, and market participants to better understand the complex dynamics of the big business promotion or industrial policy regime. Calibrated values of parameters are provided in Appendix Table B.3.

3.5.1 Sequence of Events and Market Interactions

In the following, I presents a schematic summary of the collection of the interactions as a simple form of behavioural equations occurring among economic agents before I perform the model simulations. The trigger of the sequential income generation and distribution is the initiation of economic policy under the authoritarian

government regime. The government implements an industrial policy along with the preferential credit incentives which orchestrates banking sector and corporate sector to boost the production.

1. The government place its orders to firms so that each individual firm may determine its desired level of output based on its given fixed technology. Firms set the price as defined in the model.
2. Banks compute their bank-specific interest rates according to the government preferential interest rate policy, and matching process occurs between firms and banks based on the interest rates.
3. Credit is allocated among firms according to matching mechanism between banks and firms: $link_{fb} = link(r_b)$. $link_{fb}$ is a vector of dimension $1 \times N_f$ whose elements are indices of firm-bank match. The firm-bank matching protocol indicates that once bank-specific rate r_b is offered to the potential credit partners, r_f is paid by the firm with $r_f \geq r_b$ and then the overall loan interest rate r is determined.
4. Firms compute the target leverage, the demand for loans and total capital based on loans and assets.
5. Workers update their reservation wages.
6. Firms interact with randomly chosen workers on the labour market to determine the level of labour demand required, which is the difference between labour required and current employees. On the other hand, if there are already more employees than required, the firm will fire those in excess who are randomly selected (turnover).
7. Workers decide how much they will consume based on their wage earnings and wealth (bank deposits or cash holdings). They choose to buy goods produced by a potential supplier/firm that offers the cheapest price due to the lowest markup. This process represents a matching mechanism as an initial step before transactions occur between firms and households.
8. Banks compute deposits and deposit interest rates.
9. Workers compute minimum interest rate for their deposit and how much they

would make their deposits in the banks based on interest rate offer from a bank.

10. Firms produce and the consumption process is completed.
11. Firms compute their profits, pay profit taxes, update net worth $A_{f,t}$ and evaluate their financial status whether they default ($A_{f,t} < 0$) or not.
12. Banks compute their profits and pay profit taxes. In this stage, banks also compute bad debt, $BadDebt_{b,t}$ (non-performing loans of bankrupted firms ($def = 0$)) and update their net worth and evaluate whether they default or not.
13. Government collects taxes on profits τ_π, τ_b and individual incomes τ_y to finance its welfare spending ub, updating public deficit and debt .
14. Individuals or households compute their income and net wealth based on their wage income and capital income.
15. The model ensures the stock-flow consistency at the end of period.

3.5.2 Results: Baseline Model

This section presents two baseline model simulations: fiscal austerity and expansion without credit market intervention. The former represents the default state of the economy, while the latter depicts an expansionary fiscal policy through the implementation of lower tax rates for each sector of the economy. The objective is to demonstrate the evolution of the economy in terms of growth and distribution when the government pursues economic growth only by altering the taxation scheme from a contractionary to an expansionary fiscal policy. The purpose of this analysis is to investigate the impact of fiscal policy on economic growth and income distribution without preferential interest rate policy for the targeted sector.

The austerity simulation represents the default state of the economy, whereby the government implements contractionary fiscal policy measures. This simulation serves as a benchmark for our analysis and allows us to assess the impact of any deviations from the default scenario. Conversely, the expansion simulation represents an expansionary fiscal policy, with the government implementing lower tax rates for each sector of the economy. This simulation enables us to investigate the effects of an increase in government spending on economic growth and income distribution.

These two simulations focuses on the evolution of the economy in terms of both growth and distribution without credit market intervention under the SFC-ABM framework described in the previous section. We seek to examine how simple changes in tax rates affect the growth rate of different sectors of the economy and how these changes impact income inequality across the population compared to selective industrial policy. By investigating these effects, we can gain insights into the mechanisms that drive economic growth and inequality in the presence of fiscal policy before we implement policy experiments under the industrial policy regime.

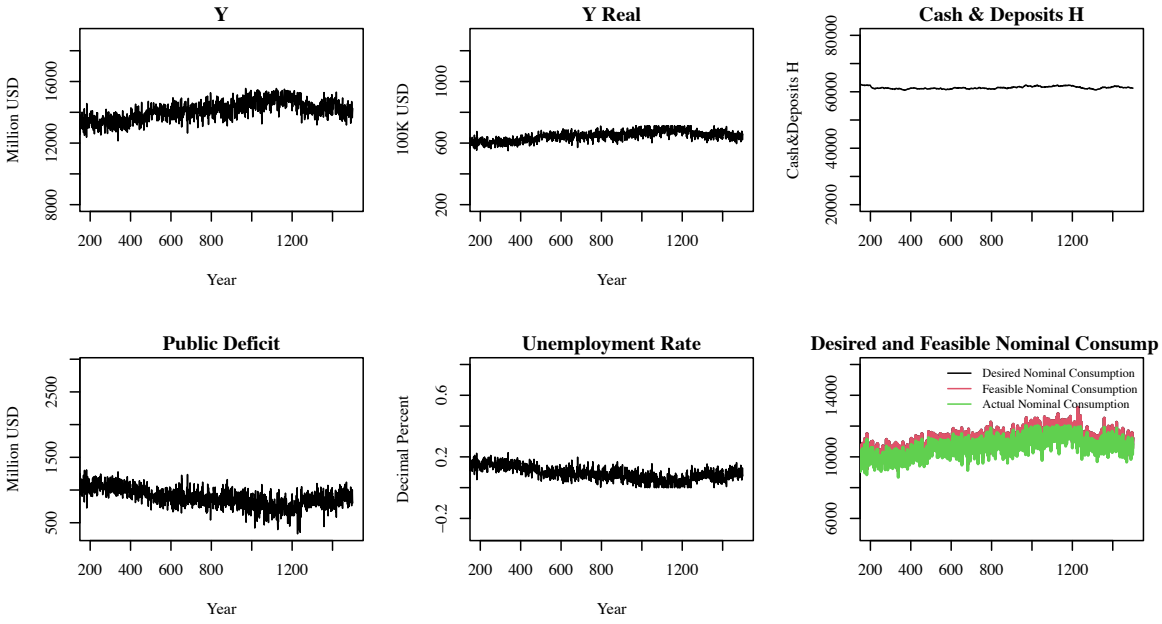


Figure 3.4: Trends of Macroeconomic Variables

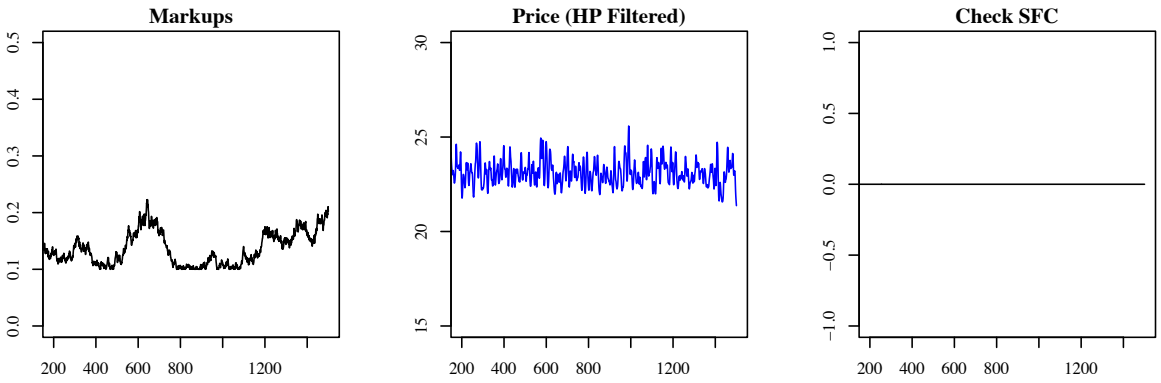


Figure 3.5: The HP filter removes the short-term fluctuations around the trend for the detection of an underlying patterns. Markups, Price and Stock-flow Consistency

The simulations presented in this section provide insights into the dynamics of key macroeconomic variables including economic growth, public debt, and unemployment rate in the baseline industrialization regime. As depicted in Figure 3.4, the baseline regime exhibits stable economic growth but faces persistent high unemployment rate and increasing public debt. The stable economic growth is a positive development for the baseline regime. Economic growth is a critical factor in escaping the poverty or middle-income trap, generating employment opportunities, and reducing poverty. However, the sustainability of economic growth is in question in this scenario. The high unemployment rate illustrated in Figure 3.4 is a significant concern for the baseline regime. High unemployment can have numerous negative impacts on the economy, including reduced productivity of the labour force and decreased consumer spending. As long as the high unemployment rate persists, income inequality remains a challenging issue for policymakers. Figure 3.5 depicts markup evolution, price movement and finally ensures the stock-flow consistency of the model. As modeled, markups follows a random walk and price reflects markups and unit labour costs.

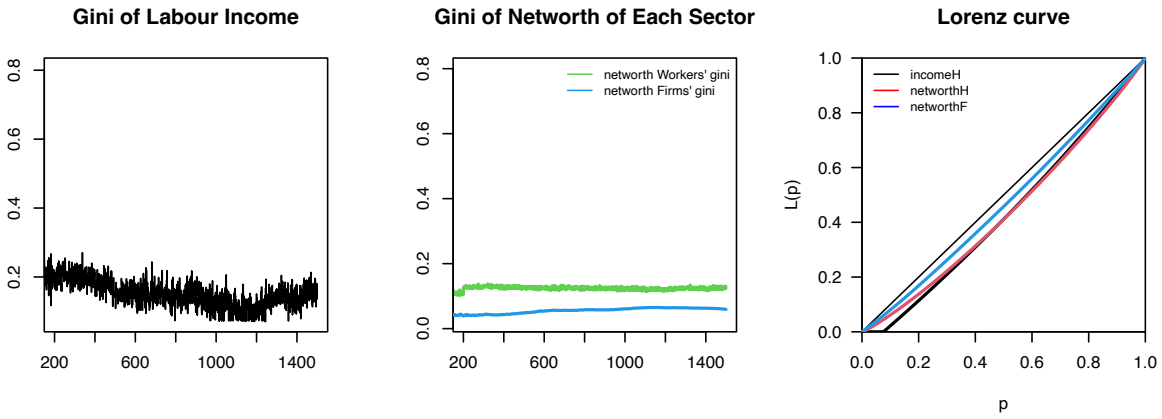


Figure 3.6: Income Inequality Dynamics and Lorenz Curve (Benchmark Tax Rate)

Figure 3.6 illustrates the trends of income inequality. Hence, all three Lorenz curves are close to the line of perfect equality. It is worth noting that in the baseline model, the distribution of income and net worth among workers and firms is relatively fair in the absence of significant preferential industrial policy instruments for firms in the targeted sector.

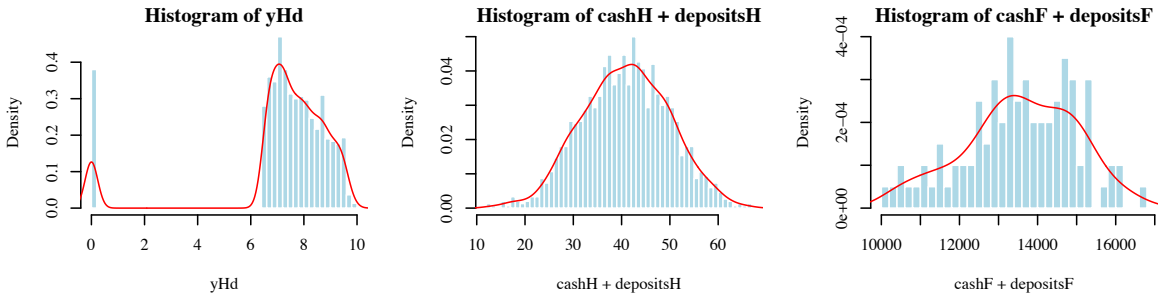


Figure 3.7: Income Decile (Histogram)

Figure 3.7 and Figure 3.8 show income and wealth distribution with histograms and bar plots, respectively. Income deciles show the average income for different income groups in the economy. A decile splits the population (by households) into 10 equal parts.

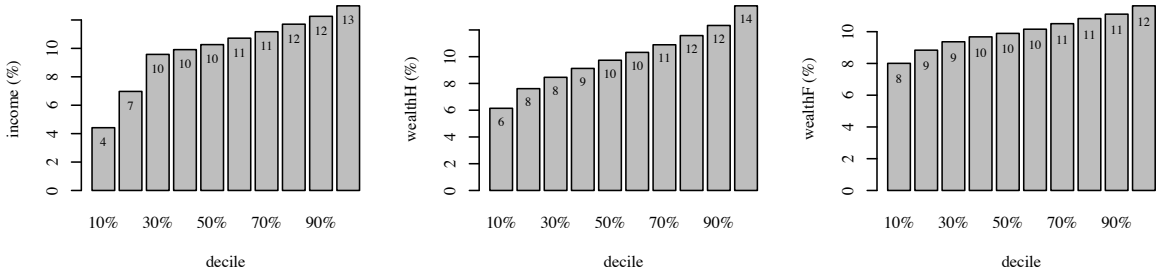


Figure 3.8: Income Decile (Bar Plots)

3.5.3 Policy Experiments: Preferential Interest Rate Policy with Emphasis on Firm-bank Interactions

This section analyzes the effects of preferential credit on firm size dynamics and income inequality. The experiment we examine involves the government selecting targeted firms based on their asset size, with the top 3% largest firms receiving preferential treatment in the form of lower interest rates. The top 3% represents the firms and their affiliates that have access to the preferential credit markets. It is worth noting that the credit allocation system changed significantly between the 1960s and 1970s. In the 1960s, credit allocation was still *chaebol*-focused but industry-neutral and based on export performance, while the 1970s saw a shift towards an asset-capacity based credit allocation system, which was more heavily focused on chaebols and the development of heavy and chemical industries.

To investigate the effects of preferential interest rate policies, we divided firms into two groups: the top 3% largest firms and the remaining manufacturing firms. We applied different average real interest rates to each group: $r^{baseline} = 0.08$ and $r^{preferential} = 0.07$ for $t > 400$, which corresponds to 2.67 years since the start of the simulation. The first policy I tested was a 100 basis point differential between *chaebols* in the key strategic industries and non-*chaebol* firms or small or medium-sized firms. In the second experiment, I used a 200 basis point differential between preferential and market interest rates, 0.06 and 0.08, respectively. I conducted 200 Monte Carlo simulations and implemented the experimental interest rate regime after the 50th simulation, with the first 50 simulations serving as the baseline regime of big business

promotion. The reason for conducting 200 Monte Carlo simulations is to ensure the robustness of our findings and to determine whether any differences observed after the implementation of the new policy were statistically significant.

Overall, this experiment allows us to examine how preferential credit affects firm size dynamics and income inequality and sheds light on the potential implications of different selection mechanisms for credit allocation in the context of Korea's economic development. The results are presented in Table 3.2, Figure 3.9, Figure 3.10, Figure 3.11 and Figure 3.12.

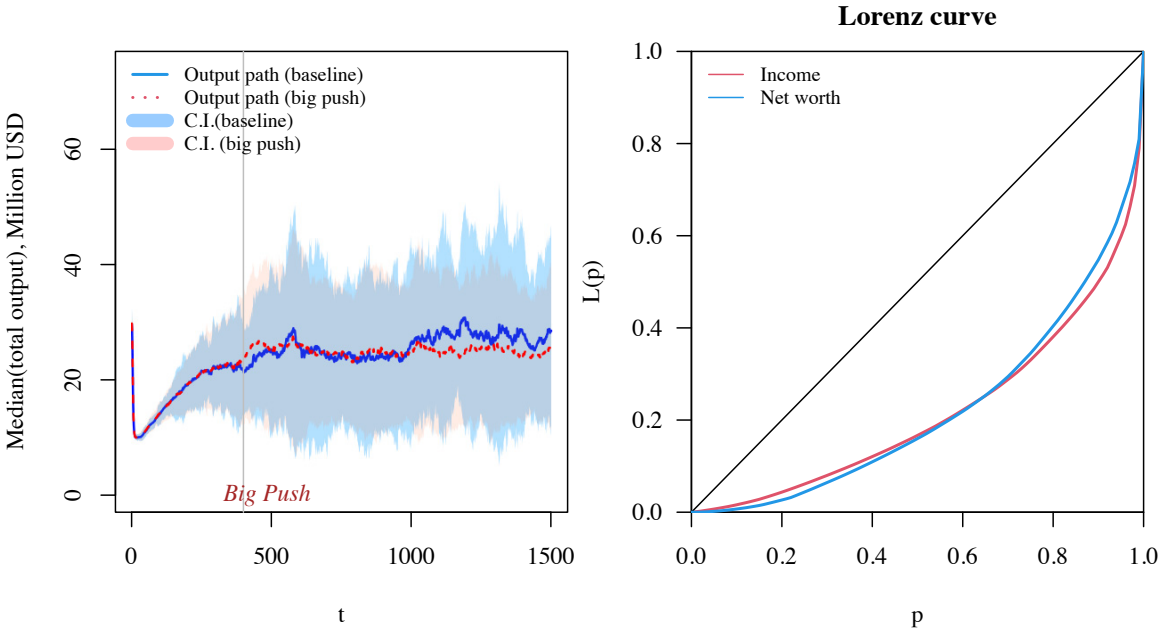


Figure 3.9: Preferential Interest Rate Policy, Growth and Lorenz Curve with 100 Basis Point Interest Rate Differential

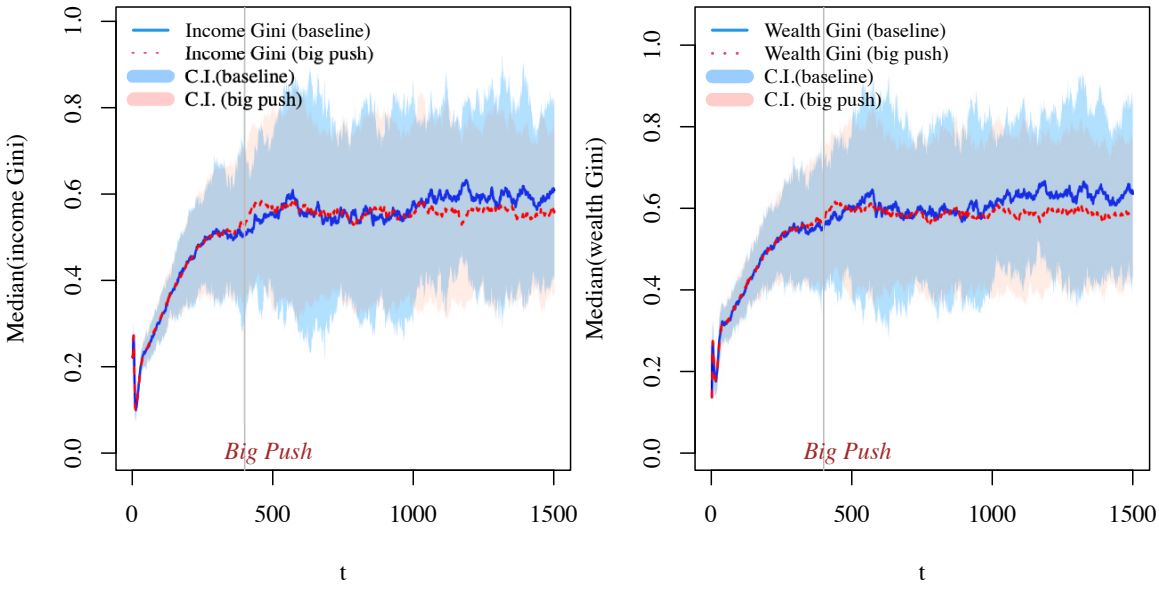


Figure 3.10: Preferential Interest Rate Policy and Income Inequality with 100 Basis Point Interest Rate Differential

Figure 3.9 and Figure 3.10 show output and inequality paths before and after big business promotion with the interest rate differential at 100 basis points between the selected big business groups and the non-selected firms. This differential does not make a significant difference in terms of both growth performance and inequality. However, Figure 3.11 and Figure 3.12 show remarkable change in both economic growth and economic inequality. With 200 basis point interest rate differential, the economy generates surges in growth and income and wealth inequality. This shows that preferential interest rate policy under big business promotion regime has a clear trade-off between economic growth and economic equality. As a result of big business promotion, 64.3% of total income is concentrated on the top decile income group as shown in Figure 3.14. Table 3.2 presents the summary of the graphical results.

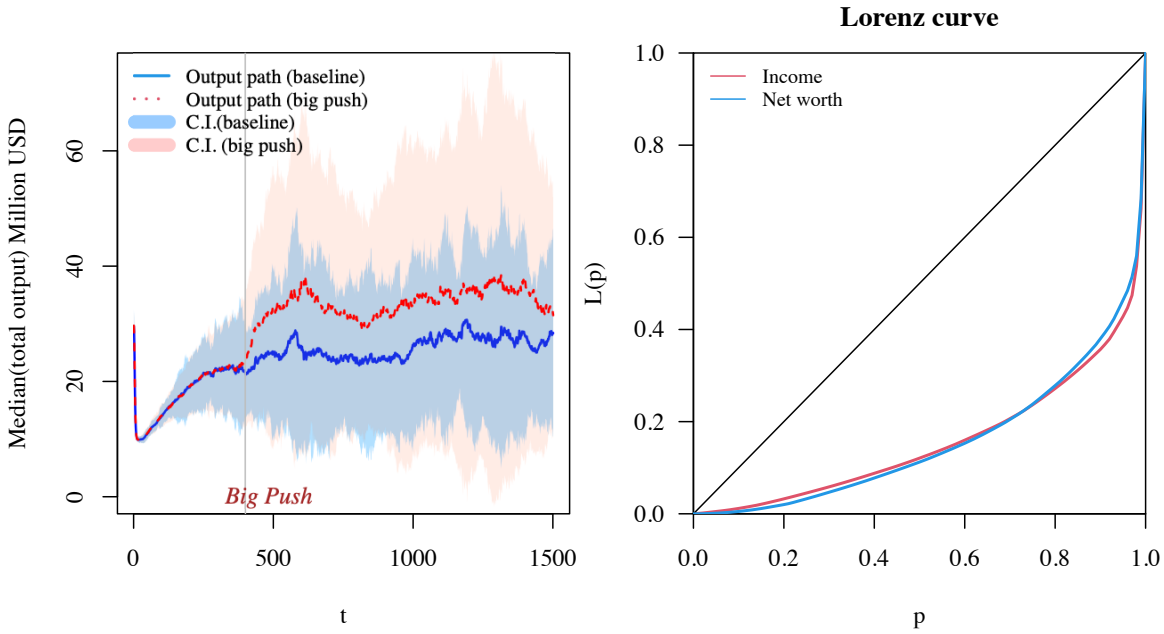


Figure 3.11: Preferential Interest Rate Policy, Growth and Distribution with 200 Basis Point Interest Rate Differential

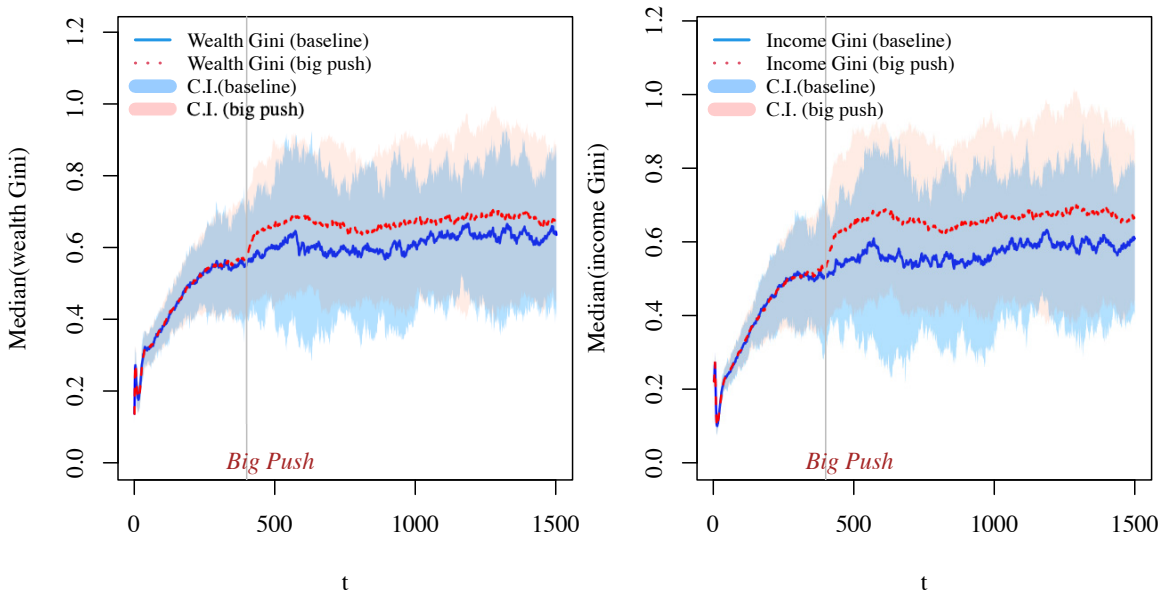


Figure 3.12: Preferential Interest Rate Policy and Income and Wealth Inequality with 200 Basis Point Interest Rate Differential

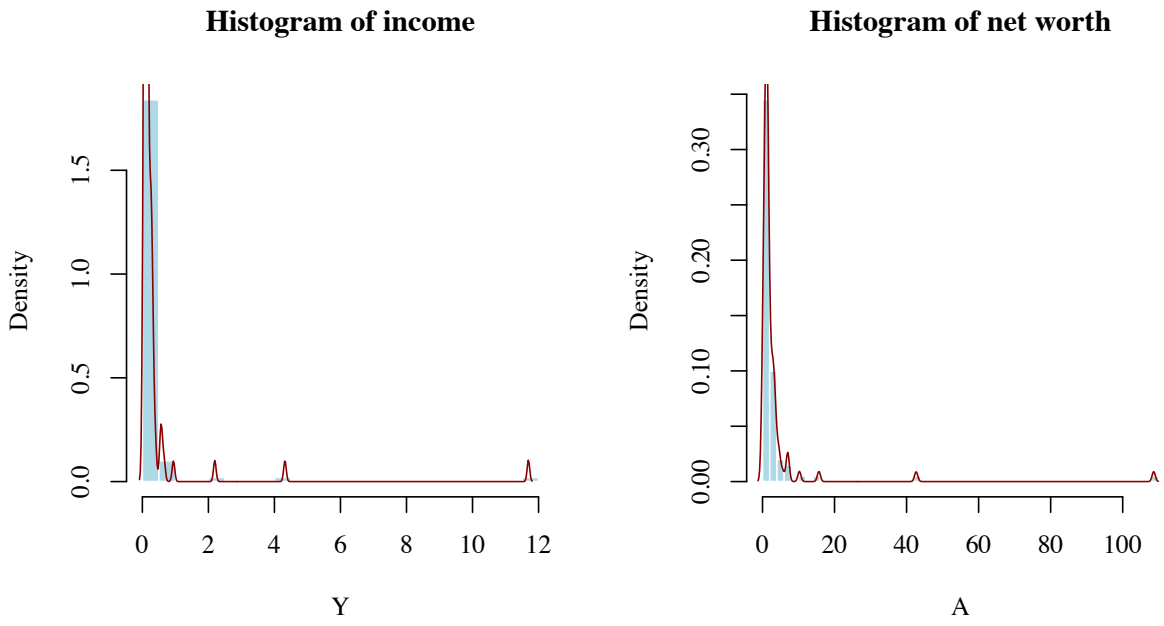


Figure 3.13: Preferential Interest Rate Policy and Income Distribution

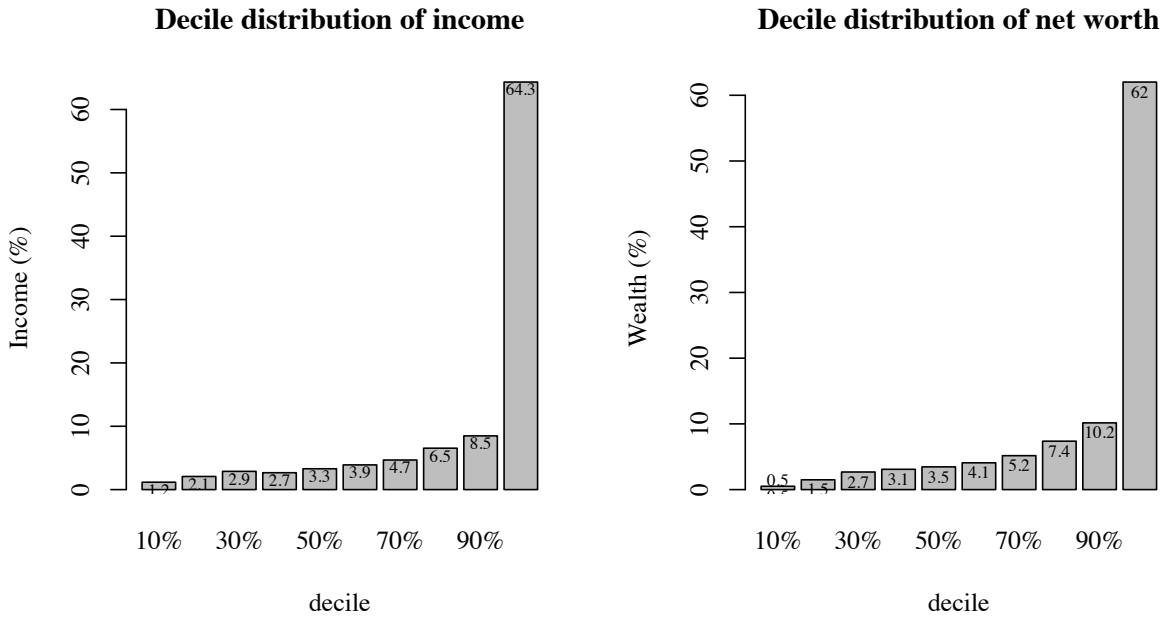


Figure 3.14: Percentage share of income by Decile Group

Table 3.2: Gini Coefficients Results

Gini	*Baseline*	*Differential* (100 basis pts)	*Differential* (200 basis pts)	*Differential* (220 basis pts)	*Differential* (250 basis pts)
Income Gini	0.525	0.563	0.680	0.705	0.949
Wealth Gini	0.554	0.555	0.683	0.703	0.916

What is the mechanism behind this association between discriminated credit access and income inequality? The dynamic system in the simulated credit markets and firms' operations generates income inequality simply through the process of wealth accumulation and debt financing. The firms' production (Q) is determined by the capital (K) multiplied by the capital productivity ($1/a_K$). The firms' debt (L) is simply determined by the difference between capital (K) and net worth (A). If a firm's net worth is negative, the firm finances its investment through retained earnings (reinvested profit), and its debt is set to zero.

The model generates income inequality by favouring firms with high net worth (i.e., ranking *chaebols* in the targeted industry), which have access to cheaper credit regardless of their risk premium status. For example, the preferential interest rates can significantly lower the risk premium factor given $\bar{r}^{pref} \cdot \left(\frac{L}{A}\right)^{r^{pref}}$. Thus, under the preferential interest rate regime, the ranking big business groups can easily accumulate more capital through debt financing, which rapidly increases their production, income and profit and further increases their net worth. On the other hand, firms with low net worth have a higher debt-to-net worth ratio, which increases their policy interest rates ($\bar{r}^{baseline}$) and reduces their investment, production, income and profit, leading to a decline in net worth.

The institutional setting devised by the government during the big business promotion period created a credit market system that incentivized banks and firms differently than what would be expected under a free and competitive financial market (Cho and Hellmann, 1993). They also argue that bank ownership in Korea allowed

the government to dictate the objectives of bank operations, resulting in managers' incentives being determined by the government's hierarchy, which leads to further income inequality as it favours the government's targeted sectors and firms over others, creating an uneven playing field.

Hence, the investment decisions in this model are predicated upon the profit rate, which ultimately establishes a hierarchical structure in regards to credit accessibility. This outcome is in concordance with the observations from the prior chapter which posited that profit share or market power has a considerable impact on macroeconomic operations. In particular, this is so-called *profit-led* growth regime, under which *chaebols* grew more capable of accumulating large profits due to their preferential access to credit. This led to a concentration of wealth in the hands of a few individuals and a decline in the demand for labour in smaller firms, which led to higher unemployment rates and lower wages in the final stage of big business promotion. As a result, the gap between the rich and the poor widened, leading to an increase in income inequality.

In particular, for small and medium sized firms, the rate of net worth and loan influences their creditworthiness and the availability of credit, but for big business groups, the ratio of loan and net worth in fact does not really matter. The model's assumption that investment decisions are based on the fraction of reinvested profit (γ) multiplied by the current period's profit is consistent with the dominant type of investment function found in the Keynesian tradition. The model's assumption that the interest rate for small and medium sized firms is determined by the net worth and debt ratio is consistent with the theory of endogenous money, which suggests that the banking system creates credit based on the borrower's creditworthiness and demand for the credit.

There could be another possible scenario of the generation of income inequality based on the current model. In the context of big business promotion, in which both profits and investments are high (often over-investment occurs), their effect on income inequality depends on how the benefits of this growth are distributed among different groups in the economy. In theory, high profits and investments can lead to increased economic growth, which can create new job opportunities and increase wages for

workers. This can help to reduce income inequality, as more people are able to share in the benefits of economic growth. However, in practice, the benefits of high profits and investments are not always distributed evenly. For example, if most of the profits are retained by business owners (they are oftentimes the entrepreneurs of the *chaebols*), and if most of the new job opportunities created are low-wage and labour-intensive, then income inequality could still persist, even if profits and investments are both high, implying the absence of trickle-down effect.

From the political economy perspective based on Kalecki (1971a); Steindl (1979), preferential interest rates can generate high income inequality due to the inherent power imbalances in the economy. At the same time, from their views, the economy is inherently unstable and characterized by power imbalances between economic agents. As a result, the benefits of preferential interest rates tend to be concentrated among a small group of large firms including *chaebols* and firms in the targeted sectors, not to mention of individuals who hugely benefited from the government favouritism, exacerbating income inequality. Furthermore, they argue that preferential interest rates can lead to financial instability and crises. Large firms that benefit from preferential interest rates may use their power to engage in risky financial practices or investment projects, such as speculative investments or taking on too much debt. This can lead to financial crises and economic downturns that disproportionately harm smaller firms and individuals who do not have the same bargaining power. It may be regrettable that the Korean government did not sufficiently prioritize income redistribution and regulate the financial sector to prevent excessive risk-taking by large firms and banks.

3.6 Conclusion

This chapter has explored the impact of Korea's industrial policy, the growth of *chaebols* and income inequality dynamics. The HCI promotion or big business promotion regime, with its preferential interest rate policy, has facilitated the expansion of large firms, particularly *chaebols*, and enabled them to invest in massive capital projects without much consideration of default risk. This policy has transformed Korea's growth regime from labour-intensive to capital-intensive, with *chaebols* playing

a significant role in the country's economic growth and income distribution. This study has found that the growth of *chaebols* and the HCI promotion regime have widened income inequality. The results of this study suggest that large-scale industrial promotion policies through credit control are highly likely to generate a hike in income inequality through credit market interaction. Without appropriate labour policies, meaningful trickle-down effects may be missing, as evidenced by the increase in the income inequality. This study underscores the importance of a well-designed and balanced industrial policy that takes into account the distributional impacts of economic growth and development.

The findings of this study have significant implications for policymakers in Korea and other countries. Industrial policies that only benefit large firms may exacerbate income inequality and financial instability, ultimately hindering economic growth and development. Policymakers should consider redistribution policies that promote a fair distribution of income and investment opportunities, and that encourage innovation and competition, particularly among small and medium-sized enterprises. Furthermore, policymakers should consider implementing appropriate labour policies that ensure that workers benefit from economic growth and development, leading to a more equitable society. Therefore, while high profits and investments have the potential to reduce income inequality, their impact depends on how the benefits of this growth are distributed among different groups in the economy. Policymakers must be mindful of these dynamics and design policies that ensure that the benefits of economic growth are shared more evenly across society.

4 The Effect of Pro-competitive Reforms on Market Power and Labour Share of Firms' Value Added: Evidence from Korean Firms

4.1 Introduction

How do pro-competitive reforms affect the labour share of firms' value added? This chapter explores this question by studying the case of the Korean pro-competitive reforms – also known as *Big Deals* – targeting Korean superstar firms called *chaebol*.[35] After the 1997 global financial crisis hit Korea, the government enacted pro-competitive reforms as part of the requirements for the IMF bailout loan. The reforms were radical and coercive corporate restructuring processes which were designed to drastically reduce the *chaebols*' debt-equity ratios to less than 200 percent and recover transparent corporate governance by abolishing unhealthy business conventions such as insider trading and mutual debt guarantees (S. Chang, 2003). The program also involves reducing excessive or duplicated investment in key sectors through inter-*chaebols*' mergers and acquisitions or swaps of non-core subsidiaries (Cherry, 2005). The government also strengthened antitrust enforcement on *chaebols* (Haggard et al., 2003). Furthermore, related-party transactions (RPTs) or intra-group transactions and unlawful insider trading were prevented. All these measures drastically lowered entry barriers for non-*chaebol* firms and effectively limited *chaebols*' privileged access to credit (Aghion et al., 2021). The 1998 pro-competitive reforms enabled Korea's economy to make the shift from investment-based to innovation-based growth. As a result, the labour productivity and total factor productivity (TFP) of non-*chaebol*

[35]The term '*chaebol*' generally refers to a conglomerate with a family-based on ownership and management and many vertically or horizontally integrated affiliated firms. Occasionally, however, according to the Korea Fair Trade Commission (KFTC), even both public groups and private groups are designated as *chaebol* despite the lack of a family ownership as long as they have total assets exceeding 5 trillion Won (about 4.47 billion USD as of today's exchange rate in the year of 2021). Most of *chaebols* emerged during the colonial and post-war period and rapidly grew during the 1970s, accumulating enormous market power. KFTC annually announces the list of top 30 large business groups which represent more accurate and common identification of *chaebols* (see Appendix Table C.1, Appendix Table C.2 and Appendix Table C.3.)

affiliates in the *chaebol*-dominant industries significantly increased, and the market power of *chaebols* markedly declined (Aghion et al., 2021).[36]

However, the declining trend of the labour share after the 1998 pro-competitive reforms in Korea raises questions about the effectiveness and strength of such policies to influence the distribution of labour income. This chapter evaluates the impact of the neoliberal economic agenda on the labour share given the fact that the labour share in Korea has continued to decline despite the pro-competitive nature of the agenda.

Using comprehensive firm-level microdata (1992-2011), this chapter highlights the behavioural responses of Korean firms – including *chaebols* and their affiliates – to the reforms and evaluates the effect of the reforms on the labour share. The context of the pro-competitive reforms on *chaebols* in the midst of Asian financial crisis (1997-1998) form a natural experiment that address the research questions of this study – namely, "How did the pro-competitive reforms affect the labour share of the value added?". To identify causal association between the reforms and key variables of our interest including labour share, profit share and markups, this chapter adopts a canonical difference-in-differences (DiD) strategy to estimate the causal effect of the 1998 pro-competitive reforms on the variables of interest. I define the intervention period as a dummy variable with the value of 0 for years before 1998, 1 for 1998 and after to compare changes in outcomes over time between the treatment group and the control group. The key assumption for DiD methods to work is the parallel trends assumption. Another crucial component of this analysis is the accurate estimation of firms' markups and labour shares.

In particular, this chapter addresses the issue of how to distinguish the effect of the pro-competitive reforms from the financial crisis effect on the declining labour share. To address this question, I conducted the two supplementary regressions. First, I ran the same regression only with *chaebol*-dominant industry sectors. Second, I ran

[36] See Vollrath (2020)(pp.~105–115) for the background discussion on the overall rise in the markups and the relationship between market power and productivity. See also Baqaee and Farhi (2017); De Loecker et al. (2020) whose results deliver contradictory messages. The former shows that spending shift toward high-markup firms could be beneficial to productivity growth, which is not the case for the latter.

the same regression for the period of the 2008 Great Recession. The results suggest that the pro-competitive reforms may have influenced the labour share trend, although the impact of the financial crisis cannot be entirely discounted. This conclusion is supported by the lack of any significant change in labour share trend during the 2008 Great Recession. In sum, the major finding is twofold. First, I find that the causal effect of the pro-competitive reforms during the 1997 financial crisis on the market power of top 30 largest *chaebols* is not significant. Second, the pro-competitive reforms significantly reduced the labour share of value added and significantly increased the profit share of value added among the surviving *chaebols* and their affiliates.

This chapter highlights the followings: first, it challenges the conventional argument for the positive association between higher competition, economic growth and a more equitable distribution of income. The pro-competitive reforms' major target was to resolve the common problem of excessive and duplicated investment; the reforms were not so much labour-friendly as business-friendly in the sense that the reforms could further weaken the bargaining power of workers employed in the large enterprises such as *chaebols*. This can result in suppressed wages, reduced benefits, and job insecurity for workers, ultimately leading to a reduced bargaining power of wage workers. This finding implies that while pro-competitive reforms aim to promote competition in product markets, it does not necessarily translate into more competition or equal distribution in the labour market. Superstar firms with high market power may use their resources to attract and retain top talent, giving them an advantage over smaller firms in the labour market. This can reinforce the bargaining power of the large *chaebols* over their employees, leading to a further decline in the labour income share.

Hence, these findings suggest that the pro-competitive policies effect to encourage competition may not necessarily translate into labour market outcome, but instead reinforce the profit share of large business group or top 30 surviving *chaebols*. Thus, this chapter contributes to the growing literature on the effects of pro-competitive policies on labour income share and provides a nuanced understanding of the challenges involved in achieving a fair distribution of income in the context of market concentration

and increasing market power of firms.

Overall, the 1998 pro-competitive reforms were a significant factor in the decline of the labour share, and additional policy measures may be necessary to address this ongoing issue. Thus, these findings highlight the importance of considering labour share as a key indicator when evaluating pro-competitive reforms implemented during a financial crisis. While markups have traditionally been used to measure the effectiveness of such reforms in particular, the market power of the targeted firms, the inclusion of labour share provides a more comprehensive evaluation. By taking into account the distribution of income between labour and capital, the examination of labour share provides insight into the welfare of workers and the potential spillover effects of the competitive reforms. This more holistic approach to evaluating pro-competitive reforms can help policymakers make more informed decisions and better assess the impact of the pro-competitive reforms on both firms in the corporate sector and workers in the household sector.

The rest of the paper is structured as follows. section 4.2 presents related studies to shed a light on the recent findings on the topic. section 4.4 briefly introduces how markups are constructed to be estimated. section 4.5 describes data and introduces the estimation procedure of markups, profitability and productivity and the recent development of the methods. section 4.6 presents difference-in-differences (DiD) models to investigate the impact of pro-competitive reforms on firms' market power and other type of corporate behaviours. section 4.7 discusses the results and checks for the robustness of estimates, and section 4.8 concludes the study.

4.2 Related Literature

The lack of competition in the goods market enables dominant (large) firms to exercise market power by applying higher markups on their products. Higher markups are inversely associated with the labour share (Kalecki, 1971b; Steindl, 1990). A growing body of recent literature has documented not only an increase firms' market power in the U.S. (e.g., Hall, 2018; Basu, 2019; Syverson, 2019; Aghion et al., 2019) but also a consistent decline in the labour share of value added since the early 1980s

(e.g., Elsby et al., 2013; Karabarbounis and Neiman, 2013; Grossman et al., 2018; IMF, 2017; OECD, 2018). It has also been found that higher market concentration leads to higher income inequality (Borjas and Ramey, 1995; Ennis and Kim, 2017; Ennis et al., 2019; Boar and Midrigan, 2019; Han and Pyun, 2020). In the same vein, De Loecker and Eeckhout (2018); De Loecker et al. (2020) find that rising corporate profit share was not caused by every firm's growing capacity to command higher prices over the unit cost of production (i.e., markup pricing) but rather coming from a small number of *superstar* firms that have become increasingly dominant in every sector of the economy.[37] In addition, Autor et al. (2020) show that firms with higher market power – which refers to the firm's leeway to control the market price over the marginal cost, mainly workers' wage – tend to have lower labour share in the U.S. Barkai (2020) documents the inverse relationship between the pure profit share and the combined share of labour and capital among the U.S. firms, echoing that rising profit share is the consequence of higher markups.

The aforementioned studies have two implications on the trend of declining labour share. First, one of the underlying causes of the decline in the labour income share could be the existence of superstar firms, which would suggest a sharp decline in the intensity of firm rivalry and increased markups. Second, and perhaps more importantly, evidence from Stiglitz et al. (2013); Baker and Salop (2015); World Bank (2017); Lamoreaux (2019); Zac (2021); Ezrachi et al. (2022) suggests that the legal framework or institutional framework for the mega-sized firms, including competition policy or antitrust law, may play a more significant role in determining the labour income share.

Studies on the association between market power caused by market concentration and income distribution are traced back to an array of pioneering studies of Kalecki (1938, 1940, 1971b) and Steindl (1952, 1979). The gist of their work is that wage shares are determined by markups, the ratio of resources to wage costs and the composition

[37] Baqaee and Farhi (2017) highlight that an increase in the aggregate level of market power is due to the *spending shift* from low-markup firms to high-markup (superstar) firms rather than the increase in the markups of each individual firm.

of industry. Kalecki's original proposition[38] is that the relative share of wages in GDP is inversely related to the degree of monopoly power and the ratio of raw material cost relative to labour costs (i.e., $\frac{W}{Y} \propto \frac{1}{\mathcal{L}}$ where $\frac{W}{Y}$ is aggregate wage share of national income Y; $\mathcal{L} = \frac{p-MC}{p}$ is Lerner's index.). He later reformulated his notion by replacing Lerner's index by markup ratio μ. Furthermore, Kalecki (1971a) considered union power as another counteracting factor to firms' market power, which affects income distribution in favour of labour.[39] Later the Kalecki's notion was reemphasized by Steindl (1990).

In this light, Kalecki's policy implication is straightforward and epitomized in the following quote :[40]

> "...if the effect of the increase in the degree of monopoly upon the distribution of national income is not counteracted by other factors, there will be a relative shift from wages to profits."(Kalecki, 1968, p.161)

From the neoclassical perspective, the fact that the elasticity of substitution (σ) between capital and labour is greater than 1 - thus, capital deepening - has been providing a pivotal point to understand the recent declines in labour share in the U.S. income (Karabarbounis and Neiman, 2013). When the elasticity of substitution is high, firms can more easily substitute capital for labour, leading to a decrease in the relative price of labour and a decline in wage share of total income. This has been particularly evident in the U.S. economy, where technological advancements have made capital increasingly substitutable for labour. However, Lawrence (2015) recently proposed an alternative view to the previous claims by arguing that labour-augmenting technical change in the U.S. has been rapid enough to cause effective capital-labour ratios to

[38] See Appendix section C.1 for the detailed derivation of his proposition.

[39] Kalecki (1940) presents a microfoundation for imperfect competition in which firms set the markup price over average variable costs based on the state of market imperfection. His underpinning for markup pricing under imperfect market structure has become a norm of many subsequent studies in a similar vein.

[40] Not surprisingly, the aforementioned studies on market power have a major difference from Kalecki's original work; the market power in today's economy is more concentrated on a few superstar firms while the market power in the Kalecki's economy is formed by the aggregation of each individual firm's markups. However, the Kalecki's statement is still valid in the context of the current "superstar" phenomenon.

fall in the sectors and industries experiencing the decline in the labour share. Indeed, the estimated σ turns out to be less than 1 in the large volume of empirical literature (Lawrence, 2015). The argument is further supported by Barkai (2020)'s finding that both capital and labour shares are jointly offset by a large increase in the profit share (see Section 4.4 for formal definition of labour share, capital share and profit share). In sum, the updated neoclassical account of the decline of labour share focuses on the rise of profit share of superstar firms or large business groups like Korea's *chaebols* rather than the tradeoff or substitutability between labour and capital. This suggests that profitability plays a key role in the decline in the labour share in highly industrialized economies. Hence, it is worthwhile to investigate whether any pro-competitive policy measurements could effectively curb markups (market power proxy) and profitability of the large corporations.

Aghion et al. (2021) recently addressed the effect of pro-competitive reforms on the market power of *chaebols*. They sort industries into two: *chaebol*-dominant industries and relatively competitive industries without *chaebol*-dominance to measure the size of reform effects on each category. Aghion et al. (2021) show that reform effect is significantly larger in the previously *chaebol*-dominant industries in which labour productivity and total factor productivity (TFP) increased more than in other industries after the reforms. In terms of the degree of competition, the entry barriers of *chaebol*-dominant industries were lowered by virtue of the reforms. The patenting activity of non-*chaebol* firms also increased in particular in the *chaebol*-dominant industries. Most importantly, the markups of *chaebol* firms were significantly lowered. Thus, pro-competitive reforms reduced *chaebol*'s market power. However, there still remains a question on the distributional impact of the pro-competitive reforms in terms of labour share of value added. This chapter addresses whether the reduced market power necessarily leads to the increase in the labour share, the question that Aghion et al. (2021) does not clearly answer. Thus, this study is focused on the benefit or harm of the pro-competitive reforms more from the workers' perspective. Based on the estimation results, this chapter shows that the reduced markup does necessarily lead to neither lower profit share nor higher labour share of the value added among

chaebols that survived the crisis.

Pro-competitive reforms in the goods market have been shown to have a potentially negative impact on labour share through three primary channels. Firstly, when firms invest their profits in labour-saving technologies or innovation, it can lead to reduced demand for labour and lower wages. This effect is exacerbated when firms are faced with greater competition, as they seek to cut costs in order to maintain profitability. Secondly, pro-competitive reforms may have an impact on firms' entry and exit. In particular, greater competition may lead to increased exit of large business groups during the reform period, leading to reduced labour share.

Moreover, pro-competitive reforms may have distributional consequences. The impact of these reforms on the labour market can be uneven, with some groups benefiting while others suffer losses. Winners from pro-competitive reforms may benefit from increased wages and improved working conditions, while losers may experience reduced wages and job losses.

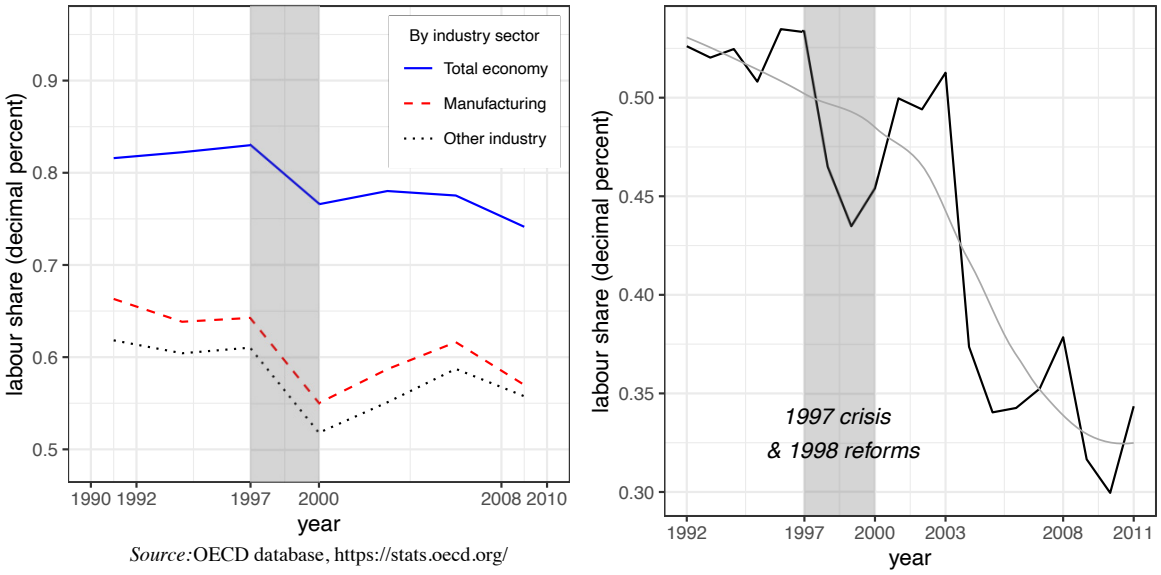
It is important to note that the impact of labour market reforms on labour share can vary depending on the specifics of the reform and the economic context in which it is implemented. In the case of Korea's pro-competitive reforms, these policies were introduced as a response to the 1997 Asian financial crisis. In their analysis of the impact of this crisis on labour market outcomes, Maarek and Orgiazzi (2013) identified two primary channels through which the effects of the crisis were felt: within-sector effects and across-sector effects. Within-sector effects refer to the erosion of bargaining power among workers in a given sector as a result of the financial crisis. This can occur due to the increased competition for jobs and the resulting pressure on workers to accept lower wages and benefits in order to remain employed. As a result, labour's share of the total value created by the sector may decline. Across-sector effects, on the other hand, result from structural changes in the economy that occur during the crisis, which can have significant impacts on the level of employment in different sectors depending on their relative capital intensities. This can further impact the overall labour share of the economy, as some sectors may experience greater increases in productivity and profitability than others.

These findings are consistent with earlier work by Kalecki (1971a) who argued that markups are largely determined by the bargaining power of workers, and Rodrik (1997, 1998) who demonstrated that financial distress can weaken labour's bargaining power in negotiations with employers. By understanding the specific mechanisms through which financial crises can impact labour market outcomes, policymakers can design more effective labour market reforms that promote greater equity and stability in the economy.

4.3 Background

Figure 4.1 aims to capture the main features of income distribution trends in Korea by examining the labour shares both before and after the 1997 Asian financial crisis at both the industry level and for a group of listed companies on the Korea Composite Stock Price Index (KOSPI). The analysis indicates a sharp decline in labour share during the financial crisis, followed by a subsequent rebound. However, the labour trend for KOSPI firms appears to be less straightforward, with a decline observed since 2003 that has remained on a decreasing trajectory. This suggests that while labour share may have rebounded following the financial crisis, the longer-term trend for KOSPI firms has been towards a decrease in the labour share of value added. These findings have important implications for policymakers and highlight the need to monitor and address trends in labour share in the wake of economic shocks and over the longer term to ensure a fair distribution of income between labour and capital in the Korean economy. Now the question is whether the 1998 pro-competitive reforms played a significant role in this dynamics and if so what kind of role the reforms played during the implementation period.[41]

[41]There has been a series of fierce controversies over the authentic measure of labour share and its trend between conservative and progressive economists in Korea. The major difference lies in the concern that wages has lagged behind growths in GDP per employment in Korean economy. The conservative school even argue that wage growth is surpassing the productivity growth in the manufacturing sector based on the firm-level and establishment-level micro data. The opposite side argues that wage share has failed to reflect the labour productivity growth by addressing the measurement issues. The discussion has been the focus of the policymakers as well as the media in Korea since the minimum wage policy highly hinges on the issue in recent years (see Park (2019); Lee (2019) for the details of the discussion.).



*Source:*OECD database, https://stats.oecd.org/

Figure 4.1: Income Inequality Trends of Korea

The 1998 pro-competitive reforms were the government's first attempt to curb the market power of mega-sized firms. Until the outbreak of financial crisis in 1997, *chaebols* have been deemed as one of the most effective growth of engines of Korean economy.[42] The government protection policies made the *chaebol*-led growth a norm of Korea's growth model. The government supported *chaebols*' operations with a coercive financial repression. As the economy grew, the size of *chaebols* rapidly expanded. Moral hazard and high default risks were not a concern of policymakers who cherished the memory of Korea's growth miracle in 1970s and 1980s. In midst of financial crisis in 1997, however, *chaebols* became the main target of media's criticism that *chaebols*' high debt ratio with poor maturity structure, low profitability and corrupted government-*chaebol* nexus eventually led to the outbreak of the crisis.

After industrialization, the corporate sector was still under the control of the government, which successfully managed to impose the competition law mainly upon *chaebols*; for example, the Monopoly Fair Trade Act (MRFTA) was enacted in 1981 and amended in 1986. Since then the MRFTA and its instruments have effectively controlled *chaebol*'s market power with both political and economic intentions. So-

[42]The emergence and the growth of most *chaebols* occurred during the 1970s, when the government launched the heavy and chemical industry promotion through the selective credit policy whose major beneficiaries are *chaebols*.

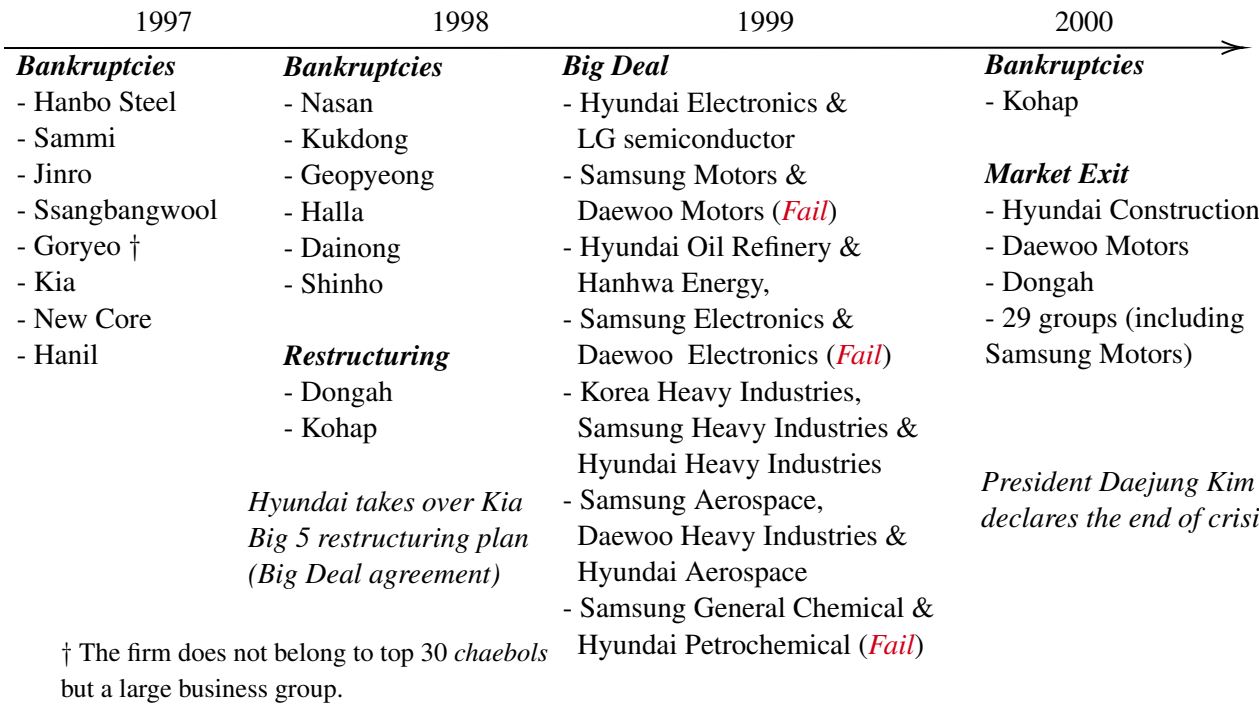


Figure 4.2: Timeline of *Chaebol* Big Deals (Pro-competition Reforms)

called "*chaebol* policy" that sought to contain the market power and promote fair competition had already existed with the first amendments to the MRFTA in 1986 (Shin, 2003).

Regulation of *chaebols* under the MRFTA strengthened after the 1997 financial crisis. The chain bankruptcy of high-ranking *chaebols* including Daewoo, which collapsed on November 1st in 1999 led the government to embark on a comprehensive *chaebols* reform (Shin, 2003). The structural reform of the corporate sector including the *chaebols* was also a precondition for the government to apply for the IMF bailout loans.

Figure 4.2 briefly shows the timeline of the pro-competitive reforms, so called *Big Deal*, whose major target was the top 30 largest *chaebols*. The chart also presents *chaebols* that either filed for bankruptcies or voluntarily exited the market. It also enumerates all the specific events as part of *Big Deal*. For example, the deal between Hyundai Electronics and LG Semiconductor in 1999 was part of a broader pro-competitive reform program initiated by the South Korean government. Both

manufacturers were one of major players in the Korean semiconductor market at the time, but faced stiff competition from larger companies such as Samsung and SK Hynix. The Korean government encouraged mergers and acquisitions by emphasizing the mutual benefits of specialization between companies and the promise of further financial supports. However, the negotiations between Samsung Motors and Daewoo Motors broke down in 1999 due to the substantial amount of corporate debt that Daewoo had accumulated, which posed a significant barrier to the success of the merger talks.

In particular, the government eradicated the mutual debt guarantees and more strictly monitored the corporate governance and its accounting. One of the most notable aspects of the reforms was that they significantly reduced entry barriers for non-*chaebol* firms (including foreign-owned ones) and loosened the government's grip on *chaebols*' access to credit, eliminating the former's preferential treatment of the latter and establishing a level playing field for the latter (Aghion et al., 2021).

However, the *chaebols*' anti-competitive related-party transactions (RPTs) were not reduced but rather reinforced after the restructuring; the *chaebols*' ownership structure and dominant sales performance remained intact even after the reforms (see Figure C.14.). Furthermore, the profitability of the corporate sector improved due to the reform, and this effect is more prominent among survived *chaebols* (Joh, 2003). In sum, the *chaebol* reforms turned out to be fragmentary and the *Big Deals* among *chaebols* was not completely successful.

Along with the incomplete implementation of the reforms, a series of literature among Korean economists (e.g., Cheong, 2001; Yoo, 2004; Kang and Yun, 2008; An and Bosworth, 2013) has documented the sharp increase in income inequality right after the crisis.[43] It is also believed that layoffs hit the labour market due to the crisis-related serial bankruptcy filings of *chaebols*, further deteriorated the labour share of national income. On the other hand, however, one may find this incidence puzzling because large business groups with outwardly less market power in the presence of

[43]One may note that inequality trends in most statistical figures show that it is not the 1997 financial crisis that triggered the increasing income inequality or reversal of the decreasing trend in wage inequality though as indicated in Kang and Yun (2008).

intensified competition is highly likely to decrease their markups, transferring less profit to business owners, capitalists, managers and other entrepreneurial groups. Thus, I find it necessary not only to conduct an in-depth research on the effectiveness of the pro-competitive reforms on *chaebols* but also to compare the effect between *chaebols* and non-*chaebols* and between top 30 *chaebols* and big business groups which are ranked below 30 in the KFTC's list.[44] In particular, the finding on the differentiated impact of the pro-competitive reforms on the market concentration ratio makes the current study more intriguing by shedding light on the the association between competition, concentration and labour income share.

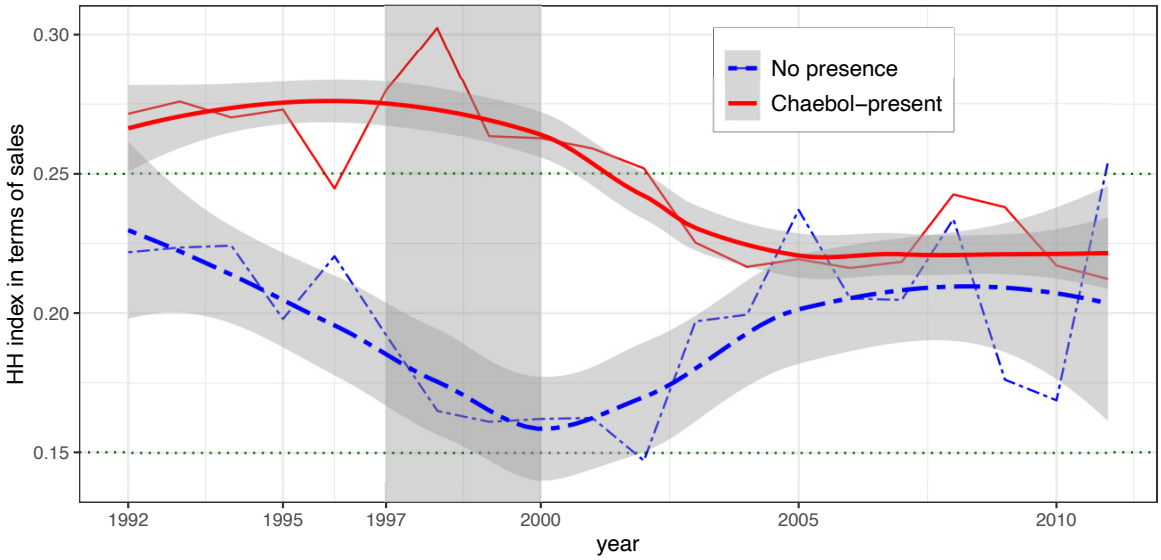
According to Figure 4.3, the market concentration ratio (Herfindahl-Hirschman Index: HHI) was significantly reduced during the crisis period and the effect is more pronounced in *chaebol*-present industries. The left panel of Figure 4.3 shows that the overall trend of aggregate HHI was dramatically declining during the reform period even though we cannot ensure that this change is due to the pro-competitive reform. However, when we look at the right panel, each group's trend turns out to be dissimilar. Considering that the major target of the reform was top 30 *chaebols*, the reform effect on the industries with non-trivial *chaebol*-presence is more pronounced; most industries with non-trivial *chaebol*-presence changed from highly concentrated markets to moderately concentrated ones, indicating the entry barrier was lowered in these industries. Aghion et al. (2021) argue that the reforms together with the removal of entry barriers and preferential credit support for *chaebols* significantly increased the degree of competition among Korean firms.

Empirical evidence suggests that the negative impact of pro-competitive reforms on labour share can be significant, particularly in the case of the 1998 pro-competitive reforms. The loser effect, whereby some workers experience reduced wages and job losses, appears to be more dominant during this period, leading to a decline in labour share. These findings underscore the importance of carefully considering the potential distributional consequences of pro-competitive reforms in the goods market, and taking

[44]For more information on the detailed analysis on other categories, see Appendix section C.2, which provides comprehensive explanation and illustrations of the effectiveness of the reforms in each category.

steps to mitigate any negative impacts on labour market and workers.

The discussion on the effect of pro-competitive reforms on labour market is not straightforward and depends on various factors, including the mechanisms through which the reforms affect labour demand and the distributional consequences of the reforms. Thus, the contribution of this study is to provide empirical evidence for the relationship between pro-competitive reforms and labour market consequences, in particular, labour income share.



HHI ranges from 0 to 10,000 in general when whole percentage numbers are used. Similarly, it can also range from 0 to 1, in which market shares (sales) are calculated as fractions. In specific, HHI less than 1,500 or 0.15 indicates a competitive market, 1,500 to 2,500 or 0.15 to 0.25 a moderately concentrated, and over 2,500 or 0.25 a highly concentrated one. In this figure, dominant presence refers to an industry where top 30 chaebols' share is above their median share.

Figure 4.3: Trend of Market Concentration ratio (HHI), aggregate (left) and by chaebol dominance

4.4 Markup Construction

This section constructs key variables: labour share, capital share, and profit share and markups that will be used in the regression models. In the Cobb-Douglas production function with only two factors of production L, K assumed, the labour share corresponds to α, the exponent of labour input L (i.e., $Q = AL^{\alpha}K^{\beta}$ where A denotes total factor productivity.). Accordingly, β represents capital share. The presence of positive profit share implies that markets are not perfectly competitive –

firms do not face a perfectly flat or elastic demand curve. An alternative notion of market power would be the degree of monopoly (Kalecki, 1971b), measured by Lerner index and then later replaced by markup ratio. In this study, I use markups as a proxy of firms' market power based on De Loecker and Warzynski (2012) for its estimation.

Markup data is not usually available because the marginal cost of a specific good is not observable. Estimation is even more challenging for the case of a large conglomerate like *chaebol* producing multiple products. This section briefly introduces an estimation method based on De Loecker and Warzynski (2012) that has become one of norms to measure the markups and total factor productivity (TFP). This method takes the production approach which derives firm-level markups by solving a standard cost minimization problem.

A set of multiple inputs X_{it} including labour, electricity, intermediate goods,[45] and capital stock K_{it} are given with its corresponding price p_{it}^{X}, a continuous and twice differentiable production function for firm i's output, $Q_{it} = Q_{it}(X_{it}^{1}, ..., X_{it}^{N}, K_{it}; \theta_{it})$ where θ_{it} is productivity of firm i in time period t. Further assumptions are made for the sake of estimation: first, the productivity measure θ is governed by a scalar Hicks-neutral productivity term $\exp(\theta_{it})$. Secondly, β is a set of common technology parameters that determine the transformation technology. That is,

$$Q_{it} = F(X_{it}^{1}, ..., X_{it}^{k}, K_{it}, \beta) \exp(\theta_{it}) \tag{4.1}$$

The first order condition of the associated Lagrangian function for a particular input X^n yields:

$$\frac{\partial Q_{it}(\cdot)}{\partial X_{it}^{n}} = \frac{p_{it}^{X^n}}{\lambda_{it}} \tag{4.2}$$

where λ_{it} is the Lagrange multiplier, which reflects the marginal cost of the production

[45] Bureau of Economic Analysis defines intermediate inputs as the goods and services (including energy, raw materials, semi-finished goods, and services that are purchased from all sources) that are not used for final consumption. It equals the industry's total output (consisting of sales or receipts and other operating income, commodity taxes, and inventory change) less value added (consisting of labour share or employees' compensation, taxes on production and imports less subsidies, and gross operating surplus).

constraint, namely *shadow price*. Hence the markup ratio μ_{it} is defined as $\frac{p_{it}}{\lambda_{it}}$.

Multiplying both sides by $\frac{X_{it}^k}{Q_{it}}$ generates the equivalent expression in terms of elasticity:

$$\underbrace{\frac{\partial Q_{it}(\cdot)}{\partial X_{it}^k}\frac{X_{it}^k}{Q_{it}}}_{\varepsilon_{it}^X} = \frac{p_{it}^{X^k}}{\lambda_{it}}\frac{X_{it}^k}{Q_{it}} = \underbrace{\frac{p_{it}}{\lambda_{it}}}_{\mu_{it}}\underbrace{\frac{p_{it}^{X^k}X_{it}^k}{p_{it}Q_{it}}}_{\alpha_{it}^X} \tag{4.3}$$

where ε_{it}^X denotes the elasticity of output production on an input X^k.

For the sake of simplicity, De Loecker and Warzynski (2012) also assume that production technology utilizes a single input, which is labour L_{it} with its corresponding price w_{it}. Then the markup rate is given as

$$\mu_{it} = \frac{\varepsilon_{it}^X}{\alpha_{it}^X} = \frac{\varepsilon_{it}^L}{\alpha_{it}^L} \tag{4.4}$$

where α_{it}^X is the share of expenditure on input X^n in total sales $p_{it}Q_{it}$. By the assumption of a single input, labour, $\alpha_{it}^L = \frac{w_{it}L_{it}}{p_{it}Q_{it}}$, the labour share on total sales or simply the revenue share.

Given the derivation of markups, ε_{it}^X is obtained by estimating the production function and α_{it}^x can be usually obtained from micro data. A novel feature of De Loecker and Warzynski (2012)'s estimation is that their approach can accommodate inputs with adjustment costs such as the firm's capital stock. This implies that estimation via capital input includes the expected stream of costs and revenues and adjustment costs besides the current markup.

Ackerberg et al. (2015) estimate the following firm-specific value-added translog production function in log capital k_{it} and log labour input l_{it} is given by

$$y_{it} = \beta_l l_{it} + \beta_k k_{it} + \beta_{ll} l_{it}^2 + \beta_{kk} k_{it}^2 + \beta_{lk} l_{it} k_{it} + \theta_{it} + \epsilon_{it} \tag{4.5}$$

The estimation procedure consists of two stages:

i) Regress y_{it} on a third-degree polynomial in inputs l_{it} and k_{it}.

$$y_{it} = \phi_t(l_{it}, k_{it}, m_{it}, z_{it}) + \epsilon_{it} \tag{4.6}$$

That is to estimate expected output ($\hat{\phi}_{it}$) and ϵ_{it} given by

$$\phi_{it} = \beta_l l_{it} + \beta_k k_{it} + \beta_{ll} l_{it}^2 + \beta_{kk} k_{it}^2 + \beta_{lk} l_{it} k_{it} + h(m_{it}, k_{it}, z_{it}) \tag{4.7}$$

ii) Compute productivity θ_{it} for any value of β using the law of motion for productivity given by

$$\theta_{it} = g_t(\theta_{it-1}) + \xi_{it} \tag{4.8}$$

That is, we obtain the estimates for productivity by using $\theta_{it}(\beta) = \hat{\phi}_{it} - \beta_l l_{it} + \beta_k k_{it} + \beta_{ll} l_{it}^2 + \beta_{kk} k_{it}^2 + \beta_{lk} l_{it} k_{it}$.

Since $\varepsilon_{it}^l = \frac{\partial F(l_{it}, k_{it}, \theta_{it})}{\partial l_{it}}$, taking the first derivative of equation (4.1) yields

$$\varepsilon_{it}^k = \beta_l + 2\beta_{ll} l_{it} + \beta_{lk} k_{it} \tag{4.9}$$

For the second component of markups in equation (4.4) α_{it}^l can be obtained by including the corrected output based on $Q_{it}^* = F(\cdot)\exp(\epsilon_{it})$. Thus, we have

$$\alpha_{it}^* = \frac{w_{it} L_{it}}{p_{it} Q_{it}} = \frac{w_{it} L_{it}}{p_{it}} \cdot \frac{Q_{it}}{\exp(\hat{\epsilon}_{it})} \tag{4.10}$$

Finally, we obtain the estimated markups for each input as

$$\mu^* = \hat{\theta}_{it}^X \cdot \alpha_{it}^{X*} \tag{4.11}$$

I also compute additional key variables as follows: The pure profit share of gross value added is:

$$\sigma_\pi = \frac{\Pi}{P^Y Y} = \frac{P^Y Y - wL - RP^K K - \text{Indirect Taxes}}{P^Y Y} \tag{4.12}$$

Finally, labour share of gross value added is

$$\sigma_l = \frac{\text{Wage Bill}}{P^Y Y} = \frac{wL}{P^Y Y} \tag{4.13}$$

I pay attention to the profit share rather than capital share to examine whether inverse relationship between labour share and profit share still holds as documented in Barkai (2020).

4.5 Data and Descriptive Statistics

In this section, I estimate markups and productivity based on the data from the Korean Stock Exchange, and then measure profitability, profit share, capital share and labour share in order. For the estimation for markups and productivity, I follow De Loecker and Warzynski (2012). Data on the financial statements of the companies listed on the Korean stock market has been provided by the FnGuide Inc.[46] and Data Analysis, Retrieval and Transfer System (DART).[47] Since 1987, Korea Fair Trade Commission (KFTC) – which was considered the first to attempt institutional reform to regulate the excess political and social influence of the so-called *chaebol* which had dramatically grown since the mid-1980s – has designated business groups based on pre-year financial data. Since 1992, KFTC has been selecting top large business groups, so called top 30 largest *chaebols* according to their asset sizes. In particular, The KFTC defines a business group in Korea as a group of companies that are connected by ownership, management, or financial relationships, and that engage in related or mutually beneficial activities. The KFTC considers a large business group to exist when the combined assets of the group's member companies exceed KRW 5 trillion or when the group controls more than 30% of the market share in a particular industry. They also define a business group in Korea, which is defined as a group of companies with a total assets of KRW 1 trillion[48] or more and with interlocking ownership or control among the member companies. The KFTC uses this criterion to regulate the activities of business groups in Korea and to prevent anti-competitive behavior in the marketplace. The summary is presented in Section 4.5.

[46] fnguide.com

[47] http://englishdart.fss.or.kr/. The website is operated by the Financial Supervisory Service that provides comprehensive financial information commonly appearing on the balance sheets of every listed and statutory audited firms in Korea including general financial status, history, shareholders and various types of operations such as production and sales performances.

[48] Approximately, it is approximately equal to 0.84 billion USD as of year 2021.

Table 4.1: Composition of the Entire Industry by Asset Size

	Top 30 *Chaebols*	Large Business Groups	Business Groups
Number	1,296	1,850	4,348
Percentage	17.63%	25.14%	59.13%

Note: The numbers change depending on the changes in firm's asset size.

The Korean Standard Industrial Classification (KSIC) is a classification system adopted by the Korean Statistical Information Service (KOSTAT)[49] and is based on the International Standard Industrial Classification (ISIC) developed by the United Nations. In this study, the two-digit division of KSIC, consisting of 77 industrial sections, was chosen and 35 sections were used for this study as shown in Table 4.2.

[49] http://kssc.kostat.go.kr/ksscNew_web/ekssc/main/main.do

Table 4.2: Korean Standard Industrial Classification Indices

KSIC	Freq.	Percent	Cumulative
M) Apparel	177	2.36	2.36
M) Basic metal	578	7.70	10.06
M) Beverage	74	0.99	11.05
M) Chemical	791	10.54	21.59
M) Coke and briquetts	24	0.32	21.91
M) Electrical equipment	243	3.24	25.14
M) Fabricated metal products	52	0.69	25.84
M) Food	381	5.08	30.91
M) Furniture	52	0.69	31.61
M) Leather, luggage and footwear	52	0.69	32.30
M) Medical and pharmaceuticals	542	7.22	39.52
M) Medical, precision and optical	33	0.44	39.96
M) Motor vehicles and trailers	553	7.37	47.33
M) Non-metalic and mineral products	292	3.89	51.22
M) Other	30	0.40	51.62
M) Other machinery and equipment	311	4.14	55.76
M) Other transport equipment	92	1.23	56.99
M) Pulp and paper	245	3.26	60.25
M) Rubber and plastic products	281	3.74	64.00
M) Textile	122	1.63	65.62
M) Wood and its product	48	0.64	66.26
S) Business support	30	0.40	66.66
S) Computer programming	64	0.85	67.51
S) Eleciticity, gas, steam and air conditioning supply	115	1.53	69.05
S) Electrical components, computers and communication equipment	438	5.84	74.88
S) Finance	70	0.93	75.82
S) General contruction	313	4.17	79.99
S) Land transport via pipelines	141	1.88	81.87
S) Motion pictures	45	0.60	82.47
S) Postal and telecommnication	47	0.63	83.09
S) Professional: science and technology	677	9.02	92.11
S) Retail trade except motor vehicles	96	1.28	93.39
S) Sports and recreational	24	0.32	93.71
S) Storage and transportation supports	40	0.53	94.24
S) Wholesale and commission trade	432	5.76	100.00

The final dataset analyzed in this study comprised 7,355 member firms. However, certain categories such as public administration, national defense, compulsory social security, human health and social work activities, membership organizations, water supply, and sewage were excluded due to data unavailability or irrelevance. In the regression analysis, the variable (KSIC2) was used to represent industry/sector identification as it is a time-invariant characteristic.

To gain further insights from the data, I classified the entire industry sectors into two categories based on the degree of dominance of the top 30 largest *chaebols* as well as their presence. The first category, which we referred to as the '*chaebol*-dominant' sectors, consisted of industries where the top *chaebols*' shares were above the median. The second category encompassed all other industry sectors. The results are summarized in Section 4.5.

Table 4.3: Classification of Industries by *Chaebol*' Presence and Dominance

	w/o *Chaebol*-dominance	w/ Dominance	Total
w/o *Chaebol*-presence	1,419	0	1,419
w/ Presence	3,068	2,868	5,936
Total	4,487	2,868	7,355
Percentage	61%	39%	100%

Note: This classification is based on the top 30 largest *chaebols*' market share in each industry sector.

Based on the data analyzed, 22 out of 35 sectors were classified as *chaebol*-dominant, and with the exception of four sectors, every sector in the dataset had the presence of *chaebols*. This data selection process was conducted to ensure the relevance of the study's findings by focusing on industries and firms that are most affected by *chaebol* dominance. The inclusion of time-invariant industry identification variables and careful categorization of the industries allows for a more accurate analysis of the effects of pro-competitive reforms on labour share, productivity, markups, and HHI. This categorization highlights the significant influence that *chaebols* have on the South Korean economy and underscores the need for further investigation into their impact

on industry competition and market dynamics.

The database covers three primary stock indices (KOSPI, KOSDAQ and KONEX). They keep the KOSPI data from 1981, KOSDAQ data from 1997 and KONEX from 1999. So only KOSPI data provides the information covering the range of period of this study (see Table C.6 for the descriptive statistics of the sample.). I trace the listing history of the large business groups and top 30 large business groups. In particular, the composition of top 30 *chaebols* shows a stark difference from that of pre-crisis period, indicating that a significant number of business groups filed the bankruptcy or exit the market. More figures that show the evolution of firms' financial operation and their key variables are presented in the Appendix section C.3.[50]

Notable feature of cleaned data is the classification of sectors depending on the degree of either *chaebol* presence or dominance. Following Aghion et al. (2021), I classify the industries based on two criteria: first, industries with non-trivial *chaebol* share and industries with zero *chaebol* share and second, industries above and below the median *chaebol* share. That is, a dummy variable called *chaebol-dominant* equals to 1 if the industry meets the condition that top 30 *chaebol* share in a certain industry is above the median of top 30 *chaebol* share of the entire economy and a dummy variable called *chaebol-present* equals to 1 if the industry meets the condition that top 30 *chaebol* share is not equal to zero. So the group of firms in the industries above the median *chaebol* share is the subset of the group of firms in the industries with non-trivial *chaebol* share. The purpose of this classification is to examine whether the degree of chaebols' dominance in the industry will make any differences in terms of the effect size. In this way, we can tell whether simple presence of *chaebols* affects the significant effectiveness of the reforms requires substantial dominance of *chaebols* in each industry.

This study also uses the database called 'Korean Firm Database I (1976-2005)' used by Chung and Lee (2015) for additional descriptive statistics of firm-level data.

[50]See Figure C.8 for asset and liability trends; see Figure C.9 for sales and net profits; see Figure C.10 for equity and COGS; see Figure C.12 for net profits and sales-cost ratio between groups; see Figure C.11, Figure C.13 and Figure C.14 for internal transactions; see Figure C.15 and Figure C.16 for patenting activities and real estate ownership between groups; see Figure C.17 and Figure C.18 for the trend of capital and profit share.

Featuring Korean firms listed on the stock market for the period 1956 to 2005, the database provides a comprehensive description on the crucial features of Korean firms of the 1950s, 1960s, and 1970s: firm size (in terms of employment, revenue and shares), ownership structure, capital structure, profitability, patenting activities, etc. In particular, with the top 30 *chaebol* data, this database enables researchers to obtain not only a big picture of the evolution of Korea's industry but also understand a particular role of *chaebols* in the growth process and the macroeconomic impact of *chaebol*-oriented economic policy on Korea's economy. The summary statistics of the data is presented in Table C.6.

The main regressand is labour share and the model further examines the effects on the several additional dependent variables such as HHI,[51] markups, productivity including TFP, average labour and capital productivity, profitability including earnings before interest and taxes (EBIT), rate on equity (ROE), and profit ratio, capital and profit share. The average labour productivity is defined by total real value added over total number of full-time employees and denominated by the Producer Price Index (PPI as of year 2010). I also attempt to pinpoint the treatment group by carefully observing the change in the asset size and the number of employees of firms that has top 30 *chaebol* membership. Lastly I also consider land ownership as an indication of rent-seeking behaviour of firms rather than pursuing employees' welfare through higher labour share or investing their profit on innovation and technological progress.

Estimating the top 30 *chaebols* poses a significant statistical challenge due to survivorship bias (Aghion et al., 2021). The firms that are listed are only those that have survived the crisis, potentially leading to overestimation, particularly in markups. Furthermore, bankrupt firms' assets and sales outcomes may have been absorbed by other top 30 *chaebols* through mergers and acquisitions or the *Big Deal* plan during the reform period, further complicating the estimation process. Changes in *chaebol* membership status may also affect our understanding of their market share, as the

[51]The Herfindahl-Hirschman Index (HHI) is a widely used measure of concentration by using the market share of each firm i. $HHI = \sum_{i=1}^{n} [Market\ Share_i]^2$. The index ranges from 1/10,000 to 10,000. An HHI below 100 indicates a highly competitive market; an HHI between 1,500 and 2,500 indicates a moderately concentrated market; an HHI above 2,500 indicates high concentration.

status is not a fixed firm-specific characteristic but depends on asset size and changes over time, particularly among lower-ranking groups below rank 20 on the list (Aghion et al., 2021). That is, identities of firms may change even as market structure remains. However, the impact of these changes on the *chaebols*' market share is expected to be minimal, and the dominance of the top 5 *chaebols* among the top 30 remains prominent. To address these challenges, Aghion et al. (2021) suggest running regression analyses only on surviving firms, and in this study, I present the results of the same analysis.

4.6 Identification Strategies and Assumptions

To measure the effect of pro-competitive reforms, I employs difference-in-differences (DiD). The estimation strategy is presented in this section, along with some of its variations, to address the paper's particular area of interest. A list of the available empirical frameworks is provided below.

2×2 DiD Model This is a static model to estimate the treatment effect of the 1998 pro-competitive reforms on large firms including top 30 largest *chaebols*, large business groups, and business groups – which are variables of separate treatment groups used in this study – by comparing year 1996 and year 2002. The most significant advantage of a two-period simple difference-in-differences (DiD) model is that it allows researchers to estimate the causal effect of a treatment while controlling for time-invariant differences between treatment and control groups. The method can help to address potential biases that may arise from unobserved factors that affect both the treatment and control groups, in the current study, which can be the effect of financial crisis on unemployment by assuming the parallel trends between the treatment and control groups. By comparing the change in the outcome variable for the treatment group before and after the treatment to the change in the outcome variable for the control group over the same time period, the DiD model can estimate the treatment effect while controlling for any pre-existing differences between the groups that do not vary over time. A simple DiD model specification is the following:

$$y_{jit} = \alpha_i + \beta_1 Treated + \beta_3 PostReform_t + \beta_4 Treated \times PostReform_t + u_{it} \quad (4.14)$$

where y_{jit} is an outcome such as markups, labour share, profit share, productivity. i denotes 2-digit (KSIC2) industries to which individual j firm belongs. For the treatment groups, $Treated$, I use each different treatment groups as a treatment variable in each separate regression model for the comparison. They are $Chaebol30_j$, $Chaebol30Share_i$, lbg, and bg. We need to note that $Chaebol30_j$, lbg_j, and bg_j are binary indicators; $Chaebol30_j$ indicates whether the firm is the member of top 30 *chaebols* annually determined by KFTC based on the asset sizes, bg_j and lbg_j indicate whether the firm belongs to large business groups or business groups, which are also annually announced, respectively before the year of 1998. $Chaebol30Share_i$ is a continuous variable that measures the pre-crisis top 30's sales share of *chaebols* in each industry i for each year. This variable can be obtained by dividing the total sales of top 30 largest *chaebols* by the total sales of all listed firms in the data (i.e., $\frac{\sum_{j=1}^{30} top30sales_{jit}}{\sum_{j=1}^{N_i} sales_{jit}}$).

Here, we pay special attention to the top 30 largest *chaebols* because they were the major target of the pro-competitive reforms, in other words, the most *Big Deal* negotiations were made among those *chaebols* during the pro-competitive reform period. Accordingly, the top 30 *chaebols* are excluded from both *lbg* and *bg*, and this exclusion will give us more precise effect of the pro-competitive reforms on the largest *chaebols*. Hence, we can also expect that the reform effect may be trivial on the remaining business groups or firms.

Following Aghion et al. (2021), I also use this variable as a proxy for the degree of domination of *chaebols* in a given industry before the crisis and at the same time, therefore, a proxy of the exposure of the *industry* to the 1998 pro-competitive reforms instead of that of the exposure of the *individual firms* to the reforms. This distinction is meaningful since the target of the reforms could be either insolvent individual enterprises or highly concentrated industries. We also need to note that the $Chaebol30Share_i$ variable is absorbed by the industry fixed effects, further simplifying the model specification. $PostReform$ is a binary indicator of whether the years are before or after the reform period. I choose two period, 1996 and 2002, the year before and after the reforms respectively to implement DiD estimates.

With respect to the identification strategy of our DiD model, the assumption that both *chaebol* treatment groups and other control groups would have followed parallel trends in the outcome variable in the absence of the pro-competitive reforms is critical. In other words, any differences in outcomes between these two groups after the intervention are assumed to be solely due to the pro-competitive reforms rather than any pre-existing differences between the groups.

Causal inference on the effect of the reforms on labour share may be a challenging task due to the fact that the reforms were implemented as a consequence of economic crisis which led to massive layoffs in the manufacturing sectors. That is, the reforms are not random treatments. In general, labour share further declines during the financial crisis since unemployment rate soars as firms lay off more workers, in particular unskilled ones. So it is critical to control for the crisis effect by a proper identification strategy while looking into reform effect. In this chapter, the analysis mainly hinges on the parallel trends assumption which indicates that the impact of financial crisis on both control and treatment groups is expected to be similar.

4.7 Results and Discussion

4.7.1 Canonical Difference-in-differences Model Outcomes

Table 4.4 is the first DiD estimation based on the regression model in equation (4.14). The coefficients in the first row shows the impact of the pro-competitive reforms on each key variable. Here I first set a dummy variable of top 30 *chaebols* as the treated group. This designation is to see if the pro-competitive reforms have overall impacts on the top 30 *chaebols*. This is obviously a broad selection, which we expect the effect to be relatively small compared to when we designate the top 30 *chaebols*' market shares in terms of their sales performance as the treated group identifier. According to Table 4.4, labour share is reduced by 0.024 unit, which is not statistically significant. The estimate for markups is also not significant. However, in Table 4.5, the labour share is significantly reduced by 0.125 unit. In both cases of using a dummy of top 30 *chaebols* and a continous variable of top 30 *chaebol shares*,

there is a significant increase in the profit share by 0.096 and 0.117, respectively. The logarithmic capital productivity ($\log(\phi_k)$) significantly increased by 0.38% in Table 4.4. The market concentration index (HHI) in terms of sales performance was decreased by 0.031 unit in Table 4.5, indicating that the reforms effectively reduced the market concentration in terms of market sales.

Table 4.4: Effects of Pro-competitive Reforms (Top 30 *Chaebols*): Two-period DiD

	Dependent variable:							
	σ^l	σ^π	log(der)	$\log(\phi_l)$	$\log(\phi_k)$	TFP	HHI	μ
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Top30Chaebols	-0.040^{**}	0.073^{**}	-0.081	0.131^{***}	0.352^{**}	2.833^{**}	-0.002	-0.084^{**}
×PostReform	(0.017)	(0.033)	(0.057)	(0.046)	(0.160)	(1.156)	(0.012)	(0.042)
Top30Chaebols	-0.038^{**}	-0.042	0.496^{***}	0.329^{***}	-0.412^{***}	-2.037^{**}	0.064^{***}	-0.116^{***}
	(0.015)	(0.028)	(0.050)	(0.040)	(0.139)	(1.004)	(0.011)	(0.037)
PostReform	-0.115^{***}	0.097^{***}	-0.835^{***}	0.568^{***}	0.175^{***}	-0.670	-0.029^{***}	0.089^{***}
	(0.007)	(0.013)	(0.023)	(0.019)	(0.065)	(0.474)	(0.005)	(0.017)
Observations	7,284	7,284	7,284	7,284	7,284	7,284	7,284	7,284
R^2	0.058	0.012	0.205	0.185	0.003	0.001	0.024	0.017
Resid.SE	0.242	0.456	0.795	0.647	2.228	16.136	0.171	0.591
F Stat	150.123^{***}	28.834^{***}	626.365^{***}	550.020^{***}	8.172^{***}	2.081	59.149^{***}	40.834^{***}

Note: These regressions were run after winsorizing top and bottom 1% of each dependent variable for the whole sample period. Industries are classified into 35 sectors based on KSIC2. *p<0.1; **p<0.05; ***p<0.01.

Table 4.5: Effects of Pro-competitive Reforms (Top 30 *Chaebol* Shares): Two-period DiD

	Dependent variable:							
	σ^l	σ^π	log(der)	$\log(\phi_l)$	$\log(\phi_k)$	TFP	HHI	μ
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Top30Share	-0.121^{***}	0.082^{**}	0.055	0.143^{***}	0.235	3.097^{**}	-0.037^{***}	0.056
×PostReform	(0.018)	(0.035)	(0.061)	(0.050)	(0.169)	(1.212)	(0.012)	(0.045)
Top30Share	0.048^{***}	-0.022	0.174^{***}	0.001	0.068	-8.175^{***}	0.205^{***}	0.067^{*}
	(0.016)	(0.030)	(0.053)	(0.043)	(0.145)	(1.043)	(0.010)	(0.039)
PostReform	-0.067^{***}	0.070^{***}	-0.885^{***}	0.524^{***}	0.108	-1.064	-0.027^{***}	0.039
	(0.010)	(0.020)	(0.035)	(0.029)	(0.096)	(0.687)	(0.007)	(0.025)
Observations	7,284	7,284	7,284	7,284	7,284	7,284	7,284	7,284
R^2	0.056	0.013	0.178	0.136	0.004	0.017	0.137	0.007
Resid SE	0.243	0.456	0.809	0.666	2.228	16.001	0.161	0.593
F Stat	142.770^{***}	31.025^{***}	525.427^{***}	382.584^{***}	9.252^{***}	43.033^{***}	385.209^{***}	17.559^{***}

*p<0.1; **p<0.05; ***p<0.01

Note: These regressions were run after winsorizing top and bottom 1% of each dependent variable for the whole sample period. Industries are classified into 35 sectors based on KSIC2.

We need to note that the choice between the dummy variable as a top 30 *chaebol* indicator and the continuous variable of the top 30 *chaebols*' sales share in a DiD model makes a difference in terms of the interpretation of the coefficient estimators or the effect size of the pro-competitive reforms. In the model using the indicator variables, the coefficient estimate will represent the average treatment effect (ATE) of the pro-competitive reforms on the outcome variable, regardless of the size or market share of the firms. This means that the effect of the reforms on *chaebols*' operation or income distribution is assumed to be the same in each industry regardless of the firms' sales share.

On the other hand, a continuous variable of *chaebols*' sales share as a *chaebol* identifier or treated group identifier, the coefficient estimate will represent the average treatment effect on the treated group (ATT) of the pro-competitive reforms, specific

to the firms with a high sales share. In other words, the reforms effect on the top 30 *chaebols* will be different for industries where *chaebols* have a relatively larger sales share of the market, compared to industries where they have a smaller share. The coefficient estimate will reflect the significant change in the outcome variable caused by the reforms only for those industries where the top 30 *chaebols* have a high sales share or market power, and not for the other industries. Therefore, the choice of treated group has the following implication: the dummy variable of the top 30 *chaebols* implies that the effect of the pro-competitive reforms is same for all the top 30 *chaebols* given specific industry. However, the estimates of the model of continuous sales share represents differential effect of the reforms on *chaebols* with a high sales share compared to other *chaebols* in the same industry.

Table 4.4 and Table 4.5 show that the signs of estimates for labour share and profit share are opposite, confirming that there is an inverse relationship between these two variables. It is also worth noting that while markups are a critical factor in comprehending market power, their decline alone cannot fully represent a decrease in market power. As highlighted by De Loecker et al. (2020), profitability also plays a significant role in this regard, particularly due to the presence of overhead costs or fixed costs that tend to increase markups to cover them, particularly when they are high. Therefore, it is crucial to pay attention to both markups and profitability as components of firms' market power. In this regard, the present study examines the impact of pro-competitive reforms on both markups and profitability, as reflected in the profit share (σ_π) of the top 30 *chaebols*.

We acknowledge that our regression may suffer from survivorship bias, whereby firms with higher profit share or lower labour share are less likely to exit the market or more likely to survive the financial crisis. To address this issue, I replicate the analysis of Aghion et al. (2021), limiting the sample to surviving firms. Table 4.6 compares the proportion of survivors between the top 30 *chaebols* and the remaining firms, with a slight variation in survivor ratio of 1.4%. Specifically, the survivor ratio in non-top 30 *chaebols* is 97%, while that in the top 30 *chaebols* is 95.6%. These results indicate that relatively smaller Korean firms may be more resilient and better able to weather

the financial crisis than mega-sized firms. I then proceed to present the regression output from running the analysis with surviving firms in Table 4.7. The coefficients are larger in absolute terms, which suggests no evidence of survivorship bias.

Table 4.7: Effects of Pro-competitive Reforms (Surviving *Chaebols*)

	Dependent variable:							
	σ^l (1)	σ^π (2)	log(der) (3)	log(ϕ_l) (4)	log(ϕ_k) (5)	TFP (6)	HHI (7)	μ (8)
Top30Shares	-0.122^{***}	0.071^{**}	0.091	0.151^{***}	0.188	2.270^{*}	-0.030^{**}	0.069
×PostReform	(0.019)	(0.035)	(0.062)	(0.051)	(0.172)	(1.237)	(0.012)	(0.046)
Top30Shares	0.047^{***}	-0.017	0.128^{**}	0.007	0.142	-7.843^{***}	0.205^{***}	0.054
	(0.016)	(0.030)	(0.054)	(0.044)	(0.149)	(1.066)	(0.011)	(0.039)
PostReform	-0.067^{***}	0.075^{***}	-0.893^{***}	0.516^{***}	0.121	-0.840	-0.031^{***}	0.034
	(0.011)	(0.020)	(0.035)	(0.029)	(0.097)	(0.699)	(0.007)	(0.026)
Observations	7,061	7,061	7,061	7,061	7,061	7,061	7,061	7,061
R^2	0.057	0.012	0.175	0.135	0.004	0.019	0.144	0.007
Resid SE	0.242	0.456	0.807	0.666	2.235	16.033	0.160	0.594
F Stat	141.930^{***}	29.000^{***}	500.699^{***}	367.451^{***}	9.712^{***}	44.570^{***}	396.081^{***}	16.723^{***}

*p<0.1; **p<0.05; ***p<0.01

Note: These regressions were run after winsorizing top and bottom 1% of each dependent variable for the whole sample period. Industries are classified into 35 sectors based on KSIC2. Firms that did not survived the crisis are identified (in this study) as Daewoo Shipbuilding, Daewoo Construction, E-land, Halla, Keumgang, Jinro, Haitai, Soosan, Anam Electronics for business groups and SPC Samlip, Hanshin, Kia Motors, Ssangbangwool, Shinwon for corporations. This does not represent a full list of non-surviving firms of the financial crisis.

Table 4.6: Proportion of Surviving Firms: Top 30 *Chaebols* vs. Remaining Firms

	Non-top 30 *Chaebols*	Top 30 *Chaebols*	Total
Non-survivors	187	60	247
Survivors	5,969	1,289	7,258
Surviving Ratio	97%	95.6%	96.7%
Total	6,156	1,349	7,505

Note: Regressions were run after winsorizing top and bottom 1% of each dependent variable for the whole sample period. Industries are classified into 35 sectors based on KSIC2. Firms that did not survived the crisis are identified (in this study) as Daewoo Shipbuilding, Daewoo Construction, E-land, Halla, Keumgang, Jinro, Haitai, Soosan, Anam Electronics for business groups and SPC Samlip, Hanshin, Kia Motors, Ssangbangwool, Shinwon for corporations. This does not represent a full list of non-surviving firms during the financial crisis.

Finally, I run the same regression on the firms in all top 30 *chaebol*-dominant sectors, and the results are presented in Table 4.8. The regression results indicate that the effects of pro-competitive reforms are more pronounced in these sectors than in all sectors combined. Specifically, the reforms reduced the labour share of firms in the *chaebol*-dominant sector by 64% more than the case when considering all sectors. Moreover, the pro-competitive reforms boosted TFP among the top *chaebols* in these sectors, which is surprising given the general expectation that such reforms may lead to a temporary decline in productivity. Additionally, the capital productivity of these firms significantly increased as well. However, the markups of the conglomerates did not show any significant change after the reforms. Interestingly, the overall HHI for the *chaebol*-dominant sector dramatically decreased following the reforms. This suggests that the pro-competitive reforms successfully lowered entry barriers in these sectors without affecting labour share. The reduced bargaining power of labour workers during the financial crisis led to more firms turning to labour cost-saving technology, leading to significant layoffs during the reform period.

Table 4.8: Effects of Pro-competitive Reforms (Top 30 *Chaebols* in *Chaebol*-dominant Sectors)

	Dependent variable:							
	σ^l	σ^π	log(der)	$\log(\phi_l)$	$\log(\phi_k)$	TFP	HHI	μ
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Top30Shares	-0.201^{**}	0.064	0.565^{*}	0.053	2.511^{***}	9.806^{***}	-0.677^{***}	0.355
×PostReform	(0.096)	(0.200)	(0.316)	(0.273)	(0.879)	(3.586)	(0.050)	(0.255)
Top30shares	0.194^{**}	-0.094	-1.010^{***}	-1.236^{***}	-2.385^{***}	-33.799^{***}	1.456^{***}	-0.179
	(0.079)	(0.164)	(0.259)	(0.224)	(0.721)	(2.942)	(0.041)	(0.209)
PostReform	0.004	0.062	-1.243^{***}	0.636^{***}	-1.962^{***}	-7.496^{**}	0.488^{***}	-0.213
	(0.079)	(0.165)	(0.260)	(0.225)	(0.724)	(2.954)	(0.041)	(0.210)
Observations	2,849	2,849	2,849	2,849	2,849	2,849	2,849	2,849
R^2	0.080	0.010	0.180	0.162	0.004	0.088	0.414	0.004
Resid SE	0.242	0.505	0.796	0.689	2.216	9.042	0.126	0.642
F Stat	82.950^{***}	9.528^{***}	207.565^{***}	182.928^{***}	3.778^{**}	91.579^{***}	669.285^{***}	3.670^{**}

*p<0.1; **p<0.05; ***p<0.01

Note: These regressions were run after winsorizing top and bottom 1% of each dependent variable for the whole sample period. Industries are classified into 35 sectors based on KSIC2. Firms that did not survived the crisis are identified (in this study) as Daewoo Shipbuilding, Daewoo Construction, E-land, Halla, Keumgang, Jinro, Haitai, Soosan, Anam Electronics for business groups and SPC Samlip, Hanshin, Kia Motors, Ssangbangwool, Shinwon for corporations. This does not represent a full list of non-surviving firms of the financial crisis.

4.7.2 Validity of Parallel Trends Assumption

A critical underlying assumption in DiD methods is the parallel trends assumption. This assumption allows us to postulate that treated group absent from the reform would have behaved in the same way as the control group of non-treatment. If the parallel trends assumption is violated, the DiD estimate may be biased and may not accurately capture the true treatment effect. In this case, the DID estimate may overestimate or underestimate the true treatment effect. In this study, I assume that the patterns of both *chaebol* and non-*chaebol* firms are expected to be the same

in terms of firms' market power and managerial behaviours without any intervention. In a DiD model, the parallel trends assumption requires that, in the absence of treatment, the difference in outcomes between the treated and control groups would have remained constant over time.

Figure 4.4 demonstrate that the gap between the Top 30 *chaebols* and their counterparts remains essentially stable till treatment time, supporting the parallel trends assumption. In the following, I also examine the coefficient plots from dynamic DiD models to assess the parallel trends assumption adopted in the previous DiD models. By examining the coefficient plots, we can identify any differences in the pre-treatment trends of the outcome variable for the treated and control groups. Later, to add more credibility to the parallel trends, I perform the placebo test by implementing an additional DiD estimation on a fake treatment group, say *chaebols* in 2008, a group which was not affected by the treatment. When running the regression, we expect that the pro-competitive reforms have no impact on the fake treatment group with a valid parallel trends assumption.

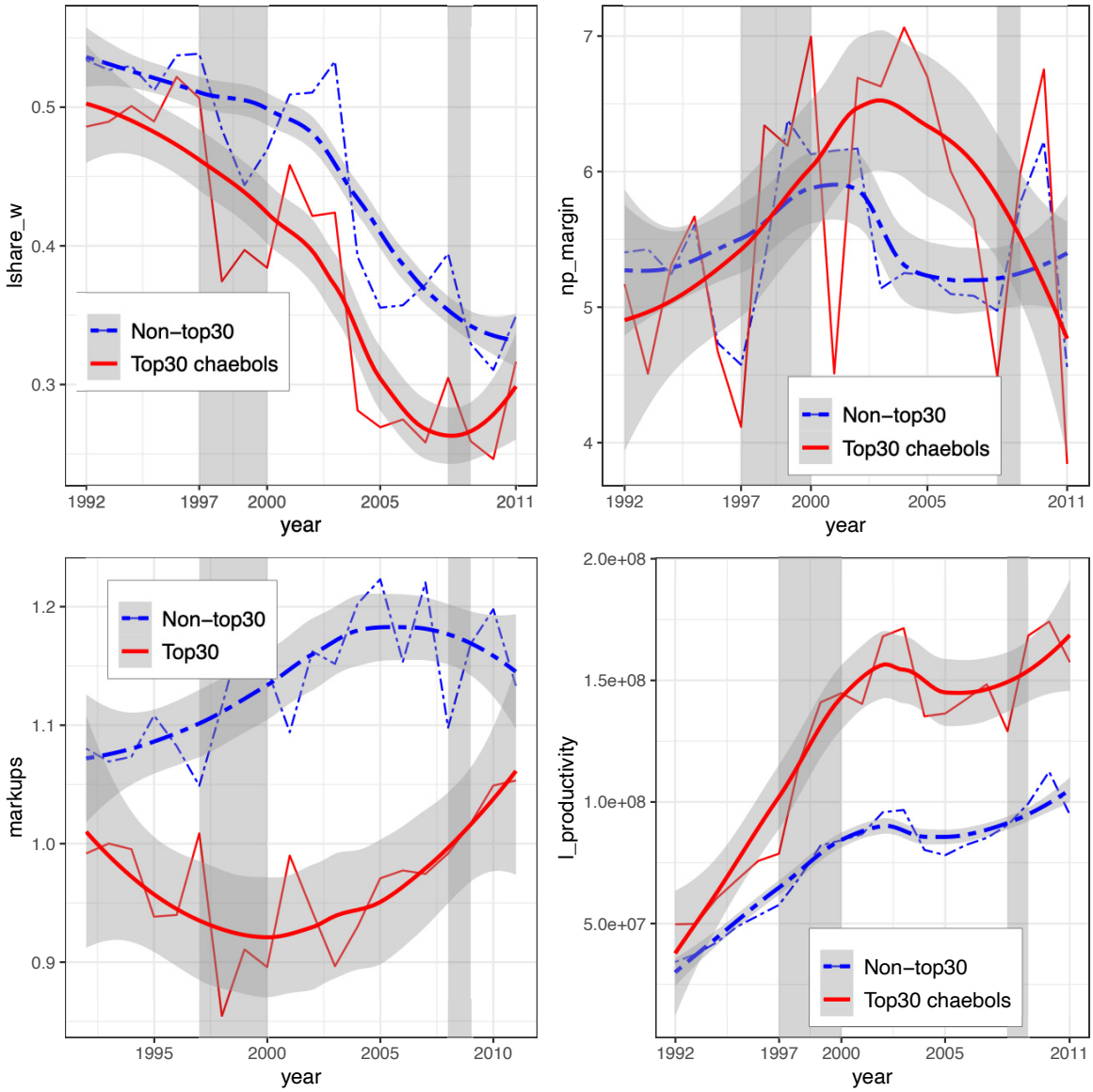


Figure 4.4: Trends of Key Variables (winsorized)

Placebo Test

Using a fake treatment group which covers the pre-treatment period only, we run the same DiD model to ensure the assumption. The parallel trends require that the estimates of the reforms effects to be statistically insignificant. Here I used the period between 1994 and 1996, and between 1995 and 1997 as if fake treatments for the control group had occurred in 1995 and 1996, respectively. The parallel trends can be validated in the sense that all the coefficients are not statistically significant, implying that there is no difference in the outcomes of the treated and placebo control

Table 4.9: Placebo Test

	σ_l	σ_k	TFP	HHI	μ
FakeTreated9496	−0.038	−0.039*	1.163***	0.001	−0.160*
	(0.020)	(0.017)	(0.304)	(0.002)	(0.064)
Num. obs.	1908	1908	1908	1908	1908
FakeTreated9597	−0.041	−0.060	1.326***	0.003	−0.148*
	(0.021)	(0.040)	(0.331)	(0.004)	(0.066)
Num. obs.	1908	1908	1908	1908	1908
Industry FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes

groups before the treatment time. Table 4.9 shows that the parallel trend is valid for labour share (σ_l) and market concentration ratio (HHI).

Further Robustness Checks This section aims to establish the robustness of our estimates by conducting a comparative analysis of the effects of the 1997 Asian Financial Crisis and the 2008 Great Recession. To ensure that the observed effects of pro-competitive reforms are meaningful, it is crucial that the estimation based on the association between the Great Recession and the same variables of interest generates distinct outcomes. Failure to do so could result in the inability to differentiate between the effects of the crisis and those of the reforms.

To achieve this objective, I employ the simple DiD regression model to distinguish the effects of pro-competitive reforms and the two major financial crises that impacted the Korean economy. The model allows us to analyze the differences in outcomes before and after an event and between affected and unaffected groups. If the estimates of key variables differ, it can be inferred that pro-competitive reforms have a unique impact on the dependent variables that cannot be solely explained by the effects of the crises. First, I collect pre- and post-2008 Great Recession, ranging from 2007 to 2011, which amounts to 395 observations. Next, I run the same simple two-period DiD regression to compare with the outcome of the pro-competitive reforms.

The results presented in Table 4.10 demonstrate that the regression outputs of the two crises are significantly different. The first row estimates inside the box remind us the result from Table 4.5 to compare with the estimates from regression

on the period of the Great Recession. The difference shows that the effect of the pro-competitive reforms (1998-1999) contributed to the differences observed between the periods before and after the 1997 financial crisis.

Table 4.10: Effects of 2008 Great Recession (Top 30 Shares): Two-period DiD

	Dependent variable:							
	σ^l	σ^π	log(der)	$\log(\phi_l)$	$\log(\phi_k)$	TFP	HHI	μ
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Top30Shares	−0.011	−0.132	0.065	−0.210	−0.467	1.218	−0.020	−0.079
×PostReform	(0.098)	(0.185)	(0.303)	(0.260)	(0.960)	(4.330)	(0.053)	(0.249)
Observations	433	433	433	433	433	433	433	433
R^2	0.055	0.039	0.009	0.020	0.001	0.051	0.168	0.012
Resid SE	0.283	0.536	0.876	0.753	2.779	12.536	0.152	0.721
F Stat	8.248***	5.876***	1.314	2.917**	0.208	7.728***	28.841***	1.719

*p<0.1; **p<0.05; ***p<0.01

Note: These regressions were run after winsorizing top and bottom 1% of each dependent variable for the whole sample period. Industries are classified into 35 sectors based on KSIC2.

4.8 Conclusion

This study aims to estimate the impact of pro-competitive reforms on the labour share of the Korean economy as well as firms' market power, particularly in relation to the operation of Korea's large business groups known as *chaebols*. While prior literature has suggested that the concentration of market power among mega-corporations and superstar firms is associated with a decline in labour share, it remains unclear whether this holds true for Korea.

Using difference-in-differences methods, both simple and dynamic DiD, this study demonstrates that the pro-competitive reforms had a negative effect on labour share that persisted after their implementation. This suggests that the pro-competitive reforms may have played a significant role in the dynamics of labour share, although

it is important to note that the negative impact of the financial crisis on income distribution cannot be entirely ruled out.

Contrary to expectations, pro-competitive reforms did not contribute to a decrease in top 30 *chaebols*' market power. The reforms were primarily focused on promoting the operational efficiency of *chaebols* through mergers and acquisitions, which altered the ownership structure of the top 30 *chaebols*. This suggests that the pro-competitive reforms prioritized efficiency and profitability over distributional issues and labour-friendly policies.

Moreover, the government's attempts to revolutionize the ownership structure of large business groups faced resistance, resulting in partial and marginal reform effects. The reforms targeted managerial and financial defects such as over-diversification, over-investment, and excessive debt-equity ratios, while seeking to lower entry barriers for foreign investors and increase dividend payment ratios.

Overall, this study implies that the enhanced competition among firms did not translate into the labour market outcomes. Instead, it appears that the pro-competitive reforms reinforced the bargaining power of large business groups over workers and allowed them to gain market power through frequent mergers and acquisitions, further expanding as larger conglomerates under the *chaebol* restructuring programs. Consequently, the profit share of big business groups increased while labour share continued to decline, validating previous findings. These outcomes indicate that the pro-competitive reforms were primarily business-friendly and had relatively little focus on labour-friendly policies, reinforcing the hegemony of *chaebols* in the Korean economy. Therefore, the myth of a trickle-down economy still prevailed in Korea, despite the pro-competitive reforms. The pronounced reduction in the labour share, which has coincided with an increasingly concerning pattern of income inequality in Korea throughout the 21st century, serves as a potent indicator of the inadequacies of the neoliberal framework governing the distribution of income. These findings provide valuable insights for policymakers seeking to promote competition and increase efficiency in the South Korean market.

5 Conclusion

In summary, Chapter 2 investigates the impact of selective industrial policy on the sectoral economy, with a case study of Korea's promotion of the Heavy and Chemical Industry (HCI). The study finds that the HCI promotion led to the rapid surge in market power of large business conglomerates called *chaebols* in the targeted sectors, creating a subordinate industrial structure between *chaebols* in the targeted sectors (H sector) and small and medium-sized firms in the non-targeted sectors (L sector). The economy also became vulnerable to external price shocks, leading to the further increase in excess or idle capacity in the H sector. Thus, the success of an industrial policy hinges on the government's initiative to ensure that beneficial effects outweigh unfavorable ones, and careful consideration of unintended consequences is necessary for successful implementation of strategic industrial policy.

Chapter 3 explores the impact of Korea's industrial policy (HCI promotion), the growth of *chaebols*, and income inequality dynamics. The study finds that the HCI promotion regime has facilitated the expansion of large firms, particularly *chaebols*, and enabled them to invest in massive capital projects without much consideration of default risk, widening income inequality. The simulation results support these findings. Policymakers should consider redistribution policies that promote a fair distribution of income and investment opportunities, encouraging innovation and competition among small and medium-sized enterprises.

Chapter 4 estimates the impact of pro-competitive reforms on the labour share of the Korean economy and firms' market power, particularly in relation to the operation of *chaebols*. The study finds that the pro-competitive reforms had a negative effect on labour share that persisted after their implementation, indicating that the reforms may have played a significant role in the dynamics of labour share. However, contrary to expectations, pro-competitive reforms did not contribute to a decrease in top 30 *chaebols*' market power, suggesting that the reforms prioritized efficiency and profitability over distributional issues and labour-friendly policies.

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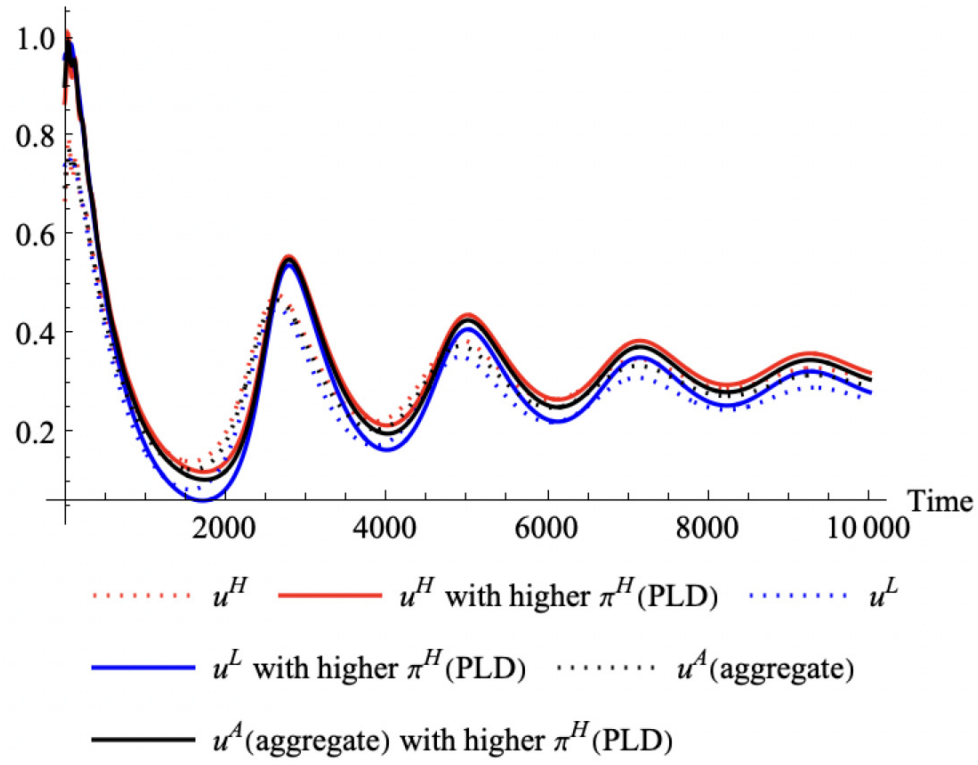
Appendices

A Chapter 2

A.1 Remaining Figures and Tables



Note) Each path is generated from $t = 0$ to $t = 20,000$ for the long-run dynamics.

Figure A.1: Long-run Capacity Utilization Paths with Increased Market Power

A.2 Algebraic Notes for Profit Share and Profit Rate

The sectoral profit share π^x is determined by μ^x (markup rate) and the ratio of materials to labour costs. Without considering the sectoral index, we have:

$$p = (1 + \mu)(ULC + UMC)$$

where ULC denotes unit (average) labour cost and UMC denotes unit material cost.

Since the sectoral value added per output, $va^x := \dfrac{VA^x}{Q^x} = \underbrace{ULC^x}_{wage} + \underbrace{\mu^x(ULC^x + UMC^x)}_{profit}$

$$\text{and the sectoral profit share, } \pi^x = \frac{profit^x}{total\ income^x}$$

$$= \frac{\mu^x(ULC^x + UMC^x)}{ULC^x + \mu^x(ULC^x + UMC^x)} = \frac{\mu^x\left(1 + \boxed{\frac{UMC^x}{ULC^x}}\right)}{1 + \mu^x\left(1 + \boxed{\frac{UMC^x}{ULC^x}}\right)},$$

the profit ratio and the profit rate of firms in each sector are determined as follows:

$$va^H = w^H a^H + \mu^H(w^H a^H + \gamma\epsilon p_m^*)$$

$$va^L = w^L a^L + \mu^L(w^L a^L + \phi p^H)$$

and

$$\pi^H = \frac{\mu^H\left(1 + \frac{\gamma\epsilon p_m^*}{w^H a^H}\right)}{1 + \mu^H\left(1 + \frac{\gamma\epsilon p_m^*}{w^H a^H}\right)}$$

$$\pi^L = \frac{\mu^L\left(1 + \frac{\phi p^H}{w^L a^L}\right)}{1 + \mu^L\left(1 + \frac{\phi p^H}{w^L a^L}\right)}.$$

Equivalently,

$$\mu^H = \frac{\pi^H}{1 - \pi^H} \cdot \frac{1}{1 + \frac{\gamma p_m^*}{w^H a_N^H}}$$

$$\mu^L = \frac{\pi^L}{1 - \pi^L} \cdot \frac{1}{1 + \frac{\phi p^H}{w^L a_N^L}}$$

The expressions above can be rewritten as

$$w^H a_N^H = \frac{1-\pi^H}{\pi^H} \cdot \mu^H \gamma p_m^*.$$

$$w^L a_N^L = \frac{1-\pi^L}{\pi^L} \cdot \mu^L \phi p^H.$$

Hence,

$$z = \frac{w^H a_N^H}{w^L a_N^L} = \frac{\frac{1-\pi^H}{\pi^H} \cdot \mu^H \gamma p_m^*}{\frac{1-\pi^L}{\pi^L} \cdot \mu^L \phi p^H} = \frac{\pi^L(1-\pi^H)\mu^H \gamma p_m^*}{\pi^H(1-\pi^L)\mu^L \phi p^H}$$

The sectoral profit rate R^x is given by

$$R^x = \frac{\pi^x u^x}{a_K^x} = \pi^x u^x, \quad x = \{H, L\}$$

where $a_K^x = 1$ is assumed.

A.3 Algebraic Notes for the Derivation and Illustration of Sector-specific Excess Demand Functions

The excess demand for heavy industry is given by

$$ED^H = \underbrace{\phi Q^L + I^H + I^L + E^H}_{\text{Demand for investment goods}} - \underbrace{Q^H}_{\substack{\text{Supply of} \\ \text{investment goods}}}.$$

Normalizing each term above by capital stock, we have

$$\begin{aligned}
\frac{ED^H}{K^H} &= \frac{\phi Q^L}{K^H} + \frac{I^H}{K^H} + \frac{I^L}{K^H}\frac{K^L}{K^L} + \frac{E^H}{K^H} - \frac{Q^H}{K^H} \\
&= \phi u^L \frac{K^L}{K^H} + \alpha_0^H + \alpha_1^H(R^H - i^H) + \alpha_2^H u^H \\
&+ \left[\alpha_0^L + \alpha_1^L(R^L - i^L) + \alpha_2^L u^L\right] k + \zeta_0 + \zeta_1 \epsilon\Big(\frac{p^{H^*}}{p^H}\Big) - u^H \\
&= \phi u^L k + \alpha_0^H + \alpha_1^H(\pi^H u^H - i^H) + \alpha_2^H u^H \\
&+ \left[\alpha_0^L + \alpha_1^L(\pi^L u^L - i^L) + \alpha_2^L u^L\right] k + \zeta_0 + \zeta_1 \epsilon\Big(\frac{p^{H^*}}{p^H}\Big) - u^H
\end{aligned}$$

where $k = \frac{K^L}{K^H}$.

The equilibrium condition requires $ED = 0$. Hence, we have:

$$0 = (\phi k + \alpha_1^L \pi^L k + \alpha_2^L k)u^L + (\alpha_1^H \pi^H + \alpha_2^H - 1)u^H + \alpha_0^H - \alpha_1^H i^H + \alpha_0^L k - \alpha_1^L i^L k + \zeta_0 + \zeta_1 \epsilon\Big(\frac{p^{H^*}}{p^H}\Big)$$

Finally, we have the condition for heavy industry as follows:

$$u^H = \left[\frac{\phi + \alpha_2^L + \alpha_1^L \pi^L}{1 - \alpha_2^H - \alpha_1^H \pi^H}\right] k u^L + \left[\frac{\alpha_0^H - \alpha_1^H i^H + (\alpha_0^L - \alpha_1^L i^L)k + \zeta_0 + \zeta_1 \epsilon\Big(\frac{p^{H^*}}{p^H}\Big)}{1 - \alpha_2^H - \alpha_1^H \pi^H}\right].$$

Similarly, the excess demand for light industry is given by

$$ED^L = C^H + C^L - Q^L$$

where C^H and C^L are consumption of workers and firms in the H and L sector, respectively. Substituting equation (2.4), equation (2.5) and equation (2.12) into equation (2.15), and normalizing each term by the capital stock, we obtain.

$$\begin{aligned}
\frac{p^L ED^L}{p^L K^L} &= \frac{\overbrace{w^H N^H + w^L N^L}^{\substack{\text{Total consumption} \\ \text{out of their wage bill} \\ \text{with zero saving propensity}}} + \overbrace{(1-s)(R^H p^H K^H + R^L p^L K^L)}^{\substack{\text{Capitalists'} \\ \text{total consumption} \\ \text{out of their profit income} \\ \text{with the saving rate of } s}}}{p^L K^L} - \frac{p^L Q^L}{p^L K^L} \\
&= \frac{w^H N^H + w^L N^L + (1-s)R^H p^H K^H + (1-s)R^L p^L K^L}{p^L K^L} - \frac{p^L Q^L}{p^L K^L} \\
&= \frac{(1-\pi^H)p^H Q^H + (1-\pi^L)p^L Q^L + (1-s)(R^H p^H K^H + R^L p^L K^L)}{p^L K^L} - \frac{p^L Q^L}{p^L K^L} \\
&= (1-\pi^H)\frac{p u^H}{k} + (1-\pi^L)u^L - u^L \\
&= (1-\pi^H)\frac{p u^H}{k} - \pi^L u^L = 0
\end{aligned}$$

where $p = \frac{p^H}{p^L}$.

We finally get $u^H = \left[\frac{\pi^L}{p(1-\pi^H)}\right] k u^L$.

A.4 Parametric Setting

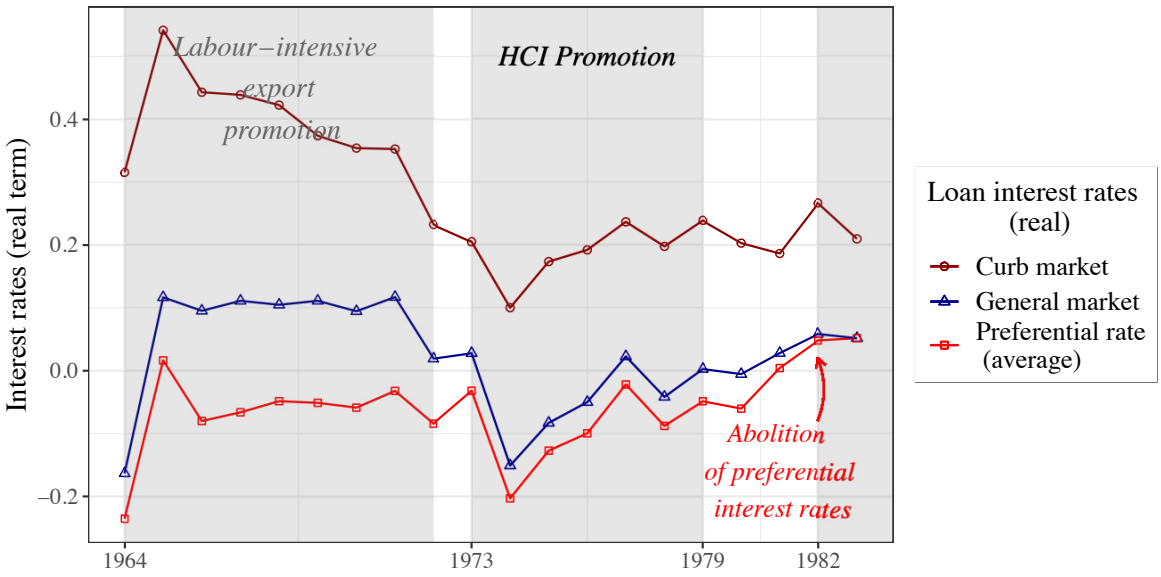
Table A.1: Parametric Setting for the Short-run Dynamics

Symbol	**Parameters** description	Values	Sources
a_K^H	Fixed amount of capital input per unit of potential output (H sector)	1.0	by assumption
a_K^L	Fixed amount of capital input per unit of potential output (L sector)	1.0	by assumption
i^H	Nominal preferential interest rate	0.117	BOK data (1973-1979)
i^L	Nominal market interest rate	0.167	BOK data (1973-1979)
π^H	Profit share in H sector	0.45	pre-determined by author
π^L	Profit share in L sector	0.40	pre-determined by author
ϵ	Nominal exchange rate	0.333	pre-determined by author
ϕ	Unilateral dependency rate of L sector on H sector	0.2	pre-determined by author
s	Saving rate	1	by assumption
k	Relative short-run capital ratio ($= \frac{K^L}{K^H}$)	0.25	pre-determined by author
α_0^H	Autonomous investment in H sector	0.01	pre-determined by author
α_0^L	Autonomous investment in L sector	0.05	pre-determined by author
α_1^H	Coefficient of sensitivity on net profit in g_K^H	0.01	pre-determined by author
α_1^L	Coefficient of sensitivity on net profit in g_K^L	0.01	pre-determined by author
α_2^H	Coefficient of sensitivity on capacity utilization rate in g_K^H	0.5	Nishi (2020)
α_2^L	Coefficient of sensitivity on capacity utilization rate in g_K^L	0.5	Nishi (2020)
ζ_0	Coefficient in export function in H sector	0.02	pre-determined by author
ζ_1	Coefficient in export function in H sector	0.02	pre-determined by author
θ^H	Adjustment speed of H sector with profit-led L sector	0.02664	Author's calculation
θ^H	Adjustment speed of H sector with wage-led L sector	0.009	Author's calculation
θ^L	Adjustment speed of L sector	0.01	pre-determined by author
η^H	Proxy of worker's bargaining power in H sector	0.28	pre-determined by author
η^L	Proxy of worker's bargaining power in L sector	0.3	pre-determined by author
q_π^H	Productivity growth rate by profit share in H sector (profit-led)	0.00025	pre-determined by author
q_π^H	Productivity growth rate by profit share in H sector (wage-led)	-0.00025	pre-determined by author
q_u^H	Productivity growth rate by utilization in H sector	0.025	Nishi (2020)
q_π^L	Productivity growth rate by profit share in L sector (profit-led)	0.00025	pre-determined by author
q_π^L	Productivity growth rate by profit share in L sector (wage-led)	-0.00025	pre-determined by author
q_u^L	Productivity growth rate by utilization in L sector	0.005	Nishi (2020)
$\bar{p}^H$	Exporting price of domestic goods from H sector	1.0	pre-determined by author
p^{H^*}	Competing foreign goods price	1.01	pre-determined by author
	Endogenous variables description		
u^H	Rate of capacity utilization in H sector	Equation (2.2)	
u^L	Rate of capacity utilization in L sector	Equation (2.2)	
z	Relative labour input cost ratio	Equation (2.25)	
Q^H	Actual level of output in H sector	Equation (2.4)	
Q^L	Actual level of output in L sector	Equation (2.4)	
p_H	Price level of goods in H sector	Equation (2.6)	
p_L	Price level of goods in L sector	Equation (2.7)	
R^H	Rate of return of firms in H sector	Equation (3.10)	
R^L	Rate of return of firms in L sector	Equation (3.10)	
g^H	Growth rate of capital stock in H sector	Equation (2.10)	
g^L	Growth rate of capital stock in L sector	Equation (2.10)	
E^H	Export of firms in H sector	Equation (2.12)	

Note: The parameter values used in the simulation and numerical analysis are not necessarily calibrated to reflect the real economy but instead to illustrate the basic properties for the steady-state of the model and characterize a representative economy under the industrial policy regime.

B Chapter 3

B.1 Remaining Figures and Tables



Source: Bank of Korea, Monthly Statistical Bulletin (various issues)

Figure B.1: Trends of Preferential Interest Rate (Average), General Market Rate and Curb Market Rate

B.2 Sensitivity Analysis

Sensitivity analysis is an essential tool for evaluating the robustness of ABMs. In this section, I conduct sensitivity analysis by varying the size of adjustment parameters. The procedure of sensitivity experiments in this study repeats the Monte Carlo experiment for different values of the parameters, storing each average and standard deviation of key variables including average rate of growth, Gini coefficients, Non-performing debts, bank and firm failures, etc.

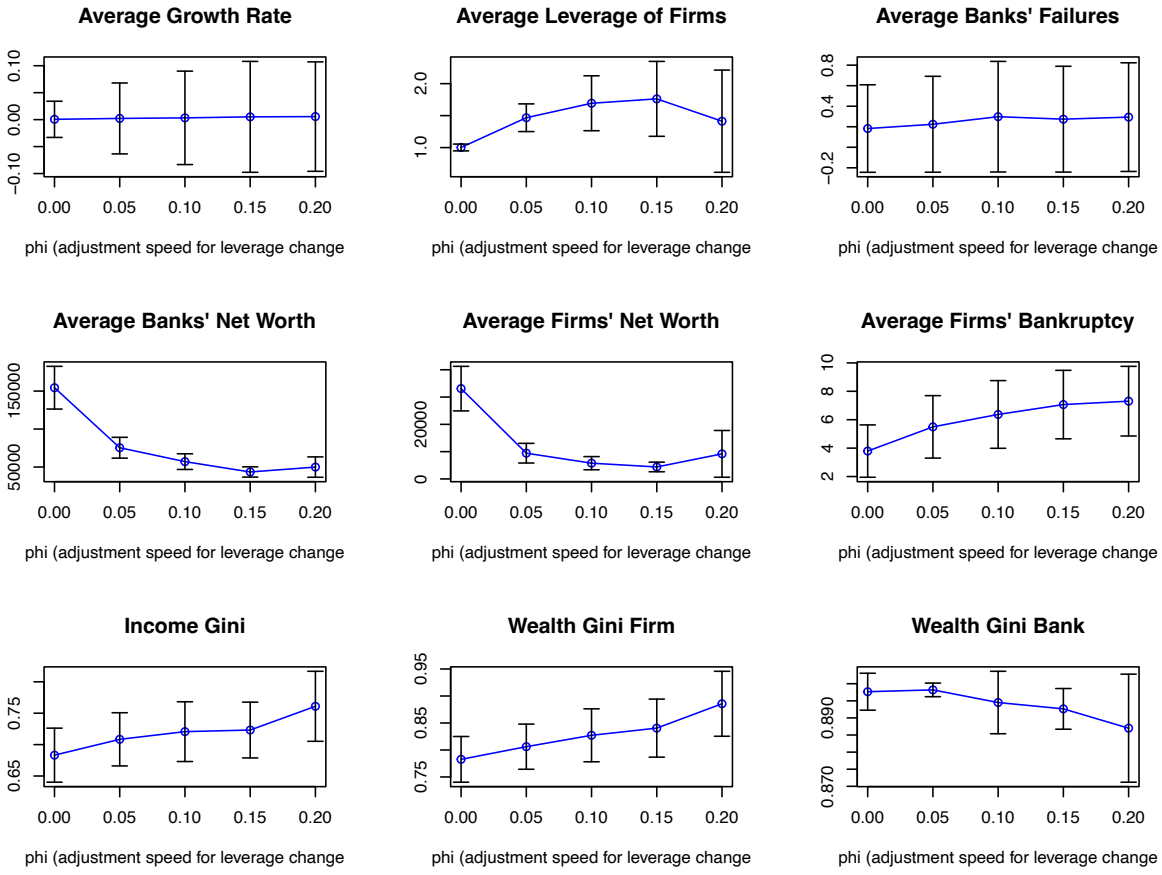


Figure B.2: Sensitivity Analysis

C Chapter 4

C.1 Derivation of Kalecki's Determination of Factors' Income Distribution

Kalecki focused on the role of firm's market power for price control in the determination of income distribution. He argues that there is a more direct association between the distribution of factor's income and the degree of firms' market power. In order to measure the market power, he used *Lerner index* (Kalecki, 1938). Later, he reformulated the notion by adopting markup as an alternative measure of market power. The following step illustrates the derivation of his core idea.

Kalecki theorem (Kalecki, 1938) with respect to a single firm's sales states:

$$\frac{w}{pq} \propto \frac{1}{\mathcal{L}} \quad \left(+\frac{w}{m}\right)$$

Table B.1: Balance Sheet Matrix

	Households	Firms	Banks	Government	$\sum$
Cash/Reserves			$+H$	$-H$	0
Loans	$-L_l$	$-L_f$	$+L_h + L_f$		0
Deposits	$+D_h$	$+D_f$	$-D_h - D_f$		0
Net worth	$+A_h$	$+A_f$	$+A_b$	$+A_g$	$\sum A$
$\sum$	0	0	0	0	$\sum A$

Note: (+) sign before a variable denotes an sources of funds or inflow while (−) sign uses of funds or outflow.

Table B.2: Transactions-flow Matrix

	Households	Firms	Banks	Government	$\sum$
Consumption	$-C_h$	$+C_f$			0
Government expenditure	$+UB$	$+G$		$-G - UB$	0
Wages	$+wN$		$-wN$		0
Interest on loans	$(-rL_h)$	$-rL_f$	$(+rL_h) + rL_f$		0
Interest on deposits	$+r^dD_h$	$(+r^dD_f)$	$-r^dD_h(-r^dD_f)$		0
Taxes/transfers	$-\tau_y wN_f$	$-\tau_\pi \Pi_f$	$-\tau_b \Pi_b$	$+T$	0
ΔCash/Reserves			$-\Delta H$	$+\Delta H$	0
ΔDeposits	$-\Delta D_h$	$-\Delta D_f$	$+\Delta D_b$		0
ΔBank loans	$+\Delta L_h$	$+\Delta L_f$	$-\Delta L_b$		0
$\sum$	0	0	0	0	0

Note: (+) sign before a variable denotes an sources of funds while (−) sign uses of funds.

Table B.3: Calibrated Values of Parameters

Symbol	Description of parameters	Baseline	Charact.(Source)
T	Time	1500	pre-SS
$TimeBanks$	Time of banks' operation	200	pre-SS
N	Total number of workers	1500	pre-SS
F	Total number of firms	100	pre-SS
B	Total number of banks	10	pre-SS
ν	Amortization period	30	pre-SS
ϕ_K	Capital productivity	1	
ϕ_L	Labour productivity	0.475	
η_1	Marginal consumption propensity to labour income	0.62	
η_2	Marginal consumption propensity to net worth	0.38	
μ	Initial markup	2.454	
μ_{max}	Upper bound of wage level	12	
μ_{min}	Lower bound of wage level	8	
τ_π	Marginal tax rate for corporate profit	0.15	pre-SS
τ_y	Marginal tax rate for labour income	0.15	pre-SS
τ_k	Marginal tax rate for capital income	0.15	pre-SS
τ_b	Marginal tax rate for banks	0.15	pre-SS
$r^{preferential}$	Average preferential loan interest rate	0.06	
$r^{baseline}$	Average baseline loan interest rate	0.08	
r^d	Deposit interest rate	0.157	pre-SS
ϕ	adjustment parameter that sets leverage target	0.04	pre-SS
$parMachingL$	Number of candidates for each vacant job	5	
$parMachingCL$	Number of consumers for each available good	2	
ξ	Leverage parameter: adjustment speed	0.1	
$\bar{r}$	Central bank's fixed policy rate	0.15	
γ	Investment fraction measure	2	
δ	Depreciation rate of capital	0.05	
$\bar{\omega}$	wage income share	0.8	pre-SS
$\bar{\pi}$	profit share	0.2	pre-SS
$\hat{un}_0$	Initial unemployment rate	0.08	pre-SS
G^{Exog}	Exogenous government real expenditure	150	
w^{Exog}	Exogenous reservation wage level	10	
w_{max}	Upper bound of wage level	12	
w_{min}	Lower bound of wage level	8	
p^{Exog}	Exogenous price level of goods	10	
$turnover$	Number of turnovers per each time period	1	
MC	Number of Monte Carlo simulation	200	

where w: wage bill, pq:firm's total sales, $\mathcal{L} = \frac{p}{p-MC} = \epsilon_D$ (Lerner index), m: raw material cost

The theorem is extended in terms of aggregate income as follows:

$$\frac{W}{PQ} \propto \frac{1}{\mu} + \left(\frac{W}{M}\right)$$

where W: aggregate wage bill, μ: markup PQ: nominal GDP, M: aggregate raw material cost

The following step shows how he reaches his proposition:

Preparation:

Π: aggregate profit and π_A average profit (per unit of product), so $\Pi = n\pi_A$

D:aggregate depreciation, d_A: average cost of depreciation, d_M: marginal cost of depreciation

O: aggregate overhead cost, o_A average overhead cost, o_M: marginal overhead cost

W: aggregate wage bill, w_A: average wage bill, w_M: marginal wage bill

R: aggregate raw material cost, r_A: average raw material cost, r_M: marginal raw material cost

Derivation of Kalecki's proposition Marginal cost (MC) and good's price (p) can be formulated as:

$$MC = d_M + w_M + o_M + r_M \tag{C.1}$$

$$p = d_A + o_A + w_A + r_A + \pi_A \tag{C.2}$$

equation (C.1) and equation (C.2) yield:

$$p - MC = \pi_A + (d_A - d_M) + (o_A - o_M) + (w_A - w_M) + (r_A - r_M) \tag{C.3}$$

We also know

$$L = \frac{p - MC}{p} \tag{C.4}$$

equation (C.4) is also $pL = p - MC$, thus:

$$pyL = y\pi_A + y(d_A - d_M) + y(o_A - o_M) + y(w_A - w_M) + y(r_A - r_M). \tag{C.5}$$

In aggregate,

$$\sum pyL = \sum y\pi_A + \sum y(d_A - d_M) + \sum y(o_A - o_M) + \sum y(w_A - w_M) + \sum y(r_A - r_M) \tag{C.6}$$

Assuming that o_M is negligible, w_M and r_M are constant, and $w_A \approx w_M$; approximately r_A is constant, so $r_A = r_M$. Then we have:

$$\sum pyL = \sum y\pi_A + \sum y(d_A - d_M) + \sum yo_A = \Pi + D(1-\alpha) + O(1-\beta) + \gamma W \tag{C.7}$$

Then equation (C.7) is rewritten as:

$$\sum pyL = (\Pi + D + O) - (\alpha D + \beta O - \gamma W) \approx \Pi + D + O \tag{C.8}$$

Since $\sum py = T$ (aggregate turnover), then:

$$L = \frac{\Pi + D + O}{\sum py} \approx \frac{\Pi + O}{T} \tag{C.9}$$

where L: weighted average of the degree of monopoly power of the whole economy

Kalecki's proposition is that the relative share of gross capitalist income and salaries in the aggregate turnover (T) is with great approximation equal to the average degree of monopoly(L). (Kalecki, 1938, p.102)

Now we reformulate the argument from aggregate perspective:
National income identity:

$$Y = W + \Pi + O \tag{C.10}$$

$$\Pi + O = Y - W \Leftrightarrow \frac{\Pi + O}{T} = \frac{Y - W}{T} \tag{C.11}$$

By equation (C.9), equation (C.11) is:

$$L = \frac{Y - W}{T} \Leftrightarrow \frac{L \cdot T}{W} = \frac{Y - W}{W} \Leftrightarrow \frac{W}{Y} = \frac{1}{1 + L \cdot (T/W)} \tag{C.12}$$

Here $\frac{W}{Y}$ is the wage share in the domestic national income, which therefore

inversely related to L and T/W, which is the ratio of total turnover to aggregate wage bill. Later Kalecki reformulated his distribution theory by replacing $\mathcal{L}$ by markup ratio $\frac{p_A}{AC}$ where p_A is average price and AC is average production cost. For the economy as a whole, it is the ratio of $\frac{A}{W+R}$ where $A = Y + R$ is aggregate proceeds, W is aggregate wage bill and R is aggregate raw material cost.

Let the degree of monopoly power m be $\frac{A}{W+R}$, then

$$\begin{aligned}
m(W+R) &= \Pi + O + W + R \\
\Leftrightarrow (m-1)(W+R) + W &= \Pi + O + W = Y \\
\Leftrightarrow \frac{(m-1)(W+R)}{Y} + w &= 1 \\
\Leftrightarrow w = 1 - \frac{(m-1)(W+R)}{(m-1)(W+R)+W} &\qquad \text{(C.13)} \\
= \frac{W}{(m-1)(W+R)+W} \\
= \frac{1}{(m-1)(1+\frac{R}{W})+1} \\
\Leftrightarrow w = \frac{1}{(m-1)(1+j)+1}
\end{aligned}$$

Thus, Kaleckian income distribution theory states the relative share of wage in the value added of the industry depends on m and j, the degree of monopoly power and the ratio of the material cost to the total wage bill, respectively.

C.2 Effectiveness of Pro-competitive Reforms

In this section, I want to present a few examples to highlight the impact of the reforms by comparing the behavioural evolution between *chaebol* affiliates and their counterparts during the reform period. In specific, this section illustrates the difference from three different angles: changes in market concentration, external output market and internal capital market transactions such as tunneling and mutual debt guarantees. Figures are based on the Korean Firm Database I (1976-2005) (Chung and Lee, 2015).

Changes in the market concentration or competitiveness, debt-equity ratio and the volume of related-party transactions (RPTs) show substantial reform effects on the corporate sector. The RPTs have been deemed unhealthy in the sense that they promote unfair competition among firms and lead to a rent-seeking behaviour, reinforcing the firms' market power. Another indicator is the trend of the number of patents between the two groups. The patenting activity is used as a proxy for the corporate innovation, which easily facilitates the accumulation of firm's market power.

The second aspect of this section is to introduce a couple of mechanisms of pro-competitive reforms. First, the reform may weaken the market power of *chaebols* by restricting related-party transactions between their subsidiaries. Also the lowered entry barrier by the introduction of the reform may encourage the more equal amount of patenting activities between *chaebols* and non-*chaebols*. Thus, market power will be more equally distributed among firms. The new entry among small and medium sized enterprises may increase along with higher amount of R&D activities among non-*chaebol* firms.

A. Debt-equity Ratio Figure C.1 also shows that the reforms were effective in reducing debt-equity ratio among the top 30 *chaebols*. Many commentators including economists in the IMF attributed the collapse of Korea's economy to high debt-equity ratio among large business groups that made the economy vulnerable to external shocks in the international capital market. As shown in the right panel, the ratio dramatically dropped among top 30 *chaebols*, substantiating the effectiveness of the reforms.

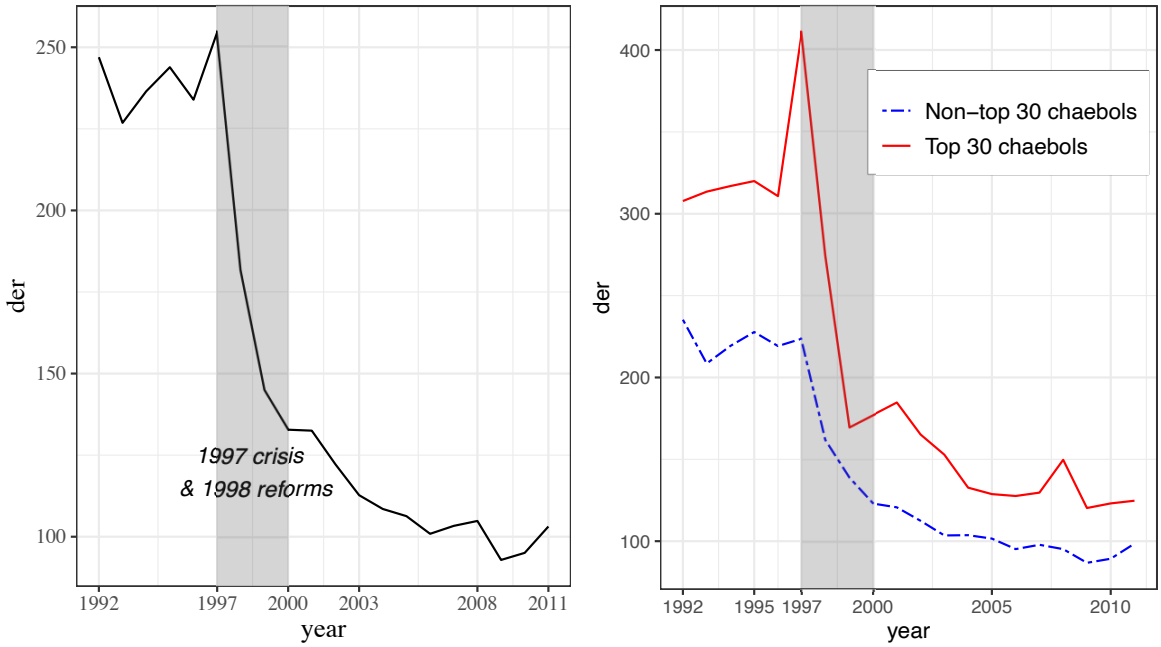


Figure C.1: Trend of Debt-equity Ratio

Figure C.2 and Figure C.3 presents the effect of the reforms is confined to liability through debt-equity ratio change among many items in the financial statement. The market dominance of *chaebols* had accumulated since 1970s' heavy and chemical industry promotion, and the pattern never ceased until the financial crisis in 1997.

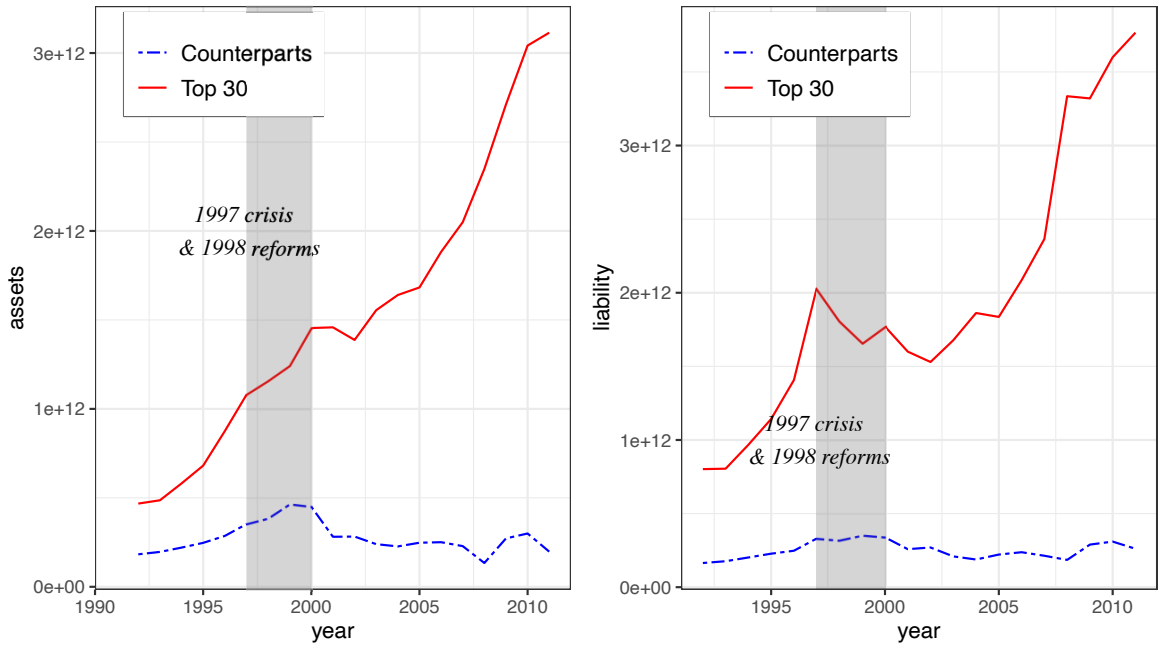


Figure C.2: Comparison between Top 30 Chaebols and Counterparts (asset and liability)

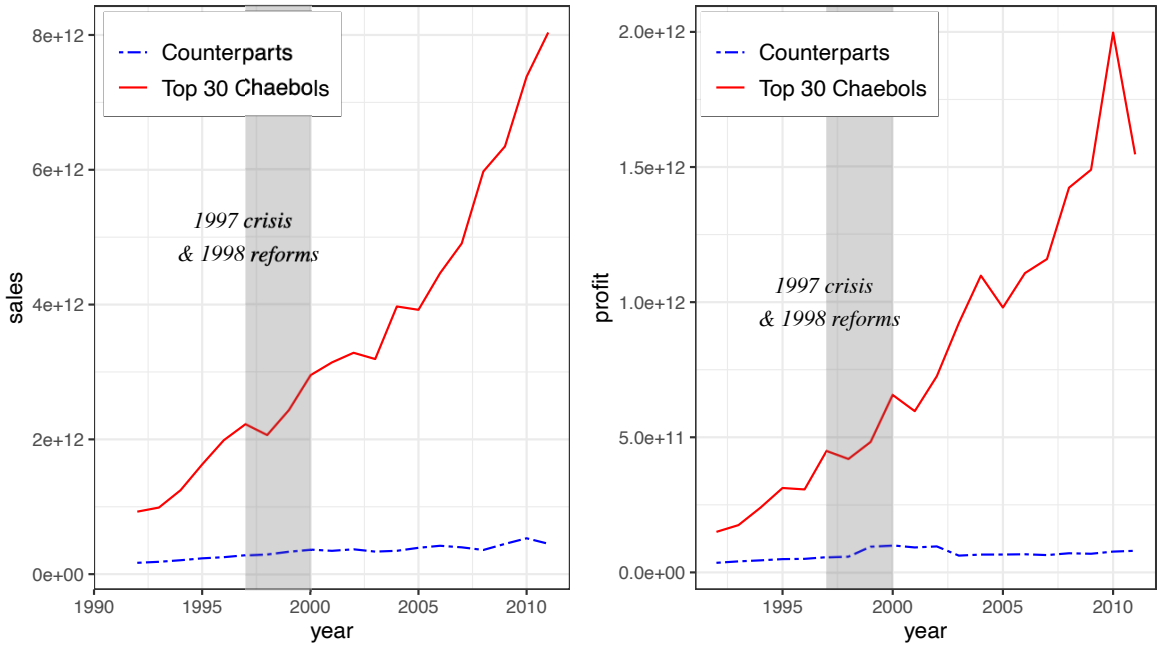


Figure C.3: Comparison between Top 30 Chaebols and Counterparts (sales and net profit)

B. Internal Transactions The *chaebols*' predominance is even more pronounced in related-party transactions (RPTs) (see Figure C.4 and Figure C.14.). La Porta et al. (1999) points out that the core of agency problem in large corporation around the world is that of restricting the managerial power abuse to expropriate minority shareholders to effectively control agency cost and maximize the firm value. The practice has become more common among big corporations like *chaebols* with loose monitoring role of the government upon corporate sector. In particular, companies where the values of shareholders and managerial group are not aligned are more likely to be indulged in this internal transactions. The implication on corporate inequality is fairly obvious: income and wealth could be easily accumulated through tunneling and self-dealing rather than through firms' sales performances.

The RPTs were clearly shrank during the crisis and reform period. In particular, pro-competitive reforms coercively prevent *chaebols* from these internal transactions as described in the earlier background chapter. Except cross shareholding, major internal transactions, in particular mutual debt guarantees were significantly reduced suggesting that the policy measures were fairly effective. In some regards, pro-competitive reforms were a powerful way to curb *chaebols*' market power whereas they were not effective

in other fields such as mergers and acquisitions and stock market transactions. Most of all, it is not evident whether and how the reforms affect wage shares until we adopt more rigorous statistical methods.

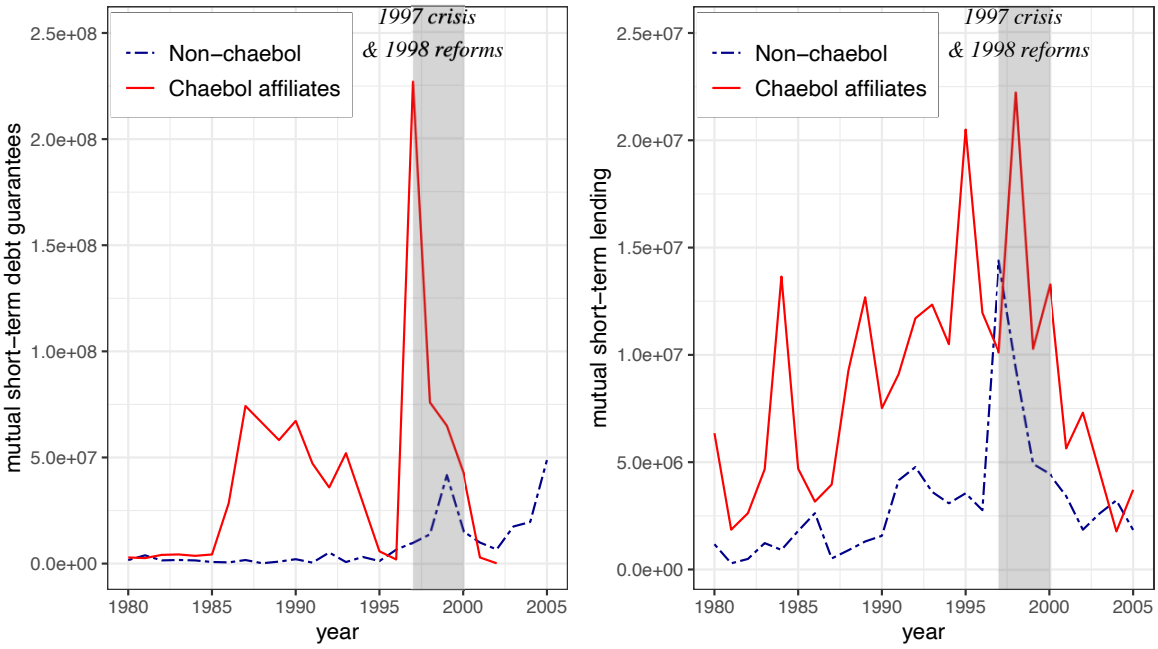


Figure C.4: Related-party Transactions

C. Patenting Activities I also pay attention to the evolution of patenting activities and land ownership between *chaebol* affiliates and their counterparts. Figure C.5 shows that the degree of innovation among non-*chaebol* firms was greatly stimulated by the reform. As in Aghion et al. (2021), I consider the patenting activity as a proxy for the firm's achievement in innovation and technological progress through R&D expenditure or other type of investment spending.[52] The productivity growth through mechanization and automation has been found to be negatively associated with the aggregate labour share (Zeira, 1998; Grossman et al., 2018). Next item is land ownership. I use this variable as a proxy for rent-seeking behaviour of firms. I assume that this activity is an alternative option for large firms or *chaebols*; as the

[52]Patenting activities increased among non-*chaebol* firms while that of the *chaebol* affiliates flattens out (see Figure C.7.). As Aghion et al. (2021) indicate, the patenting shows whether the reforms led to innovation-based growth among the firms. Baker (2016) also points out that pro-competitive policy such as antitrust enforcement against monopolization benefits innovation with a relevant target on "exclusionary conduct" (e.g., the U.S. government cases against Microsoft).

market power grows, they can choose to spend their profit on either innovation (R&D) or land purchase. This is a fairly viable story given the degree of land scarcity in Korea and skyrocketing land prices of the populated urban area. Figure C.5 tells us a very interesting story regarding the difference between *chaebol* affiliates and their counterparts. Since mid-1980s, the number of patents has been diverging between the two groups, but real estate ownership did not until the outbreak of 1997 financial crisis. More interestingly, the number of patents in the *chaebol* affiliates shrank and stagnated during the crisis, but the increasing trend of real estate ownership among the *chaebol* affiliates was intensified during the crisis period. The race to the land ownership was not different among non-*chaebol* firms, and their accumulated real estate value reached the same level as that of *chaebols*.

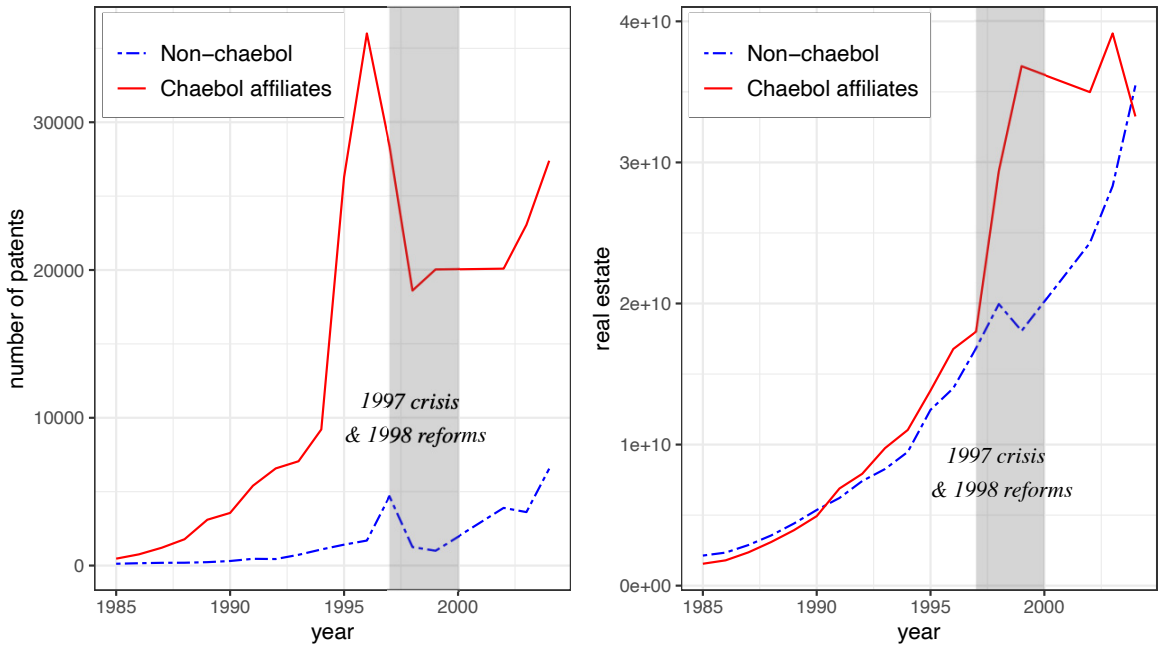


Figure C.5: Patent (left) and Land Ownership (right)

D. Market Power Weakening Among *Chaebols*? In this section, I mainly illustrate the difference between *chaebols* affiliates and non-*chaebol* firms regarding their managerial changes during the crisis. For example, Figure C.6 shows that tendency of net profit for both groups is similar in that profit tends to increase as firm size increases at the same rate. That is, probably pro-competitive reforms ameliorated the revenue model for large firms that had been suffering from low profitability and high

debt-equity ratio until the crisis. But right panel shows that the trend of profitability of the *chaebol*-affiliated was not much changed. the firm size advantage seems to have disappeared after the reforms. Could this be a piece of evidence that shows the market power of large firms was suppressed by the reforms?

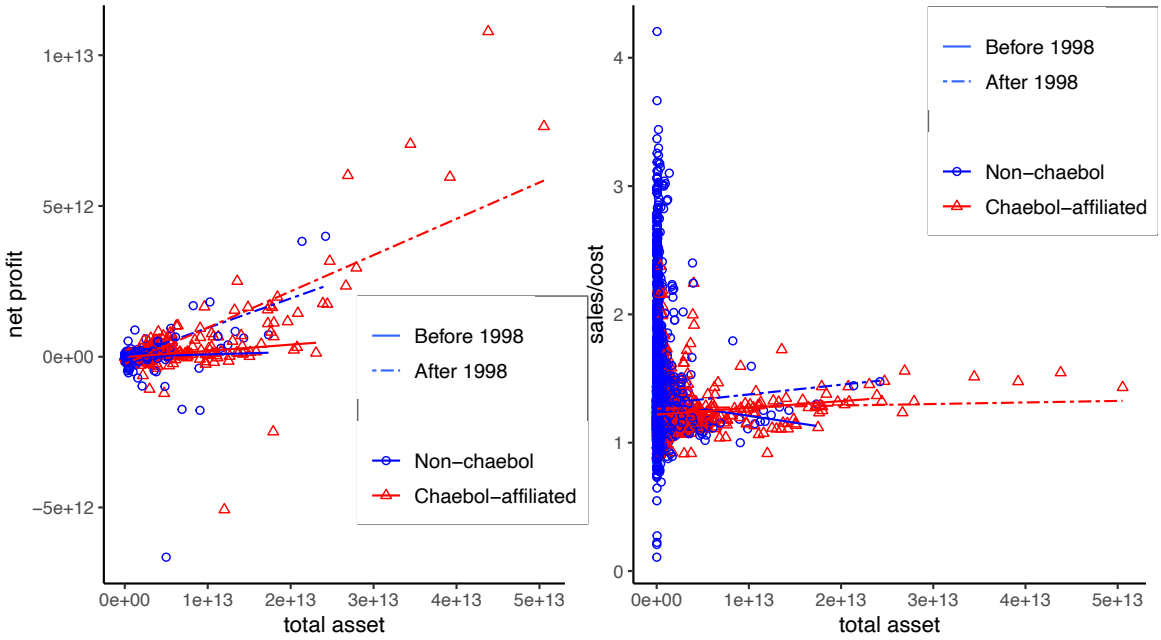


Figure C.6: Net Profit (left) and Sales-Cost(cogs) Ratio (right) before and after reform

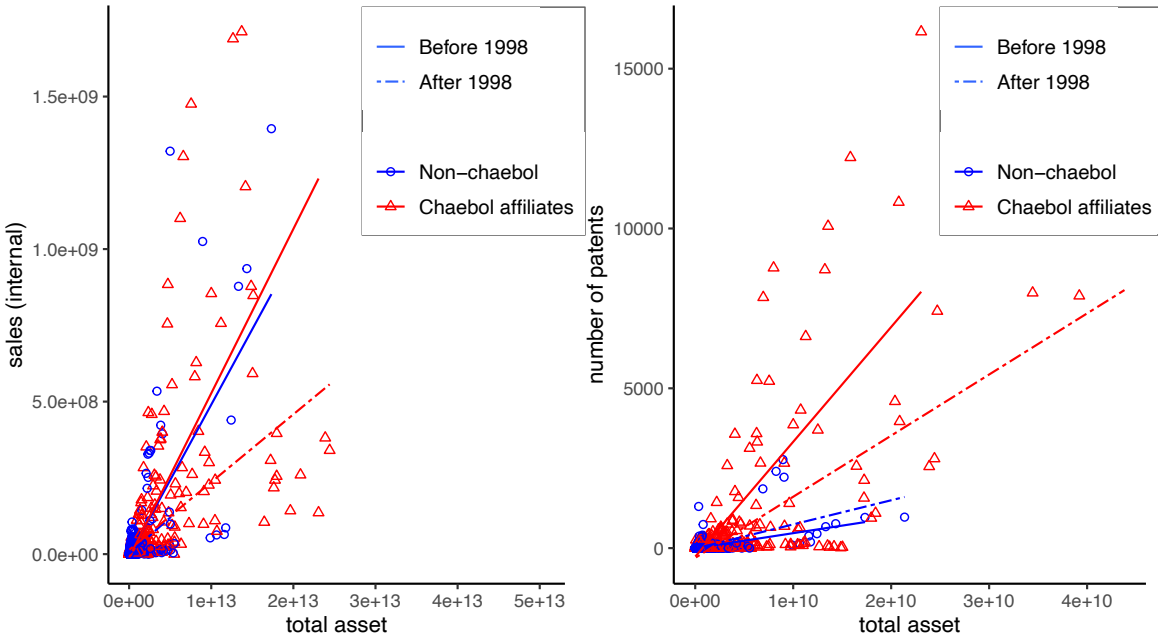


Figure C.7: Internal Sales (left) and Patents (right) before and after Reform

Figure C.7 further provides evidence for the claim. Internal transaction tendency for the *chaebol* affiliates was remarkably discouraged after the reforms. Figure C.15 also show the potential reform effect on patenting activities and real-estate investment of both groups. After the crisis or the reforms, the increasing rate of patenting among the *chaebol* affiliates became less steeper whereas that of their counterparts became slightly more steeper. One possible scenario is that patenting performances among the non-*chaebol* firms could be more encouraged by increased spending on R&D investment than before.

C.3 Remaining Figures and Tables

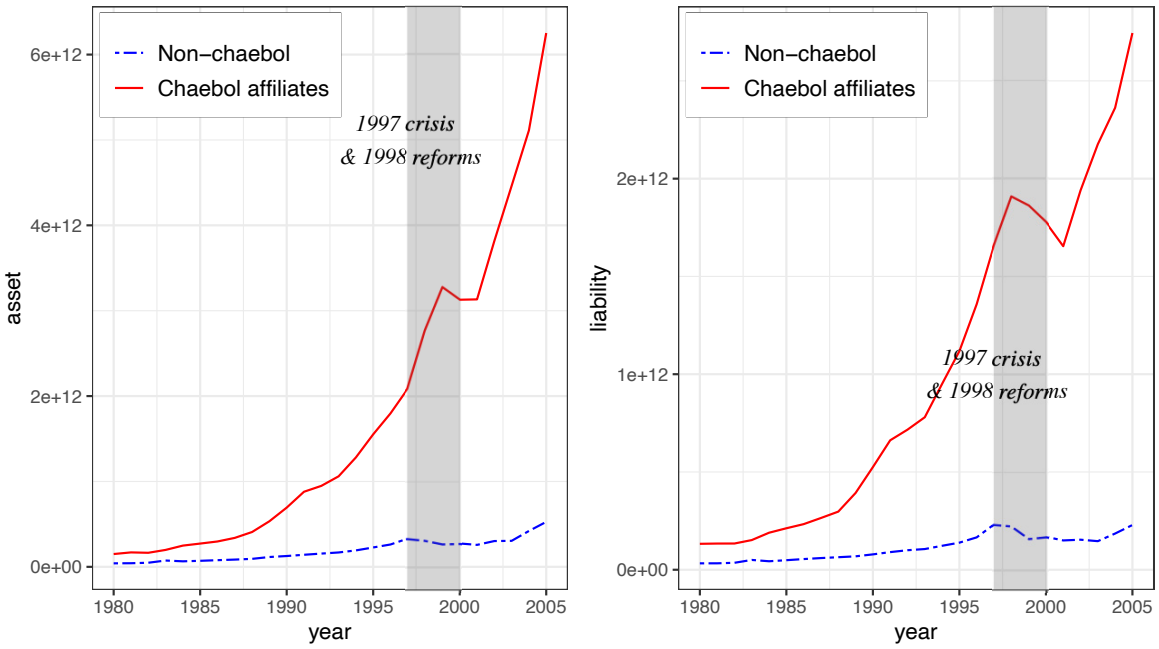


Figure C.8: Assets (left) and Liability (right)

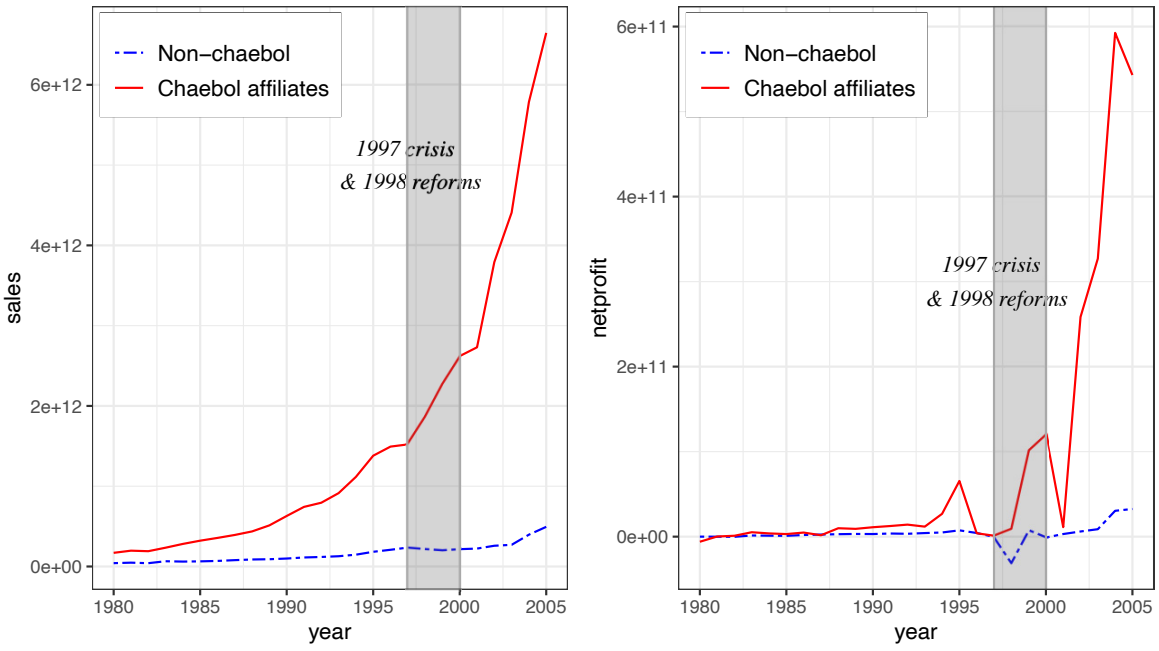


Figure C.9: Sales (left) and Net Profit (right)

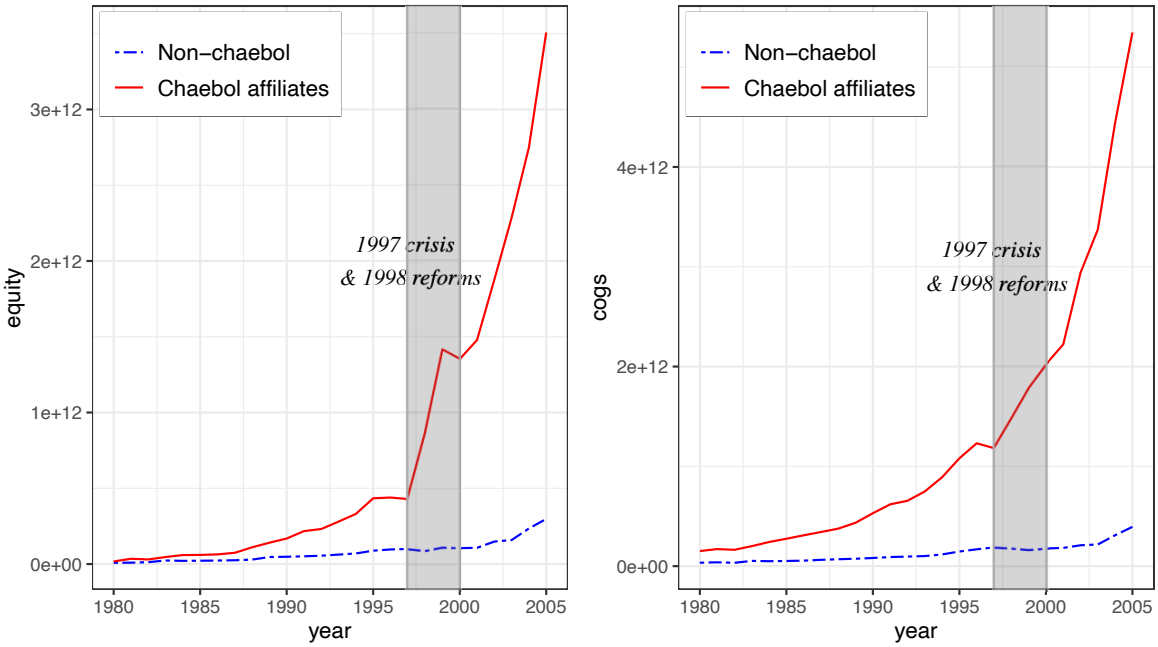


Figure C.10: Equity (left) and Cogs (right)

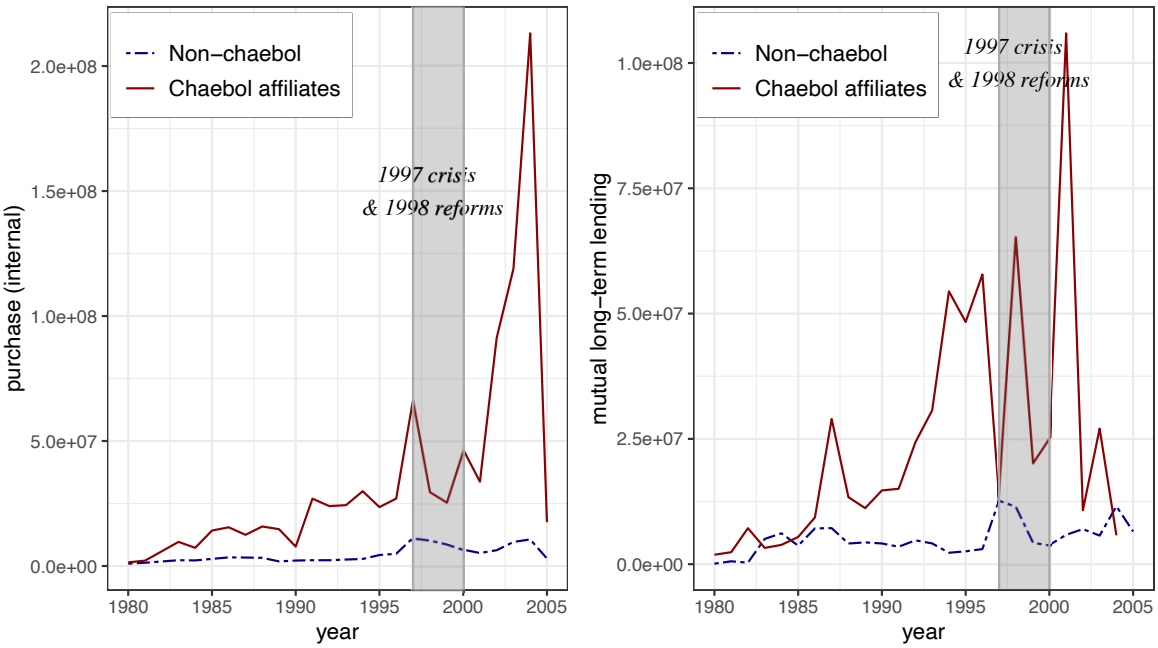


Figure C.11: Internal Sales (left) and Mutual Long-term Lending (right)

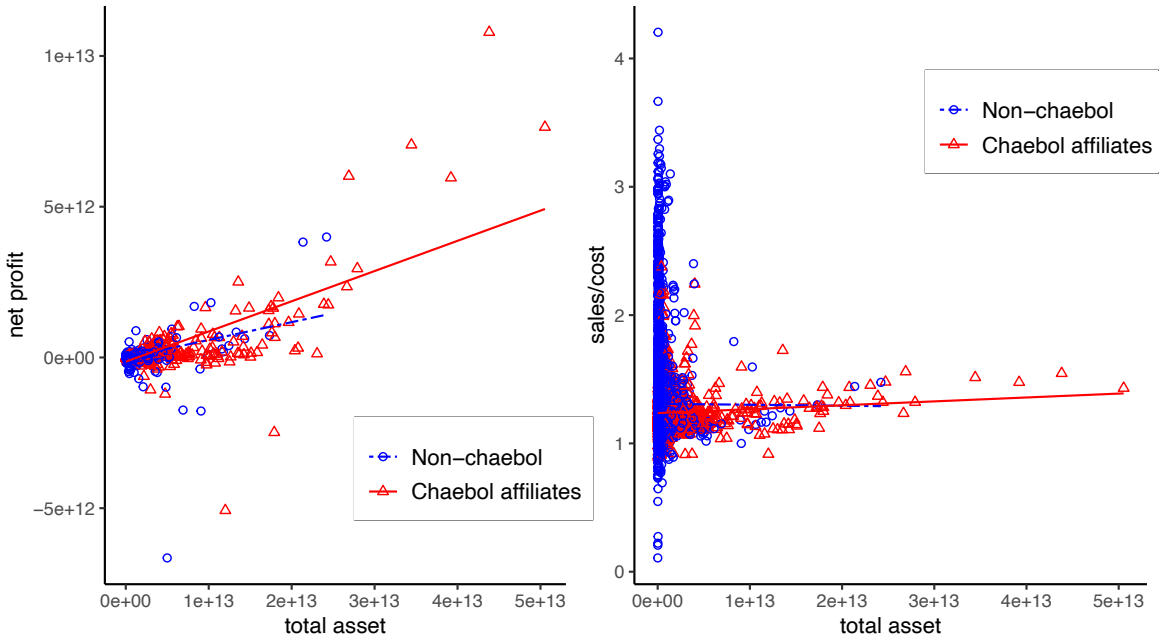


Figure C.12: Net Profit (left) and Sales-Cost Ratio (right)

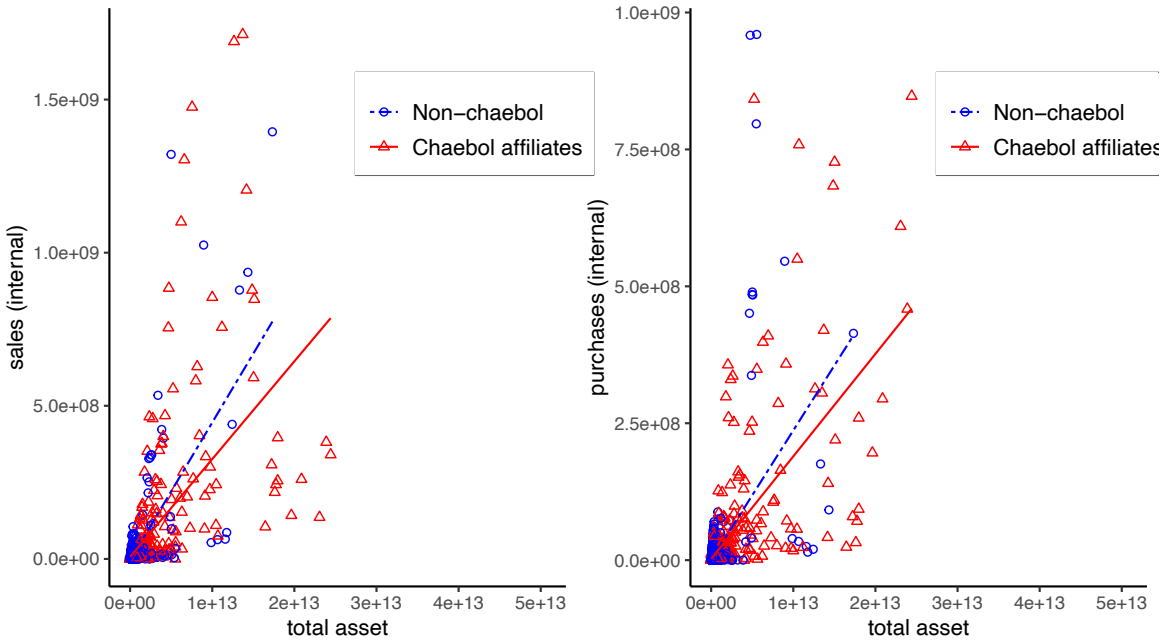


Figure C.13: Internal Sales (left) and Purchases (right)

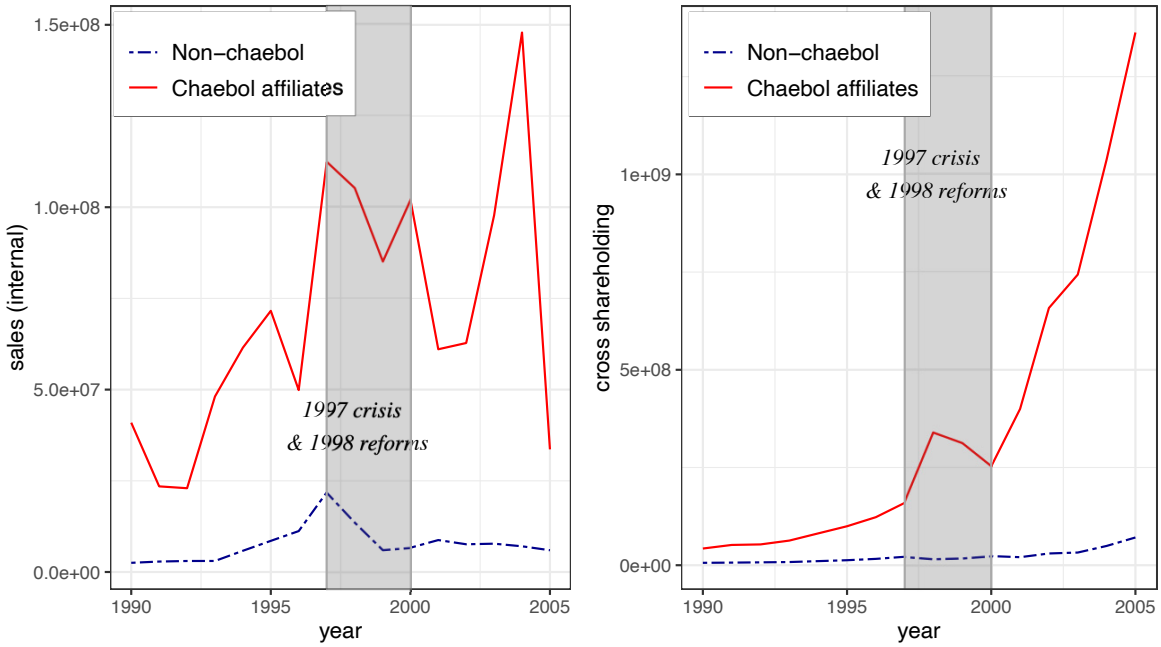


Figure C.14: RPTs (sales and cross shareholding)

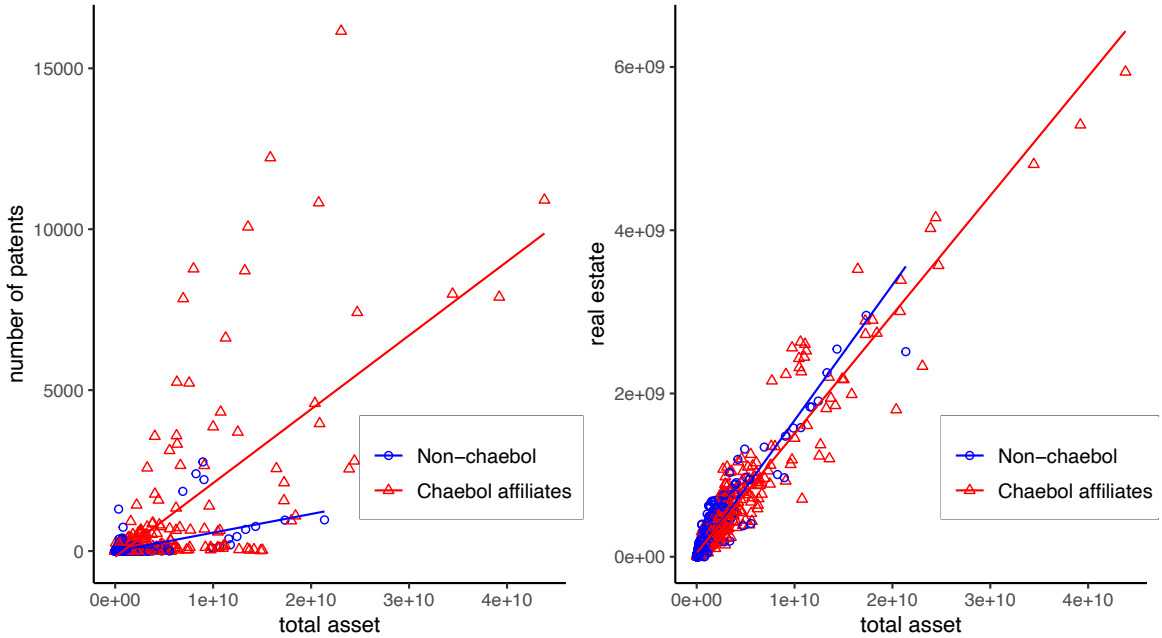


Figure C.15: Patent (left) and Land Ownership (right)

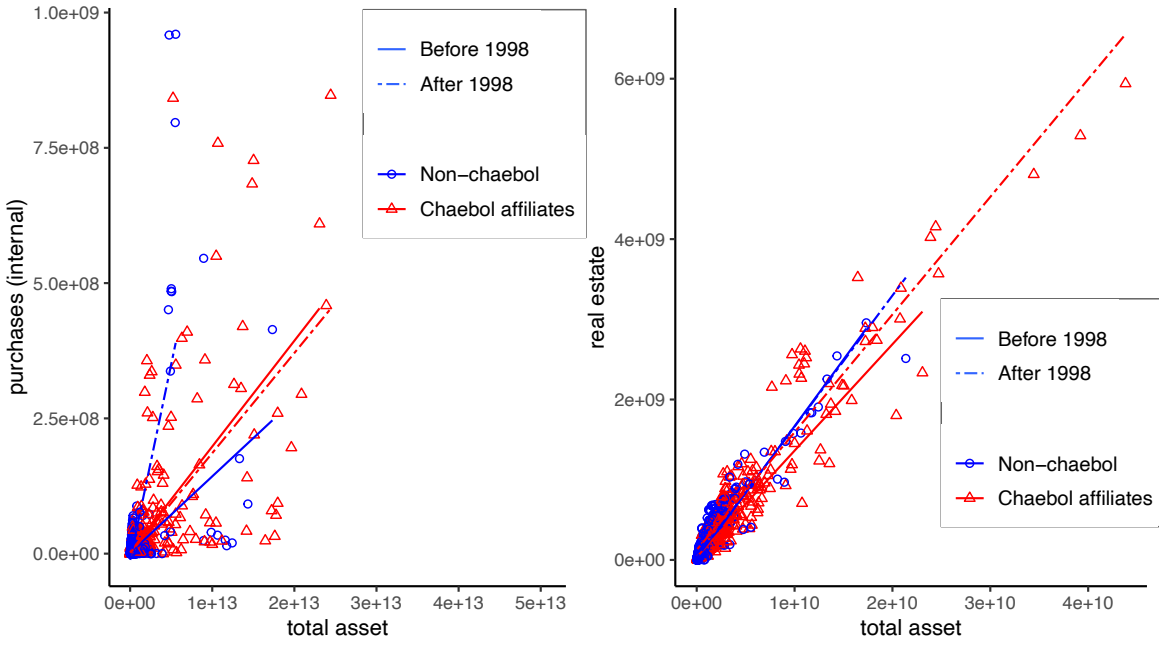


Figure C.16: Internal Purchases (left) and Real Estate Ownership (right) before and after Reform

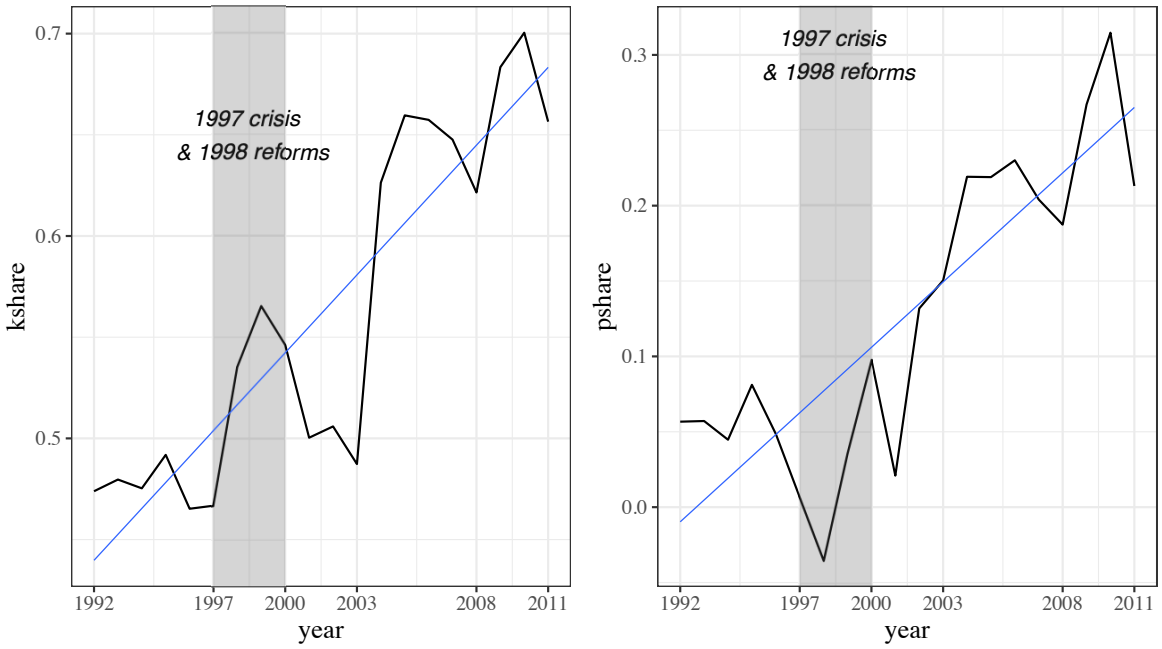


Figure C.17: Trend of Capital and Profit Share of Listed Firms on KOSPI

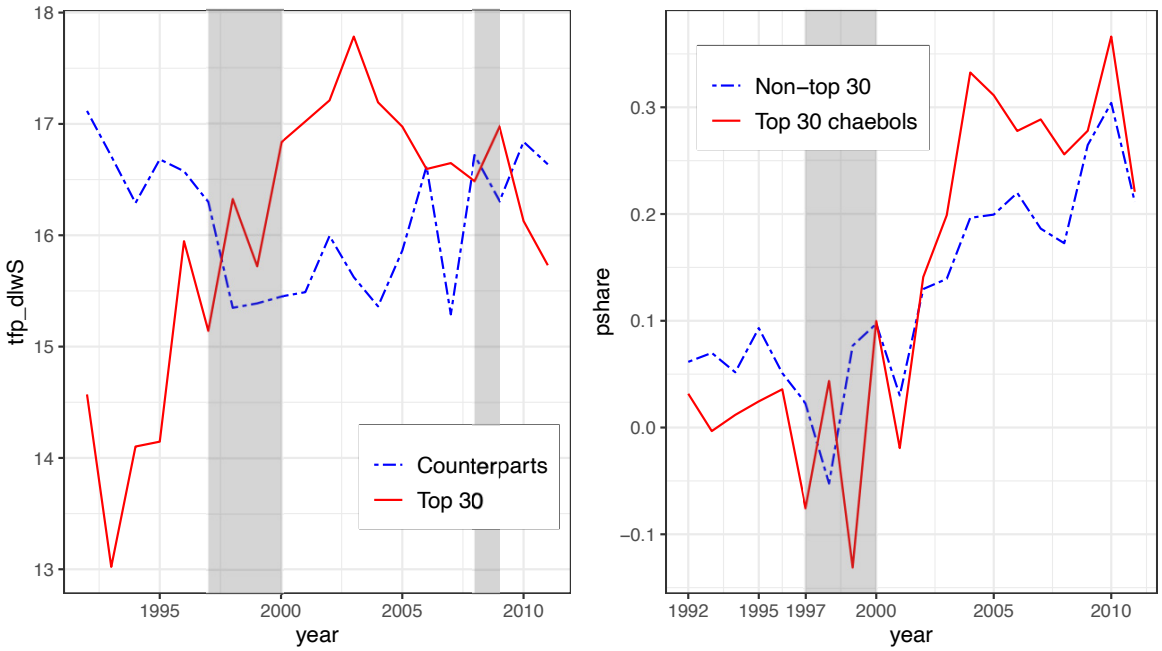


Figure C.18: Trend of Capital and Profit Share by Group

Table C.1: Top 30 *Chaebols* (1991-1997)

Rank	1991	Sub.	1992	Sub.	1993	Sub.	1994	Sub.	1995	Sub.	1996	Sub.	1997	Sub.
1	Hyundai	42	Hyundai	43	Hyundai	45	Hyundai	48	Hyundai	48	Hyundai	46	Hyundai	57
2	LG	63	Samsung	52	Samsung	55	Daewoo	24	Samsung	55	Samsung	55	Samsung	80
3	Daewoo	24	Daewoo	22	Daewoo	22	Samsung	50	Daewoo	22	LG	48	LG	49
4	Samsung	51	LG	58	LG	54	LG	53	LG	50	Daewoo	25	Daewoo	30
5	SK	27	SK	31	SK	32	SK	33	SK	32	SK	32	SK	46
6	Hanjin	22	Hanjin	23	Hanjin	24	Hanjin	21	Ssangyong	22	Ssangyong	23	Ssangyong	25
7	Ssangyong	22	Ssangyong	22	Ssangyong	22	Ssangyong	23	Hanjin	23	Hanjin	24	Hanjin	24
8	Hanwha	27	Kia	10	Kia	10	Kia	13	Kia	14	Kia	16	Kia	28
9	Kia	10	Hanwha	27	Hanwha	27	Hanwha	29	Hanwha	29	Hanwha	31	Hanwha	31
10	Lotte	32	Lotte	32	Lotte	32	Lotte	30	Lotte	29	Lotte	28	Lotte	30
11	Daelim	14	Kumho	25	Kumho	24	Kumho	22	Kumho	24	Kumho	27	Kumho	26
12	Kumho	24	Daelim	13	Daelim	12	Daelim	17	Doosan	27	Doosan	26	Halla	18
13	Dongah C	16	Doosan	24	Doosan	25	Doosan	24	Daelim	17	Daelim	18	Dongah C	19
14	Doosan	23	Dongah C	16	Dongah C	13	Dongah C	14	Dongah C	14	Hanbo	21	Doosan	25
15	Hanil	13	Hanil	15	Hanil	15	Hyosung	14	Halla	15	Dongah C	16	Daelim	21
16	Hyosung	14	Hyosung	14	Hyosung	14	Hanil	15	Dongkuk Steel	16	Halla	17	Hansol	23
17	Sammi	15	Sammi	14	Dongkuk Steel	14	Halla	12	Hyosung	15	Hyosung	16	Hyosung	18
18	Dongkuk Steel	14	Dongkuk Steel	14	Sammi	9	Dongkuk Steel	16	Hanbo	13	Dongkuk Steel	16	Dongkuk Steel	17
19	Kukdong Oil	4	Halla	10	Halla	10	Sammi	10	Tongyang	19	Jinro	14	Jinro	24
20	Kukdong EC	9	Kolon	21	Hanyang	4	Tongyang	16	Hanil	13	Kolon	19	Kolon	24
21	Tongyang	13	Tongyang	14	Tongyang	16	Kolon	19	Kolon	20	Tongyang	22	Kohab	13
22	Kolon	21	Kukdong Oil	4	Kolon	21	Jinro	17	Kohab	10	Hansol	19	Dongbu	34
23	Halla	9	Dongbu	11	Jinro	19	Kohab	8	Jinro	12	Dongbu	24	Tongyang	24
24	Dongbu	11	Kukdong EC	9	Dongbu	12	Woosung	6	Haitai	13	Kohab	11	Haitai	15
25	Woosung	6	Woosung	6	Kohab	7	Dongbu	13	Sammi	8	Haitai	14	Newcore	18
26	Hanyang	4	Hanyang	4	Kukdong EC	9	Haitai	9	Dongbu	13	Sammi	8	Anam	21
27	Tongil	16	Kohab	7	Woosung	5	Kukdong EC	10	Woosung	8	Hanil	8	Hanil	7
28	Kohab	7	Jinro	20	Haitai	10	Hanbo	11	Kukdong EC	10	Kukdong EC	11	Geopyeong	22
29	Haitai	9	Haitai	10	Byuksan	18	Daesang	22	Byuksan	18	Newcore	18	Daesang	25
30	Dongwon	8	Byuksan	19	Daesang	24	Byuksan	17	Daesang	14	Byuksan	16	Shinho	25

Notes) Sub. denotes the number of subsidiaries. Unit: 100 million Won. Rankings are based on the firms' total asset values. All the names of firms are based on the current names of *chaebols*. For example, Daesang was known as Miwon until 1997 and LG as Lucky Goldstar until 1994. One may also need to note that KFTC began to include public enterprises on the list of large business groups since 2002, but this list does not include them for the sake of the study purpose. Hyundai went through severe family feud in 2001 after the death of its founder, and the ownership was dismantled and later divided into several business groups including Hyundai Motors, Hyundai Oilbank, Hyundai Department Store, Hyundai Heavy Industries and many other subsidiaries.

Table C.2: Top 30 *Chaebols* (1998-2004)

Rank	1998	Sub.	1999	Sub.	2000	Sub.	2001	Sub.	2002	Sub.	2003	Sub.	2004	Sub.
1	Hyundai	62	Hyundai	62	Hyundai	35	Samsung	64	Samsung	63	Samsung	63	Samsung	63
2	Samsung	62	Daewoo	34	Samsung	45	Hyundai	26	LG	51	LG	50	LG	46
3	Daewoo	37	Samsung	49	LG	43	LG	43	SK	62	SK	60	Hyundai Motors	28
4	LG	52	LG	48	SK	39	SK	54	Hyundai Motors	25	Hyundai Motors	25	SK	59
5	SK	45	SK	41	Hanjin	18	Hyundai Motors	16	Hanjin	21	KT	10	KT	11
6	Hanjin	25	Hanjin	21	Lotte	28	Hanjin	19	POSCO	15	Hanjin	23	Hanjin	23
7	Ssangyong	22	Ssangyong	23	Daewoo	2	POSCO	15	Lotte	32	Lotte	35	Lotte	36
8	Hanwha	31	Hanwha	21	Kumho	20	Lotte	31	Hyundai	12	POSCO	15	POSCO	16
9	Kumho	32	Kumho	29	Hanwha	23	Kumho	17	Kumho	15	Hanwha	33	Hanwha	31
10	Dongah C	22	Lotte	28	Ssangyong	22	Hanwha	25	Hyundai Heavy	5	Hyundai Heavy	6	Hyundai Heavy	6
11	Lotte	28	Dongah C	15	Hansol	19	Doosan	18	Hanwha	26	Hyundai	12	Kumho	16
12	Halla	18	Hansol	19	Doosan	16	Ssangyong	20	Doosan	18	Kumho	15	Doosan	22
13	Daelim	21	Doosan	14	Hyundai Oil	3	Hyundai Oil	2	Dongbu	21	Doosan	22	Dongbu	22
14	Doosan	23	Daelim	17	Dongah C	16	Hansol	19	Hyundai Oil	2	Dongbu	23	Hyundai	7
15	Hansol	19	Dongkuk Steel	16	Dongkuk Steel	14	Dongbu	19	Hyosung	15	Hyosung	15	Daewoo C	14
16	Hyosung	21	Dongbu	32	Hyosung	13	Daelim	17	Daelim	15	Shinsegae	12	Shinsegae	12
17	Kohab	13	Halla	17	Daelim	18	Tongyang	30	Kolon	29	Daelim	15	LG Cable	12
18	Kolon	25	Kohab	8	S-Oil	2	Hyosung	15	CJ	28	CJ	33	CJ	41
19	Dongkuk Steel	17	Hyosung	17	Dongbu	19	CJ	30	Dongkuk Steel	6	Tongyang	15	Tongyang	16
20	Dongbu	34	Kolon	19	Kolon	17	Kolon	25	Hanaro	8	Kolon	32	Daelim	12
21	Anam	15	Tongyang	21	Tongyang	25	Dongkuk Steel	8	Hansol	12	KT&G	2	Hyosung	16
22	Jinro	15	Jinro	17	Kohab	6	Hyundai ID	9	Shinsegae	10	Hanaro	8	Dongkuk Steel	8
23	Tongyang	23	Anam	15	CJ	18	Hanaro	7	Tongyang	16	Dongkuk Steel	7	GM Daewoo	3
24	Haitai	15	Haitai	15	Daewoo E	3	Shinsegae	9	Hyundai DS	10	Hyundai DS	18	Kolon	31
25	Shinho	28	Saehan	15	Hyundai ID	7	Youngpoong	24	Hyundai ID	10	Hansol	13	KT&G	4
26	Daesang	20	Kangwon	13	Anam	14	Hyundai DS	15	Youngpoong	24	Daewoo Ship.	2	Daewoo Ship.	2
27	Newcore	18	Daesang	14	Saehan	12	Dongyang Ch	22	Daesang	12	Daewoo Motors	5	Hyundai DS	17
28	Geopyeong	19	CJ	15	Jinro	16	Daewoo E	4	Dongwon	17	Hyundai ID	11	KCC	10
29	Kangwon	27	Shinho	21	Shinsegae	10	Taekwang	15	Taekwang	18	Youngpoong	23	Hanaro	5
30	Saehan	16	Samyang	10	Youngpoong	21	Kohab	6	KCC	6	KCC	7	Hansol	11

Sub. denotes the number of subsidiaries. Unit: 100 million Won.

Table C.3: Top 30 *Chaebols* (2005-2011)

Rank	2005	Sub.	2006	Sub.	2007	Sub.	2008	Sub.	2009	Sub.	2010	Sub.	2011	Sub.
1	Samsung	62	Samsung	59	Samsung	59	Samsung	59	Samsung	63	Samsung	67	Samsung	78
2	Hyundai Motors	28	Hyundai Motors	40	Hyundai Motors	36	Hyundai Motors	63	Hyundai Motors	41	Hyundai Motors	42	Hyundai Motors	63
3	LG	38	SK	56	SK	57	SK	64	SK	77	SK	75	SK	86
4	SK	50	LG	30	LG	31	LG	36	LG	52	LG	53	LG	59
5	Lotte	41	Lotte	43	Lotte	44	Lotte	46	POSCO	36	Lotte	60	Lotte	78
6	KT	12	POSCO	21	POSCO	23	POSCO	31	Lotte	54	POSCO	48	POSCO	61
7	POSCO	17	KT	12	KT	19	GS	57	Hyundai Heavy	15	GS	69	Hyundai Heavy	21
8	Hanjin	23	GS	50	GS	48	Hyundai Heavy	9	GS	64	Hyundai Heavy	16	GS	76
9	GS	50	Hanjin	22	Kumho	38	KT	29	Kumho	48	Kumho	45	Hanjin	40
10	Hanwha	30	Hyundai Heavy	7	Hanjin	25	Kumho	52	Hanjin	33	Hanjin	37	Hanwha	55
11	Hyundai Heavy	7	Hanwha	31	Hyundai Heavy	7	Hanjin	27	KT	30	KT	30	KT	32
12	Kumho	18	Doosan	18	Hanwha	34	Hanwha	40	Doosan	26	Doosan	29	Doosan	25
13	Doosan	18	Kumho	23	Doosan	20	Doosan	21	Hanwha	44	Hanwha	48	Kumho	36
14	Dongbu	21	Hynix	5	Hynix	5	Hynix	8	STX	17	STX	16	STX	21
15	Hyundai	7	Dongbu	22	Shinsegae	15	STX	15	Daewoo Ship.	10	LS	44	LS	47
16	Shinsegae	13	Hyundai	9	LS	20	Shinsegae	15	Hynix	8	Daewoo Ship.	13	CJ	65
17	GM Daewoo	3	Shinsegae	14	Hyundai	9	CJ	66	LS	32	Hynix	9	Hynix	9
18	CJ	48	CJ	56	Dongbu	22	LS	24	Hyundai	11	CJ	54	Shinsegae	13
19	LS	17	LS	19	CJ	64	Dongbu	29	CJ	61	Daelim	16	Daewoo Ship.	16
20	Dongkuk Steel	8	Daelim	13	Daelim	14	Daelim	14	Dongbu	32	Dongbu	31	Dongbu	38
21	Daelim	12	GM Daewoo	3	GM Daewoo	3	Hyundai	9	Shinsegae	14	Hyundai	12	Hyundai	14
22	Daewoo C	14	Hite-Jinro	13	Daewoo Ship.	5	Daewoo Ship.	8	Daelim	16	Shinsegae	12	Daelim	19
23	Daewoo Ship.	3	Daewoo C	11	Hyundai C	9	KCC	7	Hyundai C	14	Hyundai C	20	Booyoung	16
24	Tongyang	16	Dongkuk Steel	12	STX	11	GM Daewoo	3	GM Daewoo	3	Booyoung	15	Daewoo C.	13
25	Hyosung	16	Daewoo Ship.	5	Dongkuk Steel	11	Hyundai C	14	Taihan Cable	32	Hyosung	40	KCC	9
26	Kolon	28	STX	10	Eland	16	Dongkuk Steel	12	Hyosung	41	S-Oil	2	Dongkuk Steel	13
27	KT&G	8	Tongyang	15	Hyundai DS	24	Hyosung	30	OCI	18	Dongkuk Steel	12	S-Oil	2
28	STX	14	KT&G	7	Kolon	33	Tongyang	20	Dongkuk Steel	13	KCC	10	Hyosung	39
29	Hyundai DS	20	Hyosung	17	Tongyang	21	Hanjin Heavy	5	Hanjin Heavy	6	Hanjin Heavy	7	OCI	17
30	Hyundai Oil	2	Hyundai Oil	2	KCC	7	Taihan Cable	20	S-Oil	2	GM Daewoo	4	Hyundai DS	26

Sub. denotes the number of subsidiaries. Unit: 100 million Won.

Table C.4: Estimates Output of Multi-period DiD: Reform and Business Group Share by Industry

	Dependent variable:									
	σ^l	σ^π	σ^k	ROE	log(der)	log(ϕ_l)	log(ϕ_k)	TFP	HHI	μ
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
BG Share	-0.097^{***}	0.053	0.097^{***}	0.009	0.411^{***}	0.108	1.343^{***}	-2.027^{***}	-0.042^{**}	0.189^{***}
×PostReform	(0.026)	(0.045)	(0.026)	(0.006)	(0.093)	(0.074)	(0.252)	(0.597)	(0.020)	(0.061)
BG Share	-0.074^{***}	0.030	0.074^{***}	-0.005	0.089	0.458^{***}	-1.398^{***}	-1.598^{***}	0.330^{***}	0.060
	(0.019)	(0.033)	(0.019)	(0.004)	(0.068)	(0.055)	(0.185)	(0.438)	(0.015)	(0.045)
PostReform	-0.041^{**}	0.108^{***}	0.041^{**}	0.015^{***}	-1.069^{***}	0.351^{***}	-0.789^{***}	-2.451^{***}	-0.002	-0.110^{**}
	(0.021)	(0.036)	(0.021)	(0.005)	(0.075)	(0.060)	(0.205)	(0.485)	(0.016)	(0.050)
Constant	0.552^{***}	0.045^{*}	0.448^{***}	0.029^{***}	5.015^{***}	17.390^{***}	21.113^{***}	10.697^{***}	0.003	1.015^{***}
	(0.015)	(0.027)	(0.015)	(0.004)	(0.055)	(0.044)	(0.150)	(0.356)	(0.012)	(0.037)
Observations	7,342	7,342	7,342	7,342	7,342	7,342	7,342	7,342	7,342	7,342
R^2	0.078	0.036	0.078	0.042	0.176	0.123	0.011	0.139	0.123	0.006
Adjusted R^2	0.077	0.036	0.077	0.042	0.176	0.122	0.011	0.139	0.122	0.006
Resid SE (df = 7338)	0.222	0.386	0.222	0.052	0.803	0.643	2.183	5.165	0.173	0.530

Note: *p<0.1; **p<0.05; ***p<0.01

Table C.5: Estimates Output of Multi-period DiD: Reform and Large Business Group Share by Industry

	Dependent variable:									
	σ^l	σ^π	σ^k	ROE	log(der)	$\log(\phi_l)$	$\log(\phi_k)$	TFP	HHI	μ
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
LBG Share	-0.087^{***}	0.073^{***}	0.087^{***}	0.002	0.194^{***}	0.056	0.545^{***}	-2.123^{***}	-0.036^{***}	0.070^{**}
×PostReform	(0.015)	(0.026)	(0.015)	(0.003)	(0.054)	(0.043)	(0.147)	(0.345)	(0.012)	(0.035)
LBG Share	-0.029^{***}	0.008	0.029^{***}	-0.005^{*}	0.118^{***}	0.218^{***}	-0.468^{***}	-0.487^{*}	0.179^{***}	0.050^{*}
	(0.011)	(0.020)	(0.011)	(0.003)	(0.041)	(0.033)	(0.112)	(0.263)	(0.009)	(0.027)
PostReform	-0.065^{***}	0.105^{***}	0.065^{***}	0.021^{***}	-0.866^{***}	0.397^{***}	-0.054	-2.749^{***}	-0.018^{**}	-0.005
	(0.010)	(0.018)	(0.010)	(0.002)	(0.037)	(0.030)	(0.101)	(0.237)	(0.008)	(0.024)
Constant	0.511^{***}	0.064^{***}	0.489^{***}	0.028^{***}	5.017^{***}	17.624^{***}	20.286^{***}	9.725^{***}	0.159^{***}	1.033^{***}
	(0.008)	(0.013)	(0.008)	(0.002)	(0.028)	(0.022)	(0.076)	(0.178)	(0.006)	(0.018)
Observations	7,342	7,342	7,342	7,342	7,342	7,342	7,342	7,342	7,342	7,342
R^2	0.083	0.038	0.083	0.043	0.179	0.116	0.006	0.145	0.101	0.005
Adj. R^2	0.082	0.038	0.082	0.042	0.179	0.116	0.005	0.145	0.101	0.005
Resid. SE (df = 7338)	0.222	0.386	0.222	0.052	0.802	0.645	2.189	5.148	0.175	0.530

Note: *p<0.1; **p<0.05; ***p<0.01

C.4 A Standard TWFE Model

The result of TWFE estimation shows a consistent outcome with that of the simple DiD estimation except markups. According to Table C.7, the pro-competitive reforms have a statistically significant, negative effect on labour share. Instead, however, the reforms reduced ROE and capital productivity by 0.017 units and 0.7 percent, respectively. In contrast, they increased debt-equity ratio and labour productivity by 0.328 percent and 0.408 percent, respectively. However, when we introduce a new treated group, top 30 *chaebols*' shares, the outcomes become quite different. According to Table C.8, the estimates of total factor productivity (TFP) and markups are statistically significant at 10%.

Pro-competitive reforms can create a more dynamic and competitive market environment, which can stimulate innovation and more efficient resource allocation through "creative destruction" that helps resources to be allocated to more innovative and productive firms, thereby increasing TFP. This feature is in fact linked to the decrease in markups. Pro-competitive policies such as antitrust enforcement, merger control, and the removal of barriers to entry can promote competition in the market, making it more difficult for superstar firms like *chaebols* to maintain their dominant position in the market. As previously pointed out, pro-competitive reforms can encourage innovation by more patenting activities among non-superstar firms. Thus, *chaebols* begin to lose their monopoly power or dominance in the market.

Table C.7: Effects of Pro-competitive Reforms on Labour Share and Chaebols' Operation: TWFE Estimates Outcomes w/ Clustered SE

	Dependent variable:									
	σ^l	σ^π	σ^k	ROE	log(der)	$\log(\phi_l)$	$\log(\phi_k)$	TFP	HHI	μ
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Top 30	−0.054	−0.128	0.054	−0.011	0.259**	0.415***	−0.673***	0.522	0.001	−0.298**
	(0.035)	(0.087)	(0.035)	(0.005)	(0.085)	(0.103)	(0.172)	(0.304)	(0.007)	(0.083)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Num. obs.	7355	7355	7355	7355	7284	7355	7355	7355	7355	7355
R^2	0.192	0.066	0.192	0.082	0.300	0.365	0.394	0.971	0.869	0.019
$\bar{R}^2$	0.186	0.059	0.186	0.075	0.295	0.361	0.389	0.971	0.868	0.011

Note: These regressions were run after winsorizing top and bottom 1% of each dependent variable for the whole sample period. Industries are classified into 35 sectors based on KSIC2. Standard errors are clustered in each industry level. LBG is dummy variable whose value is 1 if the firm belongs to large business groups or 0, otherwise. *p<0.1; **p<0.05; ***p<0.01.

Table C.8: Effects of Pro-competitive Reforms on Labour Share and Chaebols' Operation: TWFE Estimates Outcomes w/ Clustered SE

	Dependent variable:									
	σ^l	σ^π	σ^k	ROE	log(der)	$\log(\phi_l)$	$\log(\phi_k)$	TFP	HHI	μ
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
$Top30Shares$	−0.054	0.029	0.054	0.005	0.231	0.169	−0.569	1.208*	0.061	−0.944*
	(0.042)	(0.064)	(0.042)	(0.008)	(0.134)	(0.125)	(0.356)	(0.563)	(0.046)	(0.388)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Num. obs.	7505	7505	7505	7505	7424	7505	7505	7505	7505	7505
R^2	0.005	0.036	0.143	0.065	0.295	0.321	0.384	0.971	0.871	0.847
$\bar{R}^2$	−0.002	0.029	0.137	0.058	0.290	0.316	0.379	0.971	0.870	0.846

Note: These regressions were run after winsorizing top and bottom 1% of each dependent variable for the whole sample period. Industries are classified into 35 sectors based on KSIC2. Standard errors are clustered in each industry level. *p<0.1; **p<0.05; ***p<0.01.

Table C.8 shows two different signs of estimates from those of Table 4.5. The former (TWFE) shows that the reforms decreased the markups by 0.944 whereas the latter (a simple DiD) shows that the the pro-competitive reforms increased the markups by 1.214. The difference may lie in the fact that in a DiD, the estimate measures the difference in the change in the outcome variable between the treatment group and the control group before and after the treatment. Hence, this estimate captures the treatment effect, which is the difference in outcomes between the treatment and control groups that can be attributed to the treatment. In contrast, a TWFE model controls for time-invariant unobserved confounders by including fixed effects for both the treatment group and the time period. The estimate measures the difference in outcomes between the treatment and control groups, after controlling for all time-invariant differences between the groups as well as any time-specific shocks. This estimate captures the overall difference in outcomes between the treatment group and the control group, which may include treatment effects as well as other factors that differ between the groups. This result may show that the TWFE model with industry and time fixed effects, allowing for both individual-specific and time-specific shocks to be accounted for. This result also requires us to ensure the parallel trends assumption for the validity of all estimates.

Table C.9 shows that pro-competitive reforms are not effective among business groups without top 30 *chaebols*, implying that the reforms' major target was top 30 *chaebols*. The business groups are designated by KFTC based on its standard and conditions. In the dataset, they take 59.23% of the entire sample. As the main target of the reforms were top 30 *chaebols*, all the coefficient of effects on business groups without *chaebols* are not statistically significant. Table C.10 shows the treatment effect on the large businesss groups, which fall between top 30 *chaebols* and business groups in terms of asset size. We find that labour share was reduced by 0.058 units TFP was increased by 0.764 units.

Table C.9: Effects of Pro-competitive Reforms on Labour Share and Chaebols' Operation: TWFE Estimates Outcomes w/ Clustered SE

	Dependent variable:									
	σ^l	σ^π	σ^k	ROE	log(der)	log(ϕ_l)	log(ϕ_k)	TFP	HHI	μ
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
BG	−0.000	0.013	0.000	0.011	−0.121	−0.053	−0.002	−0.316	−0.010	−0.401
(w/o Top 30)	(0.018)	(0.061)	(0.018)	(0.007)	(0.075)	(0.065)	(0.137)	(0.226)	(0.007)	(0.317)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Num. obs.	7505	7505	7505	7505	7424	7505	7505	7505	7505	7505
R^2	0.005	0.036	0.142	0.066	0.295	0.320	0.383	0.971	0.869	0.846
$\bar{R}^2$	−0.002	0.029	0.136	0.059	0.290	0.315	0.378	0.971	0.868	0.845

Note: These regressions were run after winsorizing top and bottom 1% of each dependent variable for the whole sample period. Industries are classified into 35 sectors based on KSIC2. Standard errors are clustered in each industry level. BG is dummy variable whose value is 1 if the firm belongs to business groups or 0, otherwise. *p<0.1; **p<0.05; ***p<0.01.

Table C.10: Effects of Pro-competitive Reforms on Labour Share and Chaebols' Operation: TWFE Estimates Outcomes w/ Clustered SE

	Dependent variable:									
	σ^l	σ^π	σ^k	ROE	log(der)	log(ϕ_l)	log(ϕ_k)	TFP	HHI	μ
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
LBG	−0.058*	0.038	0.058*	0.012	0.121	0.175	−0.323	0.764*	−0.008	−1.097
(w/o Top 30)	(0.023)	(0.051)	(0.023)	(0.012)	(0.065)	(0.113)	(0.187)	(0.374)	(0.007)	(1.148)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Num. obs.	7505	7505	7505	7505	7424	7505	7505	7505	7505	7505
R^2	0.005	0.036	0.143	0.065	0.294	0.320	0.383	0.971	0.869	0.847
$\bar{R}^2$	−0.002	0.029	0.136	0.058	0.289	0.315	0.378	0.971	0.868	0.846

Note: LBG is dummy variable whose value is 1 if the firm belongs to large business groups or 0, otherwise. *p<0.1; **p<0.05; ***p<0.01

C.5 Dynamic Difference-in-differences Model

In this section, I will use a dynamic DiD method to estimate the causal effect of the pro-competitive reforms particularly on labour share, profit share and markups over time. The technique involves comparing the changes in the outcome variable over time for the treated group with the changes in the outcome variable for a comparison group, and then taking the difference between the two to estimate the treatment effect. The dynamic version of the technique allows for the treatment effect to vary over time, which can provide valuable insights into how the treatment is affecting the outcome variable over different periods, namely heterogeneous treatment effects. The model is specified as

$$y_{it} = \alpha_i + \lambda_t + \sum_{t \neq 1998}^{2011} \delta_t \cdot Treated \times t + \sum_{t \neq 1998}^{2011} \boldsymbol{X}_i' \gamma_j + u_{it} \tag{C.14}$$

where α_i denotes industry fixed effects that controls for the unobserved heterogeneous characteristics of the industry i, λ_i denotes a year fixed effect that controls for common temporal shocks that may arise in any time period ranging from 1992 to 2011. I also use the same treatment variables: $Chaebol30_j, Chaebol30Share_i, lbg_i, bg_i$ and add per worker net profit and return on equity for X_i to control for financial crisis influence. Standard errors are corrected for heteroskedasticity and clustered within the industry-level based on Bertrand et al. (2004). From the year range, the year 1998 was dropped to serve as a reference group.

Figure C.19, Figure C.20 and Figure C.21 are the traces of the estimates from the dynamic DiD regression model.

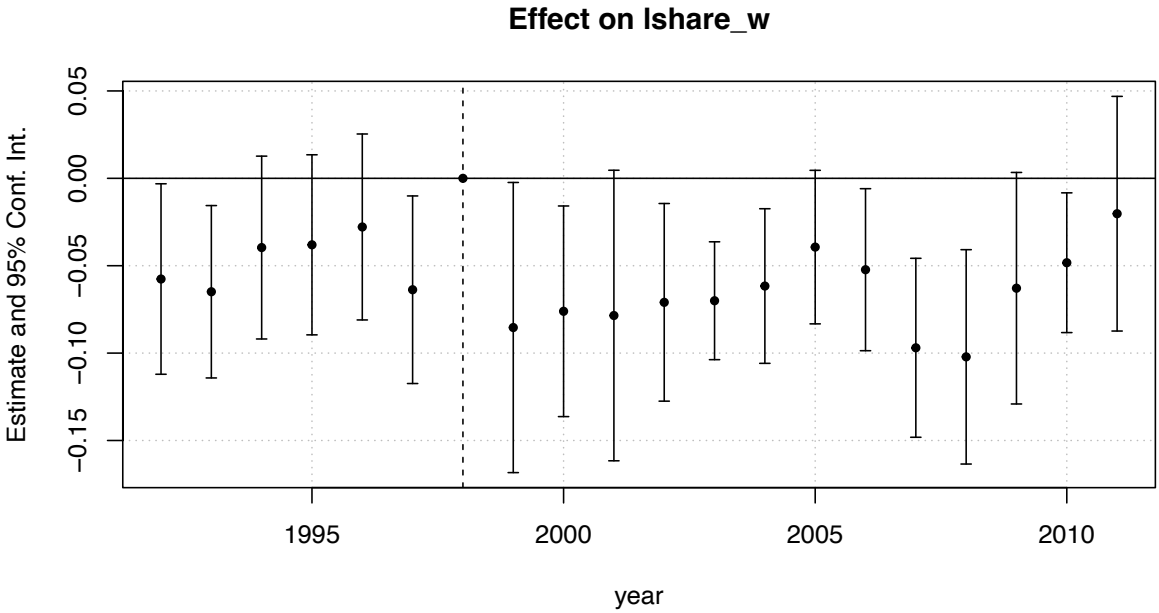


Figure C.19: Dynamic DiD Estimate of the Effect on Labour Share

In Figure C.19, the pre-treatment coefficients fall within the range of between -0.05 and 0, suggesting that there is no significant difference between the treatment group and control group given the fact that their confidence intervals contain the value of zero. This finding indicates that the parallel trends assumption holds for labour share. Further analysis reveals that the coefficient significantly drops in 1998, prior to the implementation of the pro-competitive reforms, indicating the monumental, negative impact of the 1997 financial crisis on the labour market. Following the 1998 pro-competitive reforms, the coefficients remain around -0.10, significantly lower than zero, implying that the negative effects of either the pro-competitive reforms or the financial crisis persisted in the early 2000s.

I also aims to examine the factors contributing to the decline in labour share and determine whether pro-competitive reforms or the financial crisis played a more significant role. To address this question, I focus on the coefficient for the year 2001, which was found to be significantly different from zero, indicating a substantial drop in labour share. These findings suggest that the pro-competitive reforms may have influenced the labour share trend, although the impact of the financial crisis cannot be entirely ruled out. Additionally, our analysis shows that the pro-competitive reforms

alone were insufficient in reversing the declining trend of labour share after the financial crisis. This conclusion is further supported by the absence of any significant change in the labour share trend during the 2008 Great Recession. To facilitate a more detailed comparison of the two crises events, I will utilize a standard two-way fixed effects model for the 2008 Great Recession period. Overall, these findings underscore the need for policymakers to address the underlying factors driving the decline in labour share to ensure a fair and equitable distribution of economic benefits.

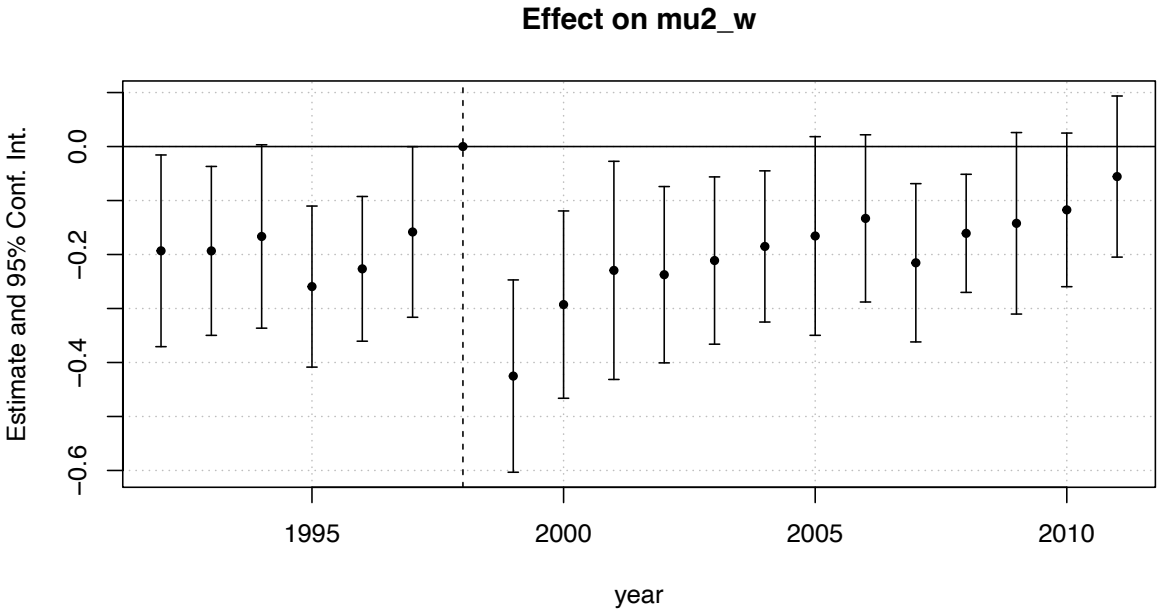


Figure C.20: Dynamic DiD Estimate of the Effects on Markups

Figure C.20 does not support the parallel trends assumption before the intervention. This indicates that the markup trends during the pre-crisis period may differ between the top 30 *chaebols* and non-top 30 *chaebols* including small and medium sized firms (in fact, it turns out to be that the markups of top 30 *chaebols* were lower than those of their counterparts given the current data). This shows that higher markups trend is neither exclusive to superstar firms like *chaebols* nor universal across all industries. The post-treatment markup trend shows that the pro-competitive reforms have a negative effect on the markups of top 30 *chaebols*. We may also be skeptical about the credibility of the result because the labour share is expected to move in the opposite way to markups, but Figure C.19 shows a parallel

movement with markups in Figure C.20. Furthermore, Table 4.5 shows the effect on markups is not statistically significant.

The post-treatment markup trend depicted in the figure shows a negative effect of pro-competitive reforms on the markups of top 30 *chaebols*. However, the credibility of this result may be called into question for several reasons. First, the labour share is expected to move in the opposite direction to markups. However, Figure C.19 shows a parallel movement with markups in Figure C.20. Second, the statistics presented in Table 4.5 indicates that the effect on markups is not statistically significant.

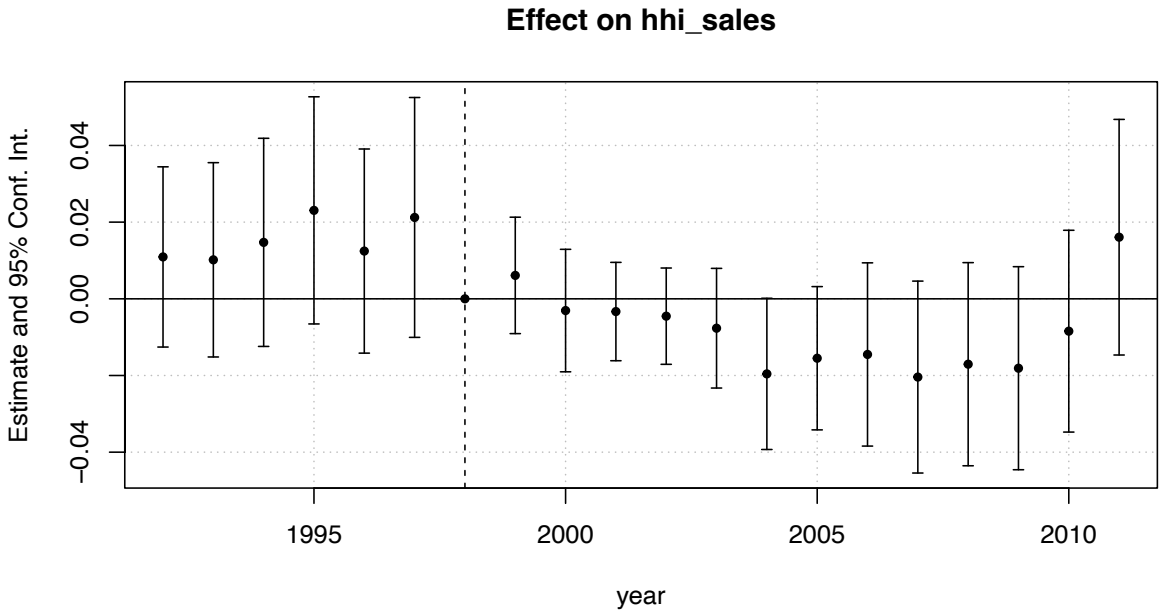


Figure C.21: Dynamic DiD Estimate on HH Index

Finally, Figure C.21 shows that the pro-competitive reforms significantly reduced the market concentration of top 30 *chaebols* although it took 4 years for the policy to be effective. This shows that in the short term, pro-competitive reforms may not have an immediate impact on market concentration as existing market players may continue to dominate the market. However, over time, pro-competitive reforms can create more entry opportunities for new firms and incentivize existing firms to compete more vigorously, leading to a more competitive market and lower market concentration.

Despite the implementation of pro-competitive policies, a crucial issue remains regarding the possible transferability of resulting changes to the labour market and

consequential alterations to labour share. Specifically, it has become evident that such transferability does not hold true for South Korea. Appendix Section C.4 presents the regression output tables from standard TWFE models. In addition, Appendix Section C.6 presents the coefficient plots for the *chaebol* dominant industry sectors, which shows more pronounced effect of the pro-competitive reforms in those industry sectors.

C.6 Dynamic DiD Coefficient Plots for *Chaebol*-dominant Industries

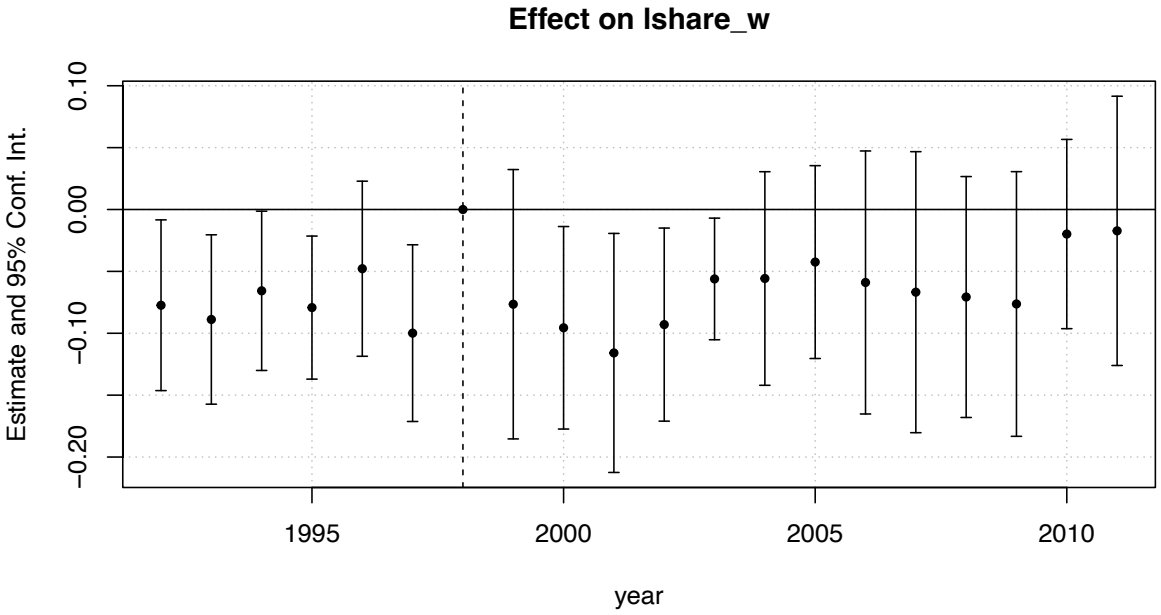


Figure C.22: Dynamic DiD Estimate of the Effect on Labour Share

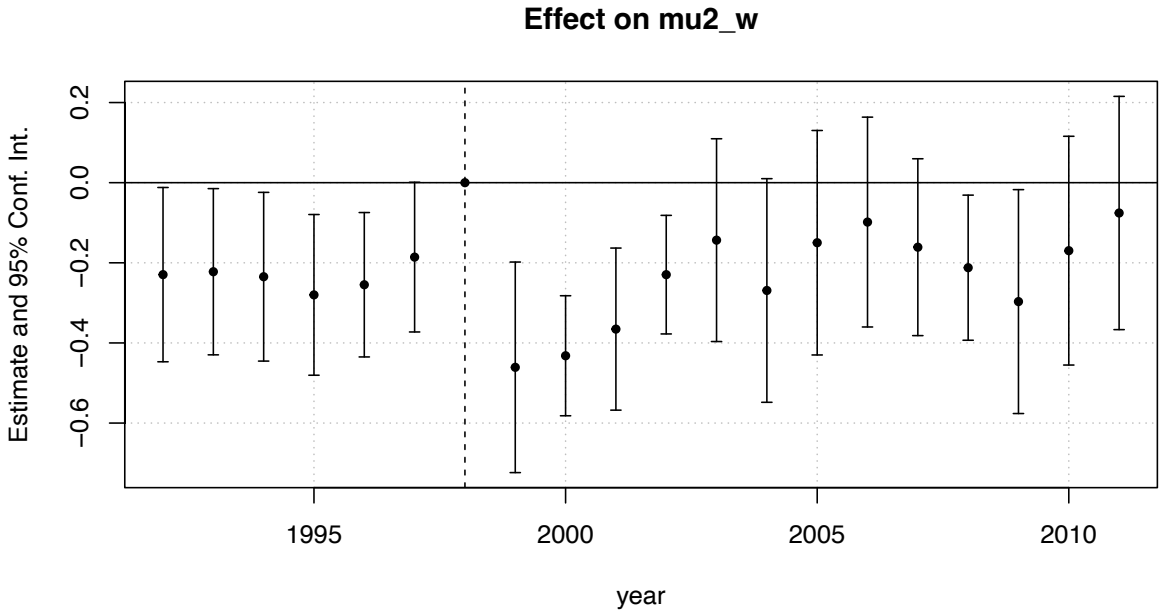


Figure C.23: Dynamic DiD Estimate of the Effect on Labour Share

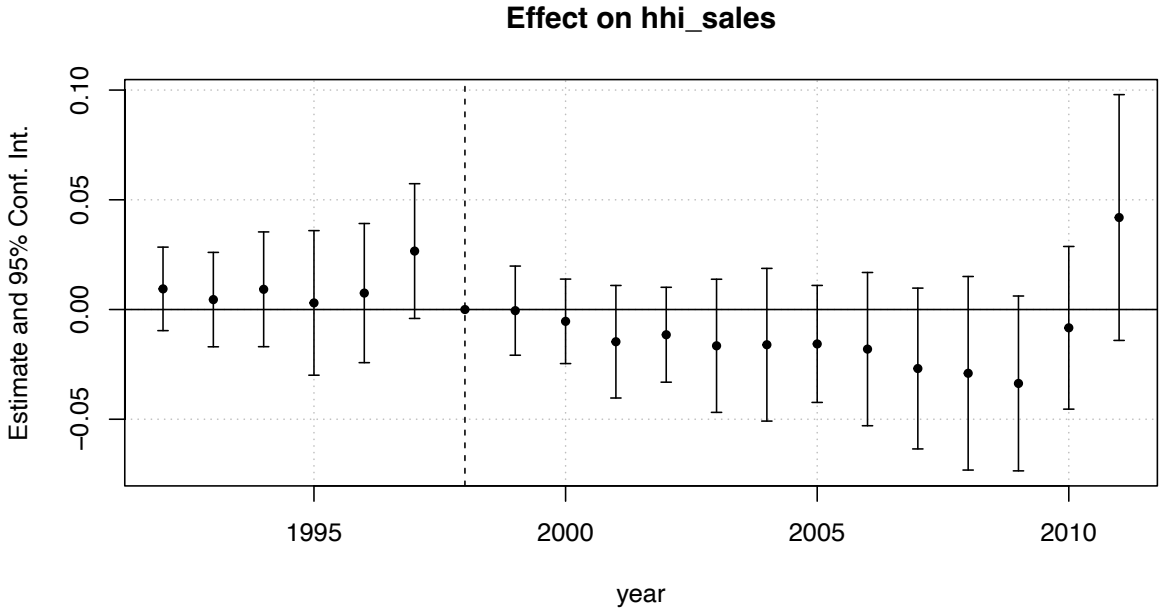


Figure C.24: Dynamic DiD Estimate of the Effect on Labour Share

	Chaebol before (N = 2025)	*Chaebol* after (N = 418)	Non-*Chaebol* before (N = 4732)	Non-*chaebol* after (N = 1060)
Asset				
min	1,007,414,016	899,977,024	94,255,000	340,000,000
max	56,125,391,110,144	8,132,442,980,352	67,875,771,514,880	43,761,086,234,624
mean..sd.	226,583,034,321.98 ± 2,09 billion	707,027,541,276.94 ± 1,10 billion	301,492,874,483.85 ± 2,29 billion	1,984,789,819,697.84 ± 3,89 billion
Liability				
min.1	1,794,923,008	7,073,050,112	889,158,016	13,945,083,904
max.1	29,608,464,351,232	17,235,575,832,576	33,819,348,434,944	27,211,834,851,328
mean..sd..1	213,212,078,291.63 ± 1,08 billion	1,172,925,730,673.91 ± 1,78 billion	304,315,863,060.15 ± 1,55 billion	2,241,493,030,485.01 ± 3,25 billion
Sales				
min.2	2,488,000,000	2,664,999,936	313,000,000	21,542,000,640
max.2	13,116,184,199,168	18,465,358,348,288	39,189,663,973,376	112,249,473,597,440
mean..sd..2	214,837,744,858.20 ± 74 billion	1,387,164,945,009.91 ± 2,42 billion	457,125,486,960.81 ± 1,74 billion	4,375,529,220,345.24 ± 8,52 billion
Profit				
min.3	2,488,000,000	2,664,999,936	313,000,000	21,542,000,640
max.3	13,116,184,199,168	18,465,358,348,288	39,189,663,973,376	112,249,473,597,440
mean..sd..3	214,837,744,858.20 ± 74 billion	1,387,164,945,009.91 ± 2,42 billion	457,125,486,960.81 ± 1,74 billion	4,375,529,220,345.24 ± 8,52 billion
L productivity				
min.4	2,070,000	2,950,000	380,000	130,000
max.4	249,600,000	413,649,984	41,420,488,704	1,380,860,032
mean..sd..4	44,396,034.57 ± 28 million	65,228,684.21 ± 51 million	111,060,492.15 ± 647 million	172,216,952.75 ± 175 million
K productivity				
min.5	25,879.99	592,620.1	9.999931	9.999999
max.5	89,015,189,504	24,808,060,928	178,852,724,736	190,818,041,856
mean..sd..5	472,024,926.28 ± 3,615 million	1,798,896,228.81 ± 3,241 million	658,745,946.91 ± 5,291 million	6,035,973,723.75 ± 17,329 million
Labour share				
min.6	0.03126607	0.01986832	0.001484772	0.0354834
max.6	500.6575	2.399524	76.9005	429.9501
mean..sd..6	0.64 ± 11.12	0.35 ± 0.19	0.66 ± 1.85	0.89 ± 13.23
Capital share				
min.7	0.117694	0.09526116	0.01251791	0.001958952
max.7	141.0746	49.37479	588.9547	5,605.191
mean..sd..7	2.70 ± 4.78	2.92 ± 2.99	5.66 ± 16.78	9.80 ± 172.76
Profit share				
min.8	-7.744678	-0.4653355	-3.139979	-0.6957247
max.8	12.6667	9.401179	144.7625	534.6362
mean..sd..8	0.79 ± 0.59	0.77 ± 0.63	1.39 ± 3.97	1.77 ± 16.59

Source) Sample data from KCI *Note:* The data shows there could be outliers, for example, labour share whose maximum values are around 500 and 429 for *chaebols* and non-*chaebols*, respectively. Unit: Korean Won

Table C.6: Summary Statistics between *Chaebols* and Non-*chaebols* and Pre-crisis and Post-crisis