The Impact of Post-secondary Education on Life Satisfaction of Immigrants and Natives:

Evidence from Canada

by

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Dalhousie University is located in Mi'kma'ki, the
ancestral and unceded territory of the Mi'kmaq.
We are all Treaty people.

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ABSTRACT

Educational attainment is widely recognized as a crucial socio-economic factor that influences life satisfaction. However, there is limited knowledge about its specific impact on life satisfaction, as it is often treated as a control variable in research. This thesis aims to investigate the impact of post-secondary education on the life satisfaction of immigrants and native individuals in Canada using the ordered probit technique and data from the annual component (2017-2018) of the Canadian Community Health Survey (CCHS). The findings of this thesis reveal a positive association between post-secondary education and life satisfaction in Canada, with a slightly stronger correlation observed among immigrants compared to natives. Both groups, especially those with post-secondary education, report higher levels of life satisfaction compared to those without such education. These findings underscore the importance of increasing access to higher education opportunities for both natives and immigrants, as it contributes to overall well-being improvements for individuals, families, and communities. Furthermore, the study indicates that the difference in the associations between post-secondary education and life satisfaction for immigrants and Canadian-born individuals is not statistically significant, suggesting a similar positive correlation of post-secondary education with life satisfaction for both groups within the study population.

Key words: post-secondary education, life satisfaction, immigrants, natives.

LIST OF ABBREVIATIONS USED

CCHS   Canadian Community Health Survey

PUMF   Public Use Microdata File

CATI   Computer-Assisted Telephone Interviews

CAPI   Computer-Assisted Personal Interviews

COPD   Chronic Obstructive Pulmonary Disease

AME   Average Marginal Effect

LS   Life Satisfaction in General

PROB   Predicted Probability

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CHAPTER 1: INTRODUCTION

Higher education is crucial in shaping an individual's career success and economic mobility in many countries. Individuals who have completed post-secondary education are often more likely to secure higher-paying job opportunities and experience improved quality of life. For most people, post-secondary education is not just a means to an end, but a way to pursue personal interests, develop new skills, and achieve a sense of self-fulfilment, all of which affect their life satisfaction. While economists' investigation of the effects of educational attainment often focuses on measuring economic productivity and objective well-being, the subjective well-being of labour is often overlooked. However, given that many individuals pursue higher education to improve their quality of life, looking beyond economic metrics and considering other outcome measures is worthwhile. Life satisfaction, increasingly recognized as an important indicator of well-being, is useful in this regard, as it provides an alternative view of the outcomes of people.

Across various studies, the definition of life satisfaction has mainly remained consistent. It is commonly described as an individual's overall evaluation of their quality of life, including their job satisfaction, social relationships, and overall happiness (Diener et al., 2002; Fors and Kulin, 2015; Karatas et al., 2021). The level of satisfaction with life provides valuable insights into people's overall well-being. Specifically for workers, it has significant implications for their mental and physical health, social relationships, and productivity. Also, studies have shown that life satisfaction is closely linked to other important economic outcomes, such as job satisfaction (Mafini et al., 2014), work engagement (Ferreira et al., 2020), and productivity (Kazekami, 2020). A satisfied

worker is likely to be more engaged, motivated, and productive, which can benefit both the individual worker and their employer. Although education plays a significant role in shaping life outcomes, little is known about how it impacts workers' life satisfaction in the Canadian context. Specifically, this area has garnered less attention in the economic literature.

For immigrants, life satisfaction serves as an indicator of how well they have integrated into their host country (Monteiro and Haan, 2021). The impact of education on immigrants' life satisfaction may be stronger due to the unique challenges they face in adapting to a new country, including potential barriers to finding suitable employment. Immigrants may experience difficulties in adjusting to the system, such as language barriers, cultural differences, and discrimination, which can lead to social isolation and lower life satisfaction. However, highly educated immigrants may have an advantage in acquiring language skills, cultural knowledge, and social networks, which are essential for successful integration and improved life satisfaction in their host country.

According to Berry et al. (2006), pursuing post-secondary education in the host country also provides opportunities for interaction with members of the host society and the development of cross-cultural competencies, thus playing a vital role in facilitating the integration of immigrants into their new environment and ultimately improving their well-being. Finally, education can provide immigrants with a sense of accomplishment and empowerment, which can have positive effects on their overall well-being and life satisfaction (Cakir and Guneri, 2011).

The results of this thesis reveal that post-secondary education is positively associated with life satisfaction in Canada, with a slightly stronger association observed

among immigrants compared to native individuals. Also, both groups, particularly those with post-secondary education, report higher levels of life satisfaction compared to those without such education. The results highlight the significance of expanding access to higher education opportunities for both natives and immigrants, as it can contribute to overall well-being improvements that extend to individuals, families, and communities.

Additionally, this thesis reveals an interesting finding regarding the correlation of post-secondary education with life satisfaction for immigrants and natives in Canada. Contrary to expectations, the difference in the association between having post-secondary education and life satisfaction for these two groups is not statistically significant. This indicates that the positive correlation of post-secondary education with life satisfaction is similar for both immigrants and natives in the study population.

1.2 Thesis objectives

This thesis aims to directly investigate the impact of post-secondary education on life satisfaction for immigrants and Canadian-born workers, controlling for a range of demographic and socio-economic factors. By focusing on the working-age population, we can better understand how post-secondary education relates to life satisfaction among those actively engaged in the labour market and thus likely to be more directly impacted by their educational attainment. Specifically, it seeks to address the following questions:

1. How does post-secondary education affect life satisfaction among natives and immigrants in Canada?

2. Are the effects of post-secondary education on life satisfaction similar for immigrants and Canadian-born individuals, or do they differ in some way?

I hypothesize that post-secondary education positively and significantly affects life satisfaction for both groups and that this effect is stronger for immigrants than for Canadian-born workers.

1.3 Thesis Contribution

Recently there has been a growing scholarly interest in examining the economics of life satisfaction (Layard et al., 2014; Frey and Stutzer, 2011). Some studies have explored the potential role of higher education by utilizing various identification strategies accordingly (e.g., Clark and Oswald, 1994; Blanchflower and Oswald, 2004; Frey and Stutzer, 2002). While it is true that educational attainment is widely recognized as an important socio-economic determinant of life satisfaction, much of the literature on this topic has treated it as a control variable and focused on estimating its association rather than exploring its direct impact on life satisfaction. This approach may be limited in its ability to capture the true effect on well-being since it is difficult to disentangle the impact of education from other factors (e.g., income) that may be related to both education and life satisfaction. Motivated by these gaps in the literature, this study investigates the effect of post-secondary education on the life satisfaction of workers. As in Maria et al. (2011), this thesis uses an ordered probit model to estimate the probability of higher life satisfaction. This approach differs from the studies above that employ techniques such as fixed effects estimation, OLS regression analysis, panel data analysis, experimental design among others to examine the relationship between post-secondary education and well-being. The ordered probit technique offers the potential for more

robust and reliable estimates, contributing to the existing literature on the effect of post-secondary education on well-being.

Further, most existing studies tend to concentrate on the general population. However, post-secondary education can have varying outcomes for different demographics based on their backgrounds and circumstances. For example, post-secondary education may affect life satisfaction differently among individuals who are not in the labour force, such as retirees or individuals who are unable to work due to disability. At the same time, post-secondary education may affect the life satisfaction of immigrants and Canadian-born or natives differently. The life satisfaction of workers is important for understanding the broader social and economic implications of labour markets. As not everyone faces similar experiences, it is important to consider the differential impact on different individual groups to understand labour market dynamics comprehensively. However, the extent to which it varies between immigrants and Canadian-born workers remains understudied. This is particularly important given that Canada is one of the most diverse countries in the world, with immigrant workers making up a significant and growing share (about 27.7%) of the Canadian labour force population (Statistics Canada, 2021). For most immigrants, obtaining a post-secondary education is a key determinant of their social integration, economic mobility, and improving quality of life in Canada.

Most immigrants obtain post-secondary education, and it is important to understand how education affects their lives in Canada. In addition to the immigrant population, some Canadian-born individuals have post-secondary education and an advantage in the job market because they may have acquired specialized skills and

knowledge through their education and training that are in demand by employers. Still, it is unclear how this advantage translates into greater life satisfaction than their immigrant counterparts. By addressing this gap in the literature, this study contributes to a deeper understanding of the role of education in shaping the well-being of immigrant and Canadian-born workers in Canada. This, in turn, can inform policies and practices that promote educational and social integration and improve the quality of life for all Canadians, regardless of their immigration status.

1.4 Thesis organization

This thesis is organized into five chapters. The remainder of the paper is organized as follows: In chapter 2, I review the relevant literature on post-secondary education and life satisfaction. Chapter 3 describes the data and estimation strategy including the sample and variable selection. Chapter 4 presents and discusses the empirical results of the study and a summary of policy implications. Finally, chapter 5 provides the limitations of the study and the conclusion.

CHAPTER 2: LITERATURE REVIEW

In this section, I discuss relevant theoretical and empirical studies on the impact of higher education on life satisfaction. I also present literature on the observed difference between immigrants versus Canadian-born variations in life satisfaction.

2.1 Higher education and life satisfaction

Whether education can improve an individual's life satisfaction is a significant and disputed issue. The nexus between education and life satisfaction is uncertain based on the available empirical evidence, and the evidence regarding the impact of education on life satisfaction is inconclusive. Although most studies report a positive relationship between higher education and life satisfaction (e.g., Gerdtham and Johannesson, 2001; Cheung and Chan, 2009; Botha, 2013; Helliwell et al., 2020), negative (e.g., Clark and Oswald, 1994; Frey and Stutzer 2002; Ferrante, 2006) and even insignificant associations (e.g., Peiró, 2006; Selim 2007; Chen 2012) have also been reported in most countries.

The theoretical literature has two perspectives on how education might impact an individual's life satisfaction. One view suggests that, in general, higher education leads to greater life satisfaction because it brings about various economic and psychological advantages. Advocates of this perspective argue that higher education may positively impact one's life satisfaction through different direct and indirect channels. Existing literature reveals a positive and significant association between higher education and direct channels such as self-esteem, social status, and social support gained from higher education (Castriota, 2006; Chen, 2012; Caunt et al., 2012).

According to Castriota (2006), to live in a society without the potential for shame, individuals need to have attained a certain level of education. Consequently, higher education acts as a signal of both competence and prestige, improving one's self-confidence and social status, thereby raising the general level of an individual's life satisfaction. Alternatively, some studies demonstrate that higher education impacts labour market prospects (e.g., productivity, income, job quality and opportunities) and health, indirectly increasing individual life satisfaction (Layard et al., 2012; Brunello et al., 2013; Jongbloed, 2018). For instance, Jongbloed (2018), using data from the 2012 European Social Survey, examines the impact of post-secondary education on the life satisfaction of Europeans. The study indicates that highly educated individuals report considerably higher scores in resilience, which refers to the duration a person takes to return to their normal state after facing adversities in life. More specifically, the study finds that vocational and tertiary education are linked with increased emotional stability. Furthermore, the author explains that mental health is closely related to life satisfaction. Therefore, the findings indicating that higher education is associated with better mental health suggest that pursuing higher education may also lead to greater life satisfaction.

On the contrary, the second perspective contends that education, particularly beyond a certain level, could lower life satisfaction. Ferrante (2009) presents an intriguing theory for the inverse correlation, which revolves around regret. Individuals' choices about pursuing higher education are among the primary sources of regret. According to Ferrante (2009), this happens because education can increase an individual's aspirations and opportunities, and if their ambitions exceed their prospects, they may experience an aspiration bias. This bias can negatively affect their life

satisfaction, particularly if they fail to anticipate changes in their aspirations. Also, Clark and Oswald (1994) argue that because individuals with higher education generally earn higher incomes, the potential cost associated with unemployment may be more significant for them, leading to greater levels of mental distress which could be detrimental to their life satisfaction. Using data from the British Household Panel Survey for 1991, they find that individuals with higher levels of education tend to have lower levels of satisfaction than those with lower levels of education, which they attribute to the greater mental distress experienced by individuals with higher levels of education.

Finally, while evidence on the relationship between higher education and life satisfaction primarily relies on studies summarizing correlations, empirical studies relying on causal techniques also report inconsistent findings. Some studies suggest that higher education has no significant impact on life satisfaction after controlling for indirect factors such as income and health. For instance, Cunado and de Gracia (2012) examine the effect of various educational attainment levels on life satisfaction in Spain using data from the 2008 European Social Survey. They find a significant positive impact of educational levels on life satisfaction. However, after adjusting for income, this significant effect disappears, indicating that the impact of education on life satisfaction is indirect and mediated through income. However, using data from the 2005-2006 World Values Survey, Salinas-Jiménez et al. (2013) discover that higher education has a significant and independent positive effect on life satisfaction, even after controlling for income, occupational status, and health.

Despite the growing body of literature on the link between life satisfaction and educational attainment, the topic remains complex. Besides the inconsistency of findings,

higher levels of education may not lead to similar experiences for diverse groups, leading to ongoing debates in the literature about how education affects life satisfaction for different populations, such as immigrants and non-immigrants.

2.2 Higher education and life satisfaction among immigrants and non-immigrants (natives)

For a long time, researchers have been interested in understanding how immigrants integrate into their host countries, and have mainly approached this subject from an economic perspective. The desire for economic prosperity in their new country is often a crucial factor that motivates immigrants to migrate and endure the social and economic costs of leaving their home countries. However, recent studies on migration suggest that non-economic factors, such as subjective well-being, also influence the decision to immigrate and the integration process (e.g., Maskileyson and Birgier, 2022). Therefore, analysing immigrants' life satisfaction in their host countries can provide valuable insights into their social and economic integration. This section delves into the variations in how higher education affects the life satisfaction of immigrants and non-immigrants, and the reasons for these differences are also discussed.

Numerous studies have consistently found that higher education positively affects life satisfaction for both immigrants and non-immigrants. For instance, Jiang and Renema (2021) conducted a study investigating native-immigrant disparities in happiness[1] among middle-aged and older adults in Denmark, Germany, and the Netherlands. They find that higher education positively correlates with happiness among immigrants and natives. Similarly, using the European Social Survey (ESS) 2020, Assari and Najand (2022)

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[1] Most of these studies use the words subjective well-being, happiness, and life satisfaction interchangeably.

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examine the relationship between immigration status, educational attainment, and happiness among individuals living in 22 European countries. The authors find that higher levels of educational attainment were associated with higher satisfaction levels among immigrants and non-immigrants. In the Canadian context, Frank and Schellenberg (2016) compare different immigrant groups and the Canadian-born population and find that most immigrant groups do not differ significantly from the native-born population in life satisfaction, especially highly educated individuals. Furthermore, Woolley (2021) examined the life satisfaction gap between Canadian-born individuals and immigrants in Canada between 1984 and 2005 and found that the gap in life satisfaction between immigrants and Canadian-born individuals with a university degree is much smaller than the gap between those who do not hold a degree. This thesis therefore adds to the existing literature by using a more recent data, i.e., CCHS (2017-2018).

While the mechanisms through which higher education impacts the life satisfaction of native-born individuals are relatively straightforward, among immigrants, the impact may depend on factors such as social and labour market integration. For natives, higher education levels are associated with more opportunities for employment and higher wages. However, the impact on life satisfaction may be less pronounced, as natives may already have greater access to opportunities and a sense of belonging in their society. Hence, their life satisfaction may be significantly influenced by other factors such as social relationships and community involvement than education (Kóczán, 2016). On the other hand, highly educated immigrants may be more likely to easily integrate into their host society, resulting in increased life satisfaction (Assari and Najand, 2022). According to Assari and Najand (2022), immigrants may face additional challenges in

integrating into a new culture and society, including language barriers, discrimination, and difficulties in finding employment. However, highly educated immigrants can develop the skills and knowledge necessary to overcome these challenges and improve their economic and social status. Thus, immigrants with higher educational attainment may have an easier time finding employment in their chosen fields, which can lead to greater financial stability and satisfaction with their standard of living (Bartram, 2011). Furthermore, highly educated immigrants may also be more likely to integrate into their new society, as they may have a better understanding of the language and culture, which can lead to a greater sense of belonging and overall life satisfaction (Amit and Bar-Lev, 2015).

On the other hand, some studies suggest that immigrants report lower levels of life satisfaction compared to native-born individuals within the host country (e.g., Frank and Hou, 2018; Bonikowska et.al., 2014; Berry and Hou, 2016). This may be due to the additional barriers immigrants face in the labour market, including discrimination, lack of recognition of their education and qualifications, and difficulty finding suitable employment. These challenges can result in unsuccessful labour market integration and lower levels of life satisfaction. For instance, these barriers could result in education-occupation mismatch for immigrants. In a study conducted by Frank and Hou (2017) on immigrant and non-immigrant workers in Canada, the relationship between over-education and life satisfaction was examined. Over-education is when a person's level of education exceeds the requirements for their job. Immigrants were found to be more likely to be over-educated for their jobs compared to natives. The study finds that highly educated immigrant workers who cannot obtain higher-status occupations that typically

match their education level tend to report lower levels of life satisfaction. When a person's educational attainment does not align with their profession or income, it may result in status inconsistency, which can lead to feelings of dissatisfaction and low levels of life satisfaction, as pointed out by Chiswick and Miller (2010). Dean and Wilson (2009) also studied highly skilled recent immigrants in Canada. They found that underemployment harmed their mental health, with many reporting feelings of frustration, disappointment, depression, and overall lower levels of well-being. Immigrants often face greater challenges in finding suitable employment that matches their level of education due to cultural and labour market differences in the host country, which can further complicate their job search, as stated by Aycan and Berry (1996). As a result, these barriers can make immigrants more susceptible to feelings of alienation and social isolation, ultimately leading to high dissatisfaction and difficulty contributing to and integrating into their host countries (Kogan et al., 2018).

Overall, the inconsistency of research findings on the relationship between higher education and life satisfaction, particularly for immigrants and native-born individuals, indicates a need for further investigation. It is unclear whether highly educated immigrants in Canada are more or less content than their Canadian-born counterparts. This study addresses this gap by examining how post-secondary education affects the life satisfaction of immigrant workers in Canada and comparing it to native-born workers. The study's focus on life satisfaction as an indicator of subjective well-being could impact policymaking in Canada. The study's results will reveal the factors that influence the life satisfaction of immigrant workers in Canada, which is important since Canadian

immigration policies prioritize selecting immigrants who are expected to contribute significantly to the Canadian economy.

CHAPTER 3: DATA AND ESTIMATION STRATEGY

3.1 Data and sample

The dataset used for empirical analysis throughout this research paper is the Canadian Community Health Survey (CCHS). The CCHS is a cross-sectional survey conducted by Statistics Canada to provide information on health status, health behaviours, lifestyle, health care utilization, and sociodemographic factors of the Canadian population. The CCHS uses a stratified random sampling design and is administered through a combination of computer-assisted telephone interviews (CATI) and computer-assisted personal interviews (CAPI). The CCHS aims to provide comprehensive and up-to-date information on Canadians' health, inform policy and program development, and monitor trends in health over time. The survey results are used by federal, provincial, and territorial governments, researchers, and public health professionals to improve health outcomes and address health inequalities across Canada.

Before 2007, the CCHS was conducted biennially, meaning data were collected every two years. However, to improve the flexibility and efficiency of the survey, Statistics Canada began collecting data annually in 2007. This change allowed for more frequent updates on health status and behaviour trends and provided researchers with more current data for their analyses. The annual data collection also allowed for gathering more detailed information on specific topics in alternate years, such as mental health and the use of health services. Overall, the move to annual data collection represented a significant change in the design of the CCHS and has had significant implications for public health research and policy in Canada.

The CCHS creates two different dataset types: "a file incorporating data from two years" and "an annual microdata file" (Statistics Canada). The data used in this research are selected from the Annual Component (2017-2018) of the CCHS, and this is a Public Use Microdata File (PUMF) - 24 Month.

3.2. Sample selection and variables

3.2.1 Data restriction

The CCHS data for this study are originally restricted to individuals who are either employees or self-employed. I refer to these groups as workers. These, however, do not include student-workers, meaning every individual in this sample is assumed to be out of school when the data were collected.

3.2.2 Dependent variable

The dependent variable used is satisfaction with life in general. In this thesis, I use it interchangeably with subjective well-being. This measure is derived from the research question: *"Using a scale of 0 to 10, where 0 means "Very dissatisfied" and 10 means "Very satisfied," how do you feel about life as a whole right now? "*

Table 1 shows the summary of responses to this question by natives and immigrants separately. On average, natives have slightly higher life satisfaction compared to immigrants. Additionally, the percentage of immigrants and natives who rate their life satisfaction using a number less than 5 out of 10 is 1.88% and 1.64%, respectively. This suggests that the vast majority of both immigrants and natives are generally content, rather than unhappy, with their lives, but that immigrants are marginally more likely to be dissatisfied with their lives. Moreover, the summary statistics show that 33.22% of

immigrants and 34.62% of natives selected 8 as their response to the question, representing about one-third of the total interviewees. This is the most significant percentage of responses from the eleven available options. In general, 93.76% of immigrants and 95.29% of natives gave an answer above 5 to the question. It appears that respondents to the survey prefer to indicate that they are happy. The Summary of responses to "life satisfaction in general" for both groups is shown below in Table 1.

Table 1: Summary statistics on life satisfaction for immigrants and natives

Number on scale	IMMIGRANTS		NATIVES	
	Frequency	Percentage	Frequency	Percentage
0	10	0.15	45	0.13
1	7	0.10	23	0.07
2	24	0.36	87	0.25
3	30	0.44	137	0.40
4	56	0.83	270	0.79
5	295	4.37	1043	3.05
6	358	5.30	1483	4.33
7	1178	17.43	5424	15.85
8	2245	33.22	11846	34.62
9	1304	19.3	7319	21.39
10	1251	18.51	6536	19.10
Mean	8.056 (0.018)		8.177 (0.008)	
Total	*6,758*		*34,213*	

Standard errors are in parentheses.

3.2.3 Determinants of life satisfaction

An individual's education level is the main independent variable of interest. This binary variable takes a value of 1 if the individual has completed post-secondary education and 0 otherwise. Post-secondary education in this context is defined to be the educational attainment of individuals who have obtained a certificate, diploma, or university degree

beyond their secondary education (high school). Amit (2009) finds that education is positively associated with life satisfaction among immigrants from western countries and from the Former Soviet Union (FSU) in Israel. Specifically, she reports that higher levels of education were associated with higher levels of life satisfaction, even after controlling for other factors such as age, gender, and income. Amit suggests that education may provide immigrants with the skills and knowledge needed to navigate their new environment, leading to greater levels of life satisfaction. I expect to see similar effects of post-secondary education on life satisfaction as in Amit (2009).

Individual-level control variables that are anticipated to impact life satisfaction are included in this study. These include health status, dwelling ownership, sense of belonging to the local community, household size, perceived stress at work, length of time in Canada since immigration, province of residence of respondent, age group, sex, sexual orientation, height, marital status, and cultural or racial background.

The health status variable is a dummy (i.e., 0 = poor health and 1= good health). This comes from whether an individual has a chronic health condition or not. If an individual has a chronic condition, then such a person is said to have poor health; people without such chronic health conditions are considered to have good health. The chronic health conditions used include asthma, chronic obstructive pulmonary disease (COPD), sleep apnea, scoliosis, fibromyalgia, arthritis, back problems (excluding scoliosis, fibromyalgia, and arthritis), osteoporosis, high blood pressure, high blood cholesterol/lipids, heart disease, diabetes, cancer, migraine headaches, allergies, chronic fatigue syndrome, mood disorder (depression, bipolar, mania, dysthymia), and anxiety disorder (phobia, OCD, panic). Ana and Alberto (2019) find that health status is strongly

associated with life satisfaction, with those reporting better health also reporting higher levels of life satisfaction. As in Ana and Alberto (2019), I expect to find that good health raises life satisfaction.

A variable that shows an individual's economic status is "dwelling ownership." It is based on the survey question: "Is this dwelling...? 1- Owned by a household member, even if it is still being paid for, 2- Rented, even if no cash rent is paid." However, this variable is recoded as a dummy (i.e., 0= rented and 1= owned by a household member). Previous research has indicated that the relationship between income and subjective well-being is positive but not linear, which has been observed at the individual and societal levels (Easterlin 1974, 2001). Additionally, Stutzer (2004) find that higher income expectations can nullify the benefits of increased income. Although income data is available in the CCHS dataset, directly measuring income can be challenging due to potential measurement errors or self-reporting biases. By using dwelling ownership status as a proxy for income, I aim to capture the income-related factors that may influence life satisfaction without relying on self-reported income data. Dwelling ownership is considered a valuable indicator of higher income levels because it typically requires a certain level of financial stability and resources. Individuals who own homes are more likely to have higher incomes compared to those who do not. Therefore, by incorporating dwelling ownership status as a proxy for income, I can indirectly capture the income-related factors that may impact life satisfaction. The decision to use dwelling ownership as a proxy for income is supported by previous research. For instance, Zsóka Kóczán (2016) found that owning a home is significantly associated with higher levels of life satisfaction among immigrants in Europe. Drawing on this previous study, I anticipate

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observing a significant positive correlation of home ownership with life satisfaction in my analysis.

An individual's sense of belonging to the local community is an important covariate. This variable is a dummy (i.e., 0 = weak and 1= strong). Pretty and McCarthy (1991) find that local community belonging, or a sense of attachment and connectedness to one's local community, is strongly associated with individuals' local social networks. People who feel a strong sense of community belonging are more likely to have supportive and diverse social networks, which can provide social support and resources that contribute to their well-being and mental health (McMillan and Chavis, 1986). The studies by the authors above show that sense of community has a positive impact on life satisfaction. They find that individuals who report a stronger sense of community also report higher levels of life satisfaction, and this is my expectation in this study.

A variable that indicates work characteristics is "perceived work stress." It is based on the survey question: "Would you say that most days at work were...? 1 - not at all stressful, 2- not very stressful, 3 - a bit stressful, 4 - quite a bit stressful, 5 - extremely stressful". A dummy is created for each of the response categories above. According to Hou and Picot (2017), perceived work stress was an important factor mediating the relationship between over-education and life satisfaction. The authors argued that over-educated workers might experience higher perceived stress levels if they feel that their jobs are unchallenging or do not fully utilize their skills and knowledge. They suggested that perceived work stress could have a negative impact on workers' well-being and job satisfaction and could help explain why over-educated workers tend to report lower levels

of life satisfaction. In this study, I anticipate seeing a similar association of perceived work stress with individuals' subjective well-being.

Additional covariates include household size, length of time in Canada, and province of residence. According to Duncan and Stafford (1980), household size could have important implications for individuals' life chances and opportunities. The authors suggested that larger households may experience greater strain on resources, such as income, living space, and privacy, which can have negative effects on individual well-being and life satisfaction, and this, therefore, is my expectation in this project. The household size variable has been grouped into five categories (i.e., 1, 2, 3, and 4 for the exact number of persons living in a household, and 5 if more persons live in a household)

The length of time in Canada since immigration variable is specific to immigrants and it shows how long an immigrant has stayed in Canada. This variable has two categories (i.e., 1= "0-9 years" and 2 = "10-121 years"). According to Statistics Canada (2011), life satisfaction among immigrants increased with longer duration of residence in Canada, and this effect was particularly strong for economic immigrants and refugees. Again, the province of residence variable is included to control for province fixed effects. This helps to examine the effect of other variables on life satisfaction among immigrants, while holding constant the potential impact of differences in province-specific conditions. This variable has eleven categories; these include Newfoundland and Labrador, Prince Edward Island, Nova Scotia, New Brunswick, Quebec, Ontario, Manitoba, Saskatchewan, Alberta, British Columbia, and the Northern territories. A dummy is created for each of these categories (i.e., 1= if the individual is in the province, and 0= otherwise). A study by Akbari and Worswick (2014) finds that the effect of province of residence on life

satisfaction is relatively small and insignificant when other factors such as income, education, and social integration are considered. As in Akbari and Worswick (2014) and Statistics Canada (2011), I expect to see a relatively small and insignificant association of the province of residence variable, and a positive correlation for individuals with longer duration of residence in Canada on life satisfaction, respectively.

Finally, demographic characteristics are controlled for. First is the age group. The sample is restricted to individuals between 25 and 64 years to capture the most active members in the labour market. These people are either employees or self-employed. As the age variable in the data source was given in groups, I construct an age category based on the groupings to capture the information contained in the variable. Therefore, there are four categories of the age group variable, i.e., 25-34 (reference group), 35-44, 45-54, and 55-64 years. Other variables include the height of the individual, sex (0 = male and 1= female), racial/cultural background (0 = white and 1 = non-white/visible minority), sexual orientation (0 = homosexual/bisexual and 1 = heterosexual) and marital status (0 = single, 1= couple, and 2 = widowed/divorced/separated).

In summary, the determinants of life satisfaction for which dummies have been created include health status, dwelling ownership, sense of belonging to local community, perceived work stress (i.e., 1 if the individual belongs to any of the categories and 0 otherwise) and province of residence (i.e., 1 if the individual belongs to any of the categories and 0 otherwise).

3.3 Estimation strategy

3.3.1 Procedure

The link between education and life satisfaction has been studied by several researchers using different econometric techniques. Salinas-Jiménez et al. (2010) used an ordered probit regression model to analyse the impact of education on life satisfaction in Spain but focused on education as a positional good. Frank and Hou (2017) used ordinary least squares regression models to investigate the impact of over-education on life satisfaction among immigrant and non-immigrant workers in Canada. Cheung and Chan (2009) employed a cross-country analysis using multilevel regression models to examine the effect of education on life satisfaction. Lastly, Jongbloed (2018) used multivariate regression analysis to investigate the impact of higher education on the hedonic and eudaimonic well-being of Europeans. These studies employed various econometric techniques to analyse the link between education and life satisfaction, highlighting the complex nature of this relationship and the need for a multifaceted approach in investigating it.

In this study, to examine the impact of post-secondary education on life satisfaction in general among immigrants and natives, I use the ordered probit model. This would help to account for the natural ordering of the categories in the dependent variable (i.e., life satisfaction in general) and allow for non-equidistant spacing between them. According to Clark and Oswald (1996), ordered response models are often more appropriate for analyzing life satisfaction data due to the ordinal nature of the dependent variable. These models can capture the fact that people's responses to survey questions about life satisfaction are ordered along a scale, with some reporting lower levels of

satisfaction and others reporting higher levels. The authors argue that standard regression models, such as OLS or logit models, are not adequate for this type of data because they do not account for the ordinal nature of the variable. They suggest using ordered logit or probit models to analyze life satisfaction data, as these models consider the ordering of responses. The ordered probit model would estimate separate parameters for each category and allow for different effects of the predictors on each category of the life satisfaction variable.

Given that the dependent variable is given on an ordinal scale, I first run ordered probit regressions for each sample (i.e., immigrants and natives) to determine whether the association of post-secondary education with life satisfaction is either positive or negative. More specifically, this helps us to understand whether immigrants or natives who have completed post-secondary education are more likely to report higher levels of life satisfaction compared to those who have not completed post-secondary education.

Next, I calculate the predicted probabilities[2] to estimate the likelihood of an individual reporting each level of life satisfaction for a given level of education, holding other factors constant. This allows us to see how the impact of post-secondary education on life satisfaction varies across different levels of life satisfaction.

I then estimate the average marginal effects of post-secondary education and other independent variables on life satisfaction. This allows us to estimate the change in the probability of reporting each level of life satisfaction for a unit change in the education and other independent variable(s). Also, the average marginal effects provide valuable information about the overall impact of post-secondary education on life

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[2] Refer to appendix 3.3.3 and 3.3.4 for detailed explanations on the estimation procedure for predicted probabilities and average marginal effects.

satisfaction and how this impact varies across different levels of life satisfaction. Overall, the average marginal effects provide a more interpretable estimate of the impact of the independent variable(s) on the probability of reporting each level of life satisfaction. For this stage, I finally focus on the highest life satisfaction scale (i.e., LS =10) because this scale produces the highest and significantly positive impact of post-secondary education on life satisfaction for Canadian-born individuals and immigrants.[3]

The final thing I do is to check for the difference between the effects of post-secondary education among immigrants and natives. This involves including interaction terms that capture the combined effect of education and immigration status on life satisfaction using the full sample. By including these interaction terms, I am able to assess whether the impact of post-secondary education on life satisfaction differs significantly between immigrants and natives. The interaction terms would allow me to explore whether there are variations in the relationship between education and life satisfaction based on immigration status. If the interaction term is statistically significant, it suggests that the effect of post-secondary education on life satisfaction differs significantly between immigrants and natives. This analysis helps uncover any unique aspects or disparities in the impact of education on life satisfaction across the two groups, providing valuable insights into the potential differential effects of education on well-being for immigrants compared to natives.

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[3] Refer to Table 4 for the associations of post-secondary education for all levels of the life satisfaction variable for natives and immigrants respectively.

3.3.2 Methodology

In conducting an empirical analysis of the ordered probit model, I use different specifications of the equation given below:

$$LS_i^* \;=\; \textstyle\sum_n \beta_n X_{n,i} + \varepsilon_i \qquad \text{for} \quad n \geq 1 \qquad \textbf{Eqn. 1}$$

Where $E(\varepsilon_i | X_{n,i}) = 0$ and $Var(\varepsilon_i | X_{n,i}) = 1$. Also, i represents an individual (i.e., immigrant or native), LS* measures life satisfaction in general, X_n is a set of explanatory variables with X_1 as the main independent variable (i.e., postsecondary education), and β_n are the parameters to be estimated where β_1 is the main parameter of interest. All control variables are contained in the set X_n. These include sociodemographic and individual characteristics such as the age group, sex, marital status, dwelling ownership, sense of belonging to local community, health status, etc. ε is a random error term following a standard normal distribution.

From **eqn.1** above, LS_i^* is not directly observable, hence it is referred to as a latent variable. However, I do observe the responses of individuals to the survey questions about their well-being (i.e., LS_i). Individuals select the response to LS_i that comes the closest to reflecting their actual or true unobserved latent level of well-being, LS_i^*. Therefore, the observable variable LS_i is treated as an ordinal variable with eleven possible responses and $\tau = \tau_{-1}, \tau_0, \tau_1, \tau_2, \ldots, \tau_{j-1}, \tau_j$ defined as a vector of unobservable threshold parameters. The relation between the observable and latent variable is expressed as:

$$LS_i = j \quad \text{if} \quad \tau_{j-1} < LS_i^* \leq \tau_j , \qquad j = 0, 1, 2, \ldots, 10 \qquad \textbf{Eqn.2}$$

Where $\tau_{-1} = -\infty$, and $\tau_{10} = \infty$ and $\tau_0 < \tau_1 < \cdots < \tau_9$

Eqn.2 is further expanded as:

$$LS_i = \begin{cases} 0 & \text{if} & \tau_{-1} = -\infty < LS_i^* \leq \tau_0 \\ 1 & \text{if} & \tau_0 < LS_i^* \leq \tau_1 \\ 2 & \text{if} & \tau_1 < LS_i^* \leq \tau_2 \\ \vdots & \vdots & \vdots \\ \vdots & \vdots & \vdots \\ 10 & \text{if} & \tau_9 < LS_i^* \leq \tau_{10} = \infty \end{cases}$$

CHAPTER 4: EMPIRICAL RESULTS AND DISCUSSION

This chapter presents the results of the ordered probit estimation analysis, the predicted probabilities and average marginal effects addressing the research objectives. Thus, I examine the results of the ordered probit model to determine the direction (i.e., positive or negative) of the influence of post-secondary education and other variables on life satisfaction. The predicted probabilities and average marginal effects of post-secondary education on life satisfaction are estimated separately for natives and immigrants, to gain a better understanding of the effect of higher education on life satisfaction for these two groups. Since there are differences in characteristics between these two groups, I will first present the summary statistics of natives and immigrants in this model. The purpose is to identify the differences in the variables between the groups. Section 4.2 presents the results of the ordered probit estimation and 4.3 presents the predicted probabilities and average marginal effects. The predicted probabilities and average marginal effects reinforce the results from the ordered probit model.

4.1 Summary statistics

Summary statistics for Canadian-born individuals and immigrants are respectively shown below in Table 2.

Table 2: Summary statistics for natives and immigrants

	Native (Canadian born)		Immigrant	
Total number of observations	**40,971**			
Total sample size	**34,213**		**6,758**	
Variable	Percentage	Mean	Percentage	Mean
Education level				
Post-secondary education	74.37		81.60	
No Post-secondary education	25.63		18.40	
Sex				
Female	47.10		46.30	
Male	52.90		53.70	

Table 2: Summary statistics for natives and immigrants (Continued)

Variable	Native (Canadian born)		Immigrant	
Total number of observations	40,971			
Total sample size	34,213		6,758	
	Percentage	Mean	Percentage	Mean
Age-group				
25-34	27.90		24.70	
35-44	25.30		27.50	
45-54	25.40		29.10	
55-64	21.40		18.70	
Height (metres)		1.72		1.69
Employment status				
Employee	84.59		83.01	
Self-employed	15.41		16.99	
Sexual orientation				
Heterosexual	96.83		97.22	
Homosexual/bisexual	3.17		2.78	
Marital status				
single	21.10		15.80	
married/common law	69.70		76.30	
widowed/divorced/separated	9.20		7.90	
Cultural / racial background				
White	93.91		28.75	
Non-white/visible minority	6.09		71.25	
Dwelling ownership				
Owned by member of household	78.26		66.32	
Rented	21.74		33.68	
Sense of belonging to local community				
Strong	65.26		69.49	
Weak	34.74		30.51	
Health status				
Good	57.00		65.23	
Poor	43.00		34.77	
Length of time in Canada				
0 - 9 years			29.39	
10 - 121 years			70.61	
Household size				
1 person living in household	14.83		10.59	
2 persons living in household	33.69		23.04	
3 persons living in household	20.23		22.44	
4 persons living in household	21.56		25.89	
5 or more persons live in the household	9.70		18.04	

Table 2: Summary statistics for natives and immigrants (Continued)

	Native (Canadian born)		Immigrant	
Total number of observations	*40,971*			
Total sample size	*34,213*		*34,213*	
Variable	Percentage	Mean	Percentage	Mean
Perceived stress at work				
Not at all stressful	6.00		11.10	
Not very stressful	17.80		19.90	
A bit stressful	44.90		42.50	
Quite a bit stressful	26.10		21.90	
Extremely stressful	5.20		4.60	
Province of residence of respondent				
Newfoundland and Labrador	1.60		0.20	
Prince Edward Island	0.50		0.10	
Nova Scotia	3.00		0.60	
New Brunswick	2.70		0.20	
Quebec	27.30		15.30	
Ontario	34.10		49.40	
Manitoba	3.20		3.40	
Saskatchewan	3.40		1.40	
Alberta	12.40		13.00	
British Columbia	11.60		16.20	
Northern territories	0.20		0.10	

According to the summary statistics, the sample for this study is made up of 34,213 native respondents and 6,758 immigrants. Among the natives, 74.37% have post-secondary education, while 25.63% do not. Also, 81.60% of immigrants have post-secondary education while 18.40% do not. Males make up 52.90% of native Canadians, while females make up 47.10%. For immigrants, 53.70% are males and 46.30% are females. The majority of Canadians included in this survey (i.e., 27.90%) are between the ages of 25 and 34. The age range of 45 to 54 has the largest percentage of immigrants at 29.10%. The summary statistics reveal that, on average, natives in the sample have a height of 1.72 meters, whereas immigrants have a slightly shorter average height of 1.69 meters. Regarding sexual orientation, most of both natives and immigrants are

heterosexual (96.83% and 97.22%, respectively) while a small percentage (3.17% and 2.78% respectively) identify as homosexual or bisexual. Also, a higher percentage of both groups work as employees (i.e., 84.59% of natives and 83.01% of immigrants) whereas the rest are self-employed.

The majority of both groups—69.70% of native-born people and 76.30% of immigrants—are either married or in common-law relationships. While non-whites or other visible minorities make up a larger percentage (71.25%) of the immigrant sub-population, whites make up a larger percentage (93.91%) of the native sub-population. Regarding dwelling ownership, the majority of respondents own their homes while the rest rent. 78.26% of natives and 66.32% of immigrants own their homes while 21.74% and 33.68%, respectively, rent their places of abode.

In terms of sense of belonging to the local community, 65.26% of natives and 69.49% of immigrants report a strong sense of belonging, while 34.74% and 30.51%, respectively, report a weak sense of belonging to their local community. The health status variable shows that 65.23% of immigrants and 57.00% of Canadian-born individuals, respectively, have good health. The length of time in Canada for immigrants is split between those who have been in Canada for 0-9 years (29.39%) and those who have been in Canada for 10-121 years (70.61%). This demonstrates that most immigrants do remain in Canada for extended stretches of time. Additionally, a portion of immigrants may also undergo naturalization to become Canadian citizens, further contributing to the long-term presence of immigrants in the country.

The household size distribution shows that many households have 2-4 people living in them, with 33.69% of households having 2 people, 20.23% having 3 people, and

21.56% having 4 people. A small percentage of households have 1 person (14.83%) or 5 or more people (9.70%). Similarly, for immigrants, 23.04% of households have 2 people, 22.44% have 3 people, and 25.89% have 4 people living in them. A small percentage of households have 1 person (i.e., 10.59%) or 5 or more people (i.e., 18.04%). The majority of both native and immigrant respondents report feeling a bit or quite a bit stressed at work, with 44.90% and 26.10% of natives, and 42.50% and 21.90% of immigrants, respectively. Finally, most natives live in Ontario (34.10%) or Quebec (27.30%), while most immigrants live in Ontario (49.40%) or British Columbia (16.20%).

4.2 Ordered probit estimation results.

4.2.1 Results for natives and immigrants respectively [4]

Table 3 below shows the ordered probit estimation results for natives and immigrants separately.

Table 3: Ordered probit estimation results for natives and immigrants.

Variables	Natives	Immigrants
Education (ref = no post-secondary education)		
Post-secondary education	0.04*	0.12**
	(0.02)	(0.06)
Sex (ref = male)		
female	0.07**	-0.02
	(0.03)	(0.06)
Age group (ref = 25 - 34)		
35-44	-0.12***	-0.02
	(0.03)	(0.06)
45-54	-0.09***	-0.10
	(0.03)	(0.07)
55-64	-0.01	-0.07
	(0.03)	(0.08)

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[4] To ensure the reliability of the ordered probit findings, I conduct sensitivity analyses using OLS, and the outcomes are consistent.

Table 3: Ordered probit estimation results for natives and immigrants (Continued)

Variables	Natives	Immigrants
Height (metres)	-0.11	0.16
	(0.14)	(0.35)
Sexual orientation (ref = homosexual / bisexual)		
heterosexual	0.10**	0.13
	(0.05)	(0.14)
Marital status (ref = single)		
married/common law	0.43***	0.10
	(0.03)	(0.08)
widowed/divorced/separated	-0.04	-0.22***
	(0.03)	(0.08)
Employment status (ref = employee)		
Self-employed	0.03	0.08
	(0.03)	(0.06)
Cultural / racial background (ref = white)		
Non-white or visible minority	-0.13***	-0.08*
	(0.05)	(0.05)
Dwelling ownership (ref = rented)		
Owned by member of household	0.24***	0.08
	(0.03)	(0.05)
Sense of belonging to local community (ref = weak)		
strong	0.36***	0.44***
	(0.02)	(0.05)
Health status (ref = good)		
poor	-0.33***	-0.25***
	(0.02)	(0.05)
Household size (ref = 1 person lives in household)		
2 persons live in the household	-0.05	0.14*
	(0.03)	(0.08)
3 persons live in the household	-0.03	0.02
	(0.04)	(0.08)
4 persons live in the household	-0.06	0.09
	(0.04)	(0.08)
5 or more persons live in the household	-0.08	0.10
	(0.05)	(0.10)
Perceived work stress (ref = not at all stressful)		
Not very stressful	-0.23***	-0.24***
	(0.05)	(0.09)
A bit stressful	-0.36***	-0.34***

Table 3: Ordered probit estimation results for natives and immigrants (Continued)

Variables	Natives	Immigrants
	(0.05)	(0.08)
Quite a bit stressful	-0.57***	-0.50***
	(0.05)	(0.09)
Extremely stressful	-0.88***	-0.81***
	(0.07)	(0.13)
Length of time in Canada since immigration (ref = 0-9 years)		
10 - 121 years		-0.06
		(0.05)
Thresholds		
τ_1	-3.78***	-2.94***
	(0.29)	(0.64)
τ_2	-3.60***	-2.84***
	(0.28)	(0.63)
τ_3	-3.36***	-2.53***
	(0.27)	(0.61)
τ_4	-3.08***	-2.26***
	(0.27)	(0.61)
τ_5	-2.77***	-2.01***
	(0.27)	(0.61)
τ_6	-2.28***	-1.43*
	(0.27)	(0.61)
τ_7	-1.88***	-1.03
	(0.27)	(0.61)
τ_8	-1.12***	-0.35
	(0.27)	(0.61)
τ_9	-0.12	0.55
	(0.27)	(0.62)
τ_{10}	0.57*	1.16
	(0.27)	(0.62)
Pseudo R-squared	*0.0444*	*0.0338*
Observations	*34,213*	*6,758*
Total number of observations	*40,971*	

Standard errors are in parentheses, *** p<0.01, ** p<0.05, * p<0.10.

4.2.2 Natives

The results of the ordered probit estimation analysis reveal that post-secondary education is positively associated with life satisfaction for Canadian-born individuals. This suggests that natives with post-secondary education are more likely to report higher levels of life satisfaction compared to those without. This finding is consistent with previous research that has shown that education is positively related to life satisfaction (Blanchflower and Oswald, 2004).

The coefficient for sex is significant at the 95% level, with females reporting higher levels of life satisfaction than males. Age group is another significant variable for natives. Compared to the reference group of 25–34 year-olds, the coefficients for 35-44 and 45-54 year-olds are negative and significant at the 99% level, indicating that older individuals are less likely to report higher levels of life satisfaction than younger individuals.

Marital status is another significant variable for natives, with married or common-law individuals being more likely to report higher levels of life satisfaction than those who are single. Also, being a heterosexual is positively correlated with life satisfaction relative to being a homosexual or bisexual.

Compared to those who rent, natives who own their places of abode are significantly more likely to report higher levels of life satisfaction. Also, being a non-white or visible minority shows a negative correlation with life satisfaction relative to being a white. Similarly, individuals with poor health status are more likely to report reduced levels of life satisfaction compared to those with good health status.

Sense of belonging to local community and perceived work stress are also significant predictors of life satisfaction among natives. Those who report a strong sense of belonging to their local community are more likely to report higher levels of life satisfaction. In contrast, higher levels of perceived work stress are associated with lower levels of life satisfaction.

Finally, for natives, household size, height of an individual, belonging to the age group of 55-64, and being a widow or divorcee do not show significant correlations with life satisfaction.

4.2.3 Immigrants

The results show that immigrants with post-secondary education are more likely to report higher levels of life satisfaction compared to those without. This suggests that higher education may be a particularly important factor in determining life satisfaction for immigrants, who may face additional challenges such as language barriers and cultural adjustment, as compared to native-born individuals. This finding is consistent with previous research conducted by Amit (2009), who finds a positive relationship between education and life satisfaction among immigrants in Israel. This result also suggests that policymakers and educators should consider the role of education in promoting life satisfaction and well-being among immigrants and should work to ensure that immigrants have access to educational opportunities that can help them to succeed and thrive in their new home country.

Marital status is also a significant predictor of life satisfaction among immigrants, but the direction of the relationship is different from that of natives. Being widowed,

divorced, or separated shows a negative correlation with life satisfaction as compared to being single. Cultural or racial background is another significant variable for immigrants, with non-white or visible minority individuals being more likely to report lower levels of life satisfaction relative to whites. Also, households with two persons have positive correlations with life satisfaction for immigrants relative to households with just a single individual.

As found for natives, sense of belonging to local community, perceived work stress and health status have similar correlations with life satisfaction for immigrants. Those who report a strong sense of belonging to their local community are more likely to report higher levels of life satisfaction relative to those who report a weak sense of belonging. Also, perceived work stress shows a negative relationship with life satisfaction. Additionally, individuals with poor health status are more likely to report lower levels of life satisfaction compared to those with good health status.

Finally for immigrants, an individual's sex, age group, sexual orientation, dwelling ownership, and length of time in Canada do not significantly correlate life satisfaction. This is similar for those who are married or in common law relationships and households with three or more persons.

4.3 Average marginal effects

The average marginal effects of post-secondary education across all levels of life satisfaction are shown below in Table 4.

Table 4: Average marginal effects of post-secondary education from ordered probit models predicting life satisfaction for natives and immigrants.[5]

Variable - Post-secondary education (reference = no post-secondary education)				
	NATIVES	**S.E**	**IMMIGRANTS**	**S.E**
AME for LS =0	0.000	0.000	-0.001	0.000
AME for LS =1	0.000	0.000	0.000	0.000
AME for LS =2	0.000	0.000	-0.001	0.001
AME for LS =3	0.000	0.000	-0.001	0.001
AME for LS =4	-0.001*	0.000	-0.002*	0.001
AME for LS =5	-0.002*	0.001	-0.008*	0.004
AME for LS =6	-0.002*	0.001	-0.009**	0.005
AME for LS =7	-0.006*	0.003	-0.017**	0.008
AME for LS =8	-0.003*	0.001	-0.004***	0.002
AME for LS =9	0.004*	0.002	0.013**	0.006
AME for LS =10	0.009*	0.006	0.031**	0.015
Observations	*34,213*		*6,758*	

*** $p<0.01$, ** $p<0.05$, * $p<0.10$.

The findings indicate that the association of post-secondary education with life satisfaction differs based on the scale of life satisfaction and whether individuals are immigrants or natives.

Non-significant average marginal effects on life satisfaction are found on scales 1 to 3 for both groups. This suggests that post-secondary education does not have a significant association with life satisfaction for both immigrants and natives in the lower ranges of life satisfaction. There could be various reasons for this. For example, factors other than education, such as personal relationships or health, may play a more significant role in determining life satisfaction at these lower scales.

Significant negative average marginal effects on life satisfaction are observed for scales 4 to 8 among both immigrants and natives. These effects are relatively weaker for

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[5] All covariates relevant to the analysis have been included and controlled for, separately for natives and immigrants.

immigrants compared to natives, consistent with Frank and Hou (2017). The negative effects suggest that post-secondary education is linked to lower life satisfaction within these ranges for both groups. One possible explanation is that higher education can elevate expectations and aspirations, and if these are not met, it may lead to dissatisfaction. Moreover, the demands and pressures associated with higher education might adversely affect overall well-being.

Significant positive average marginal effects on life satisfaction are observed for scales 9 and 10 among both groups. The positive AME's indicate that post-secondary education is associated with higher life satisfaction in the highest ranges for both immigrants and natives. This association may be attributed to the fulfillment of career goals, higher income potential, increased job opportunities, and a sense of accomplishment that accompanies higher education.

The highest average marginal effect observed on scale 10 indicates a strong positive association between post-secondary education and life satisfaction at the highest level of life satisfaction. This suggests that individuals who achieve the highest levels of life satisfaction are more likely to have pursued and completed post-secondary education. Consequently, the subsequent analysis focuses specifically on this scale, namely LS = 10.

4.3.1 Natives

The average marginal effects for natives are shown below in Table 5.

Table 5: Average marginal effects from ordered probit models predicting life satisfaction for Canadian-born individuals.

Variable	Very satisfied Life satisfaction = 10
	A.M.E
Education	
No Post-Secondary education	
Post-Secondary education	0.009* (0.006)
Sex	
male	
female	0.017** (0.007)
Age group	
25-34	
35-44	-0.030*** (0.007)
45-54	-0.023***(0.007)
55-64	-0.002 (0.008)
Sexual orientation	
Homosexual/Bisexual	
Heterosexual	0.025** (0.011)
Marital status	
single	
married/common law	0.101*** (0.007)
widowed/divorced/separated	-0.007 (0.006)
Employment status	
Employee	
Self-employed	0.007(0.007)
Racial background	
White	
Visible minority	-0.032*** (0.012)
Dwelling ownership	
Rented	
Owned by member of household	0.058*** (0.006)
Sense of belonging to local community	
weak	
strong	0.087*** (0.005)

Table 5: Average marginal effects from ordered probit models predicting life satisfaction for Canadian-born individuals. (Continued)

Variable	Very satisfied Life satisfaction = 10
	A.M.E
Health status	
good	
poor	-0.081*** (0.005)
Household size	
1 person living in household	
2 persons living in household	-0.012 (0.008)
3 persons living in household	-0.009 (0.009)
4 persons living in household	-0.015 (0.011)
5 or more persons live in the household	-0.00024
Perceived work stress	
Not at all stressful	
Not very stressful	-0.072*** (0.016)
A bit stressful	-0.106*** (0.015)
Quite a bit stressful	-0.156*** (0.015)
Extremely stressful	-0.212*** (0.016)
Number of observations	*34,213*

*A.M.E – Average marginal effect, Standard errors are in parentheses, *** p<0.01, ** p<0.05, * p<0.10.*

The results of the analysis indicate that there is a small difference in the probability of high life satisfaction between natives with post-secondary education and those without. This difference, although small, is statistically significant at the 90% level with the average marginal effect being 0.9%, suggesting that education may play a role in promoting life satisfaction among native Canadians.

Females are significantly 1.7% happier relative to males. Also, those who identify as heterosexuals have about 2.5% higher likelihood of being happy compared to homosexuals or bisexuals.

Older natives also have lower likelihood of being very happy relative to younger people within the ages of 25-34 years. The average marginal effects are significantly negative which confirms that they are more likely to be unhappy rather than happy. The decline in life satisfaction with age can be attributed to several factors, including declining health, loss of social connections, and reduced financial resources. Also, as individuals age, they tend to focus more on positive emotions and experiences, which may result in a more positive outlook on life, but they also tend to become less motivated to engage in new activities or take risks, which may limit opportunities for growth and fulfillment.

The results suggest that married/common law natives have higher life satisfaction levels compared to singles and divorcees/widows/separated. The average marginal effect of 10% indicates that being part of a couple is associated with a significant increase in life satisfaction. Research has suggested that the benefits of marriage on life satisfaction may be due to several factors, including increased social support, a sense of purpose, and better financial stability (Luhmann et al., 2012). Furthermore, it has been proposed that the benefits of marriage may be due to the provision of emotional and physical support, as well as a shared sense of meaning and purpose in life (Carr et al., 2014).

Non-white natives are 3.2% less likely to report being very satisfied. This finding highlights the presence of racial disparities in life satisfaction, which could be due to various factors such as discrimination, inequality, and cultural differences. Paradies (2006) finds that racial discrimination can negatively impact mental health and well-being and that people from different racial backgrounds may have different cultural values and beliefs that affect their life satisfaction. Moreover, other factors such as

income, education, and health may also play a role in explaining the lower predicted probabilities of life satisfaction among non-white natives. For example, studies have shown that people from racial and ethnic minority groups may face systemic barriers in accessing education and job opportunities that could affect their well-being (Williams and Mohammed, 2013).

The results suggest that home ownership has a significantly positive impact (5.8%) on life satisfaction among natives. According to Diener and Seligman (2004), homeowners report higher levels of life satisfaction compared to renters, even after controlling for income and other demographic factors. There are several possible explanations for why home ownership might be linked to greater life satisfaction. For one, owning a home provides a sense of stability and security that renting does not. Homeowners may also have greater control over their living environment, allowing them to personalize and improve their surroundings to better suit their needs and preferences. Additionally, home ownership may confer a sense of pride and achievement, as well as social status and a sense of community belonging.

Natives who have good health status and strong sense of belonging to local community report high levels of life satisfaction. Individuals with poor health status are 8.1% less likely to report that they are happy. Those with strong sense of belonging are 8.7% more likely to be happy with their lives. Additionally, those who experience different forms of stress at work are more likely to be unhappy compared to those who do not experience any form of stress at work. Similarly, those who belong to households with five or more persons show a significantly lower likelihood of reporting to be happy (2% less) compared to households with just one person.

4.3.2 Immigrants

The average marginal effects for immigrants are shown below in Table 6.

Table 6: Predictions and average marginal effects from ordered probit models predicting life satisfaction for immigrants.

Variable	Very satisfied Life satisfaction = 10
	A.M.E
Education	
No Post-Secondary education	
Post-Secondary education	0.031** (0.015)
Sex	
male	
female	-0.005 (0.016)
Age group	
25-34	
35-44	-0.006 (0.016)
45-54	-0.027 (0.018)
55-64	-0.018 (0.022)
Sexual orientation	
Homosexual/Bisexual	
Heterosexual	0.033 (0.034)
Marital status	
single	
married/common law	0.027 (0.021)
widowed/divorced/separated	-0.051***(0.019)
Employment status	
Employee	
Self-employed	0.021 (0.016)
Racial background	
White	
Non-white or visible minority	-0.000273
Dwelling ownership	
Rented	
Owned by member of household	0.020 (0.013)

Table 6: Predictions and average marginal effects from ordered probit models predicting life satisfaction for immigrants. (Continued)

Variable	Very satisfied Life satisfaction = 10
	A.M.E
Sense of belonging to local community	
weak	
strong	0.107*** (0.011)
Health status	
good	
poor	-0.065*** (0.013)
Household size	
1 person living in household	
2 persons living in household	0.038* (0.019)
3 persons living in household	0.005 (0.019)
4 persons living in household	0.024 (0.021)
5 or more persons live in the household	0.026 (0.025)
Length of time in Canada	
0 - 9 years	
10 - 121 years	-0.015 (0.014)
Perceived work stress	
Not at all stressful	
Not very stressful	-0.074*** (0.028)
A bit stressful	-0.101*** (0.026)
Quite a bit stressful	-0.141*** (0.026)
Extremely stressful	-0.201*** (0.030)
Number of observations	***6,758***

*A.M.E – Average marginal effect, Standard errors are in parentheses, *** p<0.01, ** p<0.05, * p<0.10.*

The average marginal effect shows that having post-secondary education increases the likelihood of an immigrant reporting a high life satisfaction on average by 3.1 percentage points. This effect is also significant at the 95% level, indicating that it is unlikely to be due to chance. This means that increasing the level of education among immigrants can

have a meaningful impact on their overall life satisfaction. This finding is consistent with the literature by Amit (2009), who argues that education is an essential determinant of immigrants' success and integration into the host country's labour market and society. Amit (2009) suggests that education enables immigrants to acquire the necessary skills and knowledge to navigate the host country's economic and social systems, enhancing their chances of achieving a higher standard of living and life satisfaction. Therefore, my finding that post-secondary education has a positive and significant impact on immigrants' life satisfaction in Canada supports Amit's argument. Additionally, my findings are supported by Cheung and Chang (2009) who find that higher education leads to higher life satisfaction. They argue that education positively influences life satisfaction across all countries, regardless of their level of economic development. This means that higher education may have a universal positive association with life satisfaction, which could explain why immigrants with post-secondary education in this study have higher predicted probabilities relative to those without higher education.

The findings of this paper indicate that policies aimed at increasing access to post-secondary education for immigrants in Canada could have a positive impact on their well-being and quality of life. Additionally, these results underscore the importance of investing in higher education to promote social and economic integration among immigrant communities. Furthermore, the results suggest that future research should continue to explore the factors that contribute to the well-being of immigrants in Canada, particularly those related to higher education.

The results also suggest that being a widow/divorcee or having poor health status can have a negative impact on the life satisfaction of immigrants in Canada. The

estimated average marginal effects for widows/divorcees and those with poor health status are -5.1% and -6.5%, respectively. These indicate that, on average, being a widow/divorcee decreases the probability of reporting a high life satisfaction score by 5.1%, and also, if immigrants with poor health status were to transition to having good health status, their predicted probability of having a high life satisfaction would increase by 6.5 percentage points. These findings have shown that social support and physical health are important determinants of life satisfaction among immigrants. As well, non-white immigrants have a lower probability of reporting higher levels of life satisfaction, and this is supported by the average marginal effect. Being a non-white immigrant reduces life satisfaction significantly by 2.1 percentage points. The negative effects of being a widow/divorcee, having poor health status or being a non-white immigrant on life satisfaction may be due to a range of factors, such as social isolation, financial difficulties, and limited access to healthcare services. Policymakers and service providers can use these results to develop targeted interventions and programs that aim to improve the well-being of these vulnerable immigrant populations.

Immigrants with a strong sense of belonging to the local community have a 10.7% higher likelihood of reporting a high life satisfaction. This finding highlights the importance of social integration and community engagement in enhancing the well-being of immigrants in Canada. Additionally, the highly significant relationship between the sense of belonging to the local community and life satisfaction suggests that policymakers and practitioners should consider policies and interventions that promote social integration and community engagement among immigrants in Canada. These may include initiatives that encourage immigrants to participate in community activities,

connect with local organizations, and establish social networks with members of the local community. This finding is consistent with the social capital theory, which posits that social networks and connections within a community can facilitate positive outcomes for individuals, such as higher life satisfaction. Pretty and McCarthy (1991) argue that a strong sense of community belonging can contribute to individuals' well-being by providing them with social support, a sense of purpose, and a feeling of connectedness. Similarly, McMillan and Chavis (1986) suggest that individuals who feel connected to their local community have access to resources and information that can enhance their quality of life. Therefore, the results of this study suggest that policymakers and community leaders should work towards creating an inclusive and welcoming environment that promotes social connections and community engagement among immigrants. Such initiatives can help to enhance their sense of belonging and improve their overall well-being.

The results indicate that immigrants who experience any amount of work stress have lower levels of life satisfaction compared to those who do not experience work stress. Specifically, the probability of having a high life satisfaction decreases as the level of work stress increases. These findings are supported by the negative and significant average marginal effects observed for those who experience different levels of work stress, especially those with extreme levels of work stress who are about 20.1% less likely to report being very satisfied with their lives.

4.4 Differential effects

The differences in effects of post-secondary education on life satisfaction between immigrants and natives are shown in Table 6 below.

Table 7: Predictions and test of differences from ordered probit models predicting life satisfaction for immigrants and natives.[6]

Life satisfaction =10 (very satisfied)					
Education category	**Immigrants**		**Natives**		
	PROB.	Difference	PROB.	Difference	**Overall difference**
No Post-secondary education	0.1597		0.1932		
		0.0319 (0.0135)**		**0.0104* (0.0056)**	**0.0216 (0.0148)**
Post-secondary education	0.1917		0.2035		
Pseudo R-squared	0.0400				
Observations	41,876				

Standard errors are in parentheses, *** p<0.01, ** p<0.05, *p<0.10, PROB. - Predicted probability.

Table 7 aims to answer the research question on whether the impact of post-secondary education on life satisfaction is significantly different between immigrants and Canadian-born individuals.[7]

The results suggest that immigrants with post-secondary education report being very happy with a significant 3.2% higher probability relative to those without. Similarly, natives with higher education are significantly 1.04% more likely to report being very

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[6] All covariates relevant to the analysis have been included and controlled for in the interaction regression except for the length of time in Canada variable which only applies to immigrants. The impact of post-secondary education on life satisfaction does not differ significantly between immigrants and natives across all other reported scales of the life satisfaction variable.

[7] An additional finding concerns the life satisfaction gap between immigrants and natives with post-secondary education (1.18%) and between those without (3.35%). As in Woolley (2021), the gap is small for those with higher education, suggesting that post-secondary education is a crucial factor in narrowing the life satisfaction gap between Canadian-born individuals and immigrants.

happy, relative to their counterparts without post-secondary education. These results show that the impact is slightly higher for immigrants than Canadian-born individuals when comparing individuals with higher education and those without. This could imply that policies aimed at promoting access to education should prioritize immigrants, who may face additional barriers to accessing education such as language barriers, credential recognition issues, and financial constraints.

It is interesting to find that the difference between the impacts of having post-secondary education on life satisfaction for these two groups is, however, not statistically significant, similar to Frank and Schellenberg (2016). This means that the positive effect of post-secondary education on life satisfaction is similar for immigrants and natives. There could be several reasons why there is no significant difference between the effects of higher education on life satisfaction for immigrants and natives in Canada. One possibility could be due to adaptation and resilience. Immigrants, especially those who have successfully adjusted to their new environment, may have developed adaptive strategies and resilience like social networks with both fellow immigrants and native-born individuals that mitigate potential disparities in the effect of education on life satisfaction. Additionally, both groups may face similar challenges in the job market and other aspects of their lives, and the benefits of education may help to mitigate some of these challenges for both groups. It also suggests that policies should still focus on improving access to education for all individuals, regardless of their immigration status. It also highlights the importance of inclusive policies that address the unique challenges faced by immigrants in accessing education and training, while also ensuring that Canadian-born individuals are not left behind.

4.5 Summary of policy implications

The results have shown a positive impact of higher education on life satisfaction as in Amit (2009). Some policy implications of these results are that investing in education could be an effective way to promote life satisfaction among immigrants and native Canadians. Research has shown that investing in education can have positive effects on various outcomes, including well-being (Witter et al., 1984).

Furthermore, policies aimed at increasing access to education and improving its quality have been associated with increased life satisfaction and happiness (Oishi et al., 1993). Therefore, investing in education in Canada may have multiple benefits beyond just increasing educational attainment. It could also contribute to promoting the well-being of the population. Some specific policy recommendations that could be implemented to promote education and well-being among immigrants and native Canadians include increasing funding for schools and educational programs in underprivileged areas, providing more access to educational opportunities, providing access to mental health services on campuses, offering scholarships and other financial aid to low-income students, and implementing policies that address the unique challenges faced by indigenous students in accessing education.

Additionally, policy initiatives aimed at improving the educational opportunities for immigrants in Canada could have positive implications for their well-being and life satisfaction. For instance, providing access to language training, offering educational grants, and facilitating the recognition of foreign credentials could all help to increase the educational attainment of immigrants in Canada, which in turn may positively impact

their life satisfaction. It would also help to narrow the life satisfaction gap between these two groups.

Moreover, policies should also address other factors that may contribute to differences in life satisfaction, such as discrimination and social exclusion. This is an important finding, as it highlights that higher education can be a key factor in promoting social and economic integration for immigrants and can help to reduce the socioeconomic disparities that often exist between immigrants and natives in host countries (Kao and Tienda, 1998).

The findings also suggest that policies should focus on addressing the factors that contribute to lower life satisfaction among Canadian-born males and LGBTQ+ individuals. For example, policies that aim to address gender-based disparities in education and employment opportunities could help improve the well-being of native males. Similarly, policies that promote inclusivity and equality for LGBTQ+ individuals, such as anti-discrimination laws and access to mental health services, may contribute to increasing their life satisfaction. These policies could also help reduce any negative consequences associated with gender-based and sexual orientation-based disparities in terms of economic and social outcomes.

The lower life satisfaction among older indigenous individuals suggests the need for policies that address the unique challenges faced by this demographic group. One potential policy approach could be to increase access to healthcare and social services, including mental health resources, for older indigenous individuals. Additionally, programs that promote intergenerational connections and social engagement could help to combat the sense of isolation and loss of social connections that can contribute to lower

life satisfaction. Policies that encourage older natives to continue to engage in meaningful activities and pursue new experiences could also promote a sense of fulfillment and well-being in later life (Merz and Huxhold, 2010).

The lower life satisfaction among immigrant widows/divorcees suggests the need for policies that address the unique challenges faced by this demographic group. One potential policy approach could be to increase access to social support networks, mental health resources, and financial assistance for immigrant widows/divorcees. Additionally, programs that promote community engagement and social connections could help combat the sense of isolation and loss of social connections that can contribute to lower life satisfaction (Evans and Kelley, 2004).

Finally, policies aimed at reducing work stress and promoting work-life balance could have positive implications for the well-being and life satisfaction of both immigrants and native-born Canadians. This could include initiatives such as flexible work arrangements, mental health support programs, and measures to address workplace discrimination and harassment (Hou and Picot, 2017)

CHAPTER 5: LIMITATIONS AND CONCLUSION

5.1 Limitations

Although this study addresses some research gaps regarding the impact of post-secondary education on life satisfaction among immigrants and Canadian-born individuals, it has some limitations, just like any other study.

One important limitation of this study is the potential for omitted variable bias. While we have included a range of demographic and socio-economic factors in our analysis, there may still be other unobserved variables that could impact the relationship between post-secondary education and life satisfaction among immigrants and Canadian-born workers. For example, the source country of immigrants and the year of their arrival in Canada could be important determinants of their life satisfaction but were not included in the CCHS (2017-2018) dataset. This is because immigrants from different countries may face different levels of discrimination and prejudice, which could affect their access to education and employment opportunities. Additionally, the year of arrival in Canada may be important, as immigrants who arrived more recently may face different challenges than those who have been in Canada for longer periods, such as language barriers or difficulties in adapting to a new culture. Hence, this could lead to biased estimates of the effect of post-secondary education on life satisfaction. Also, life satisfaction, which is the dependent variable, may have an influence on some of the independent variables. Consequently, the interpretation of the results should be approached with caution. Future studies should aim to collect more comprehensive data in order to address this limitation and obtain more accurate estimates of the relationship between post-secondary education and life satisfaction.

Furthermore, given that post-secondary education is defined as the educational attainment of individuals who have obtained a certificate, diploma, or university degree beyond their secondary education (high school), it is important to recognize that there may be distinct implications for life satisfaction based on the level of education achieved. For example, individuals with a Bachelor's degree may experience different life satisfaction outcomes compared to those who have pursued graduate studies. However, due to the limitations of my data, I am unable to specifically analyze the differential implications of various levels of post-secondary education on life satisfaction. Acknowledging this limitation, further research that considers the nuanced impact of different post-secondary educational attainment levels on life satisfaction would provide a more comprehensive understanding of the relationship between education and well-being.

Finally, the CCHS data is a cross-sectional survey, which means that it captures data at a single point in time. Hence, it does not allow for the examination of changes in life satisfaction or education over time, and it also makes it difficult to establish causal relationships between variables. Additionally, the cross-sectional nature of the data makes it impossible to account for individual differences in life satisfaction or education that may exist before the time of the survey, which could lead to reverse causality in the analysis. Therefore, caution should be taken when interpreting the results of this study. Also, future studies could consider using longitudinal surveys, which follow individuals over time and allow for the examination of changes in variables over the course of their lives.

5.2 Conclusion

This thesis examines the impact of post-secondary education on life satisfaction among immigrant and Canadian-born workers. The findings from this study indicate that post-secondary education has a positive impact on life satisfaction for both natives and immigrants in Canada although the effect is slightly stronger for immigrants. One possible explanation for this difference is that immigrants may face additional barriers to accessing education, such as language barriers and credential recognition issues, which may make it more challenging for them to pursue higher education. Therefore, policies aimed at promoting access to education should prioritize immigrants to help narrow the gap in life satisfaction between immigrants and Canadian-born individuals.

For both groups, those with post-secondary education are more likely to report higher levels of life satisfaction compared to those without post-secondary education. Additionally, the positive relationship between education and life satisfaction among immigrants and Canadian-born individuals is also consistent with previous research conducted by Blanchflower and Oswald (2004), and Amit (2009).

The study's findings also underscore that enhancing the availability of higher education opportunities for both natives and immigrants could contribute to advancing their overall well-being, which could have positive effects on individuals, families, and communities. Moreover, this study highlights the importance of addressing socio-economic and demographic disparities that may impact life satisfaction, such as reducing work related stress and promoting a sense of belonging to the local community.

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APPENDIX

3.3.3 Predicted probabilities[8]

Given that the random error term, ε, is normally distributed, the probabilities that an individual reports 0, 5 and 10 levels of life satisfaction, as in Becker and Kennedy (1992) would respectively be:

$$
\begin{aligned}
\text{Prob}(\text{LSi} = 0|X_i) &= \text{Prob}(\text{LS}_i^* \leq \tau_0) \\
&= \text{Prob}\left[\sum_n \beta_n X_{n,i} + \varepsilon_i \leq \tau_0\right] \\
&= \text{Prob}\left[\varepsilon_i \leq \tau_0 - \sum_n \beta_n X_{n,i}\right] \\
&= \int_{-\infty}^{\tau_0 - \sum_n \beta_n X_{n,i}} \phi\,(\varepsilon_i)\,d\varepsilon_i \\
&= \Phi\left[\tau_0 - \sum_n \beta_n X_{n,i}\right]
\end{aligned}
$$

$$\vdots$$

$$
\begin{aligned}
\text{Prob}(\text{LSi} = 5|X_i) &= \text{Prob}(\tau_4 \leq \text{LS}_i^* \leq \tau_5) \\
&= \text{Prob}\left[\tau_4 \leq \sum_n \beta_n X_{n,i} + \varepsilon_i \leq \tau_5\right] \\
&= \text{Prob}\left[\tau_4 - \sum_n \beta_n X_{n,i} \leq \varepsilon_i \leq \tau_5 - \sum_n \beta_n X_{n,i}\right] \\
&= \int_{\tau_4 - \sum_n \beta_n X_{n,i}}^{\tau_5 - \sum_n \beta_n X_{n,i}} \phi\,(\varepsilon_i)\,d\varepsilon_i \\
&= \Phi\left[\tau_5 - \sum_n \beta_n X_{n,i}\right] - \Phi\left[\tau_4 - \sum_n \beta_n X_{n,i}\right]
\end{aligned}
$$

$$\vdots$$

$$
\begin{aligned}
\text{Prob}(\text{LSi} = 10|X_i) &= \text{Prob}(\tau_9 \leq \text{LS}_i^* \leq \tau_{10}) \\
&= \text{Prob}\left[\tau_9 \leq \sum_n \beta_n X_{n,i} + \varepsilon_i \leq \tau_{10}\right] \\
&= \text{Prob}\left[\tau_9 - \sum_n \beta_n X_{n,i} \leq \varepsilon_i \leq \tau_{10} - \sum_n \beta_n X_{n,i}\right] \\
&= \int_{\tau_9 - \sum_n \beta_n X_{n,i}}^{\infty} \phi\,(\varepsilon_i)\,d\varepsilon_i \\
&= 1 - \Phi\left[\tau_9 - \sum_n \beta_n X_{n,i}\right]
\end{aligned}
$$

---

[8] Let Φ be the standard normal cumulative distribution function for the ordered probit model; then Φ follows the standard normal distribution with $\tau \sim N\,(0, \sigma^2)$ and $\varepsilon_i \sim N(0, 1)$.

The probabilities of obtaining different observed y values can be found using similar formulations. The maximum likelihood estimates are obtained by maximising the likelihood function with respect to the β's, and the τ's. The likelihood function is the product of these formulations for each of the data points, i.e. $\overline{L}(β, τ) = \prod_{i=1}^{n} \text{prob}(LS_i = j \mid X_i)$

3.3.4 Average Marginal effects (A.M.E)

Generally, the marginal effect is expressed as:

$$ME_j = \frac{δ\text{Prob}(LSi \mid X_i ; β,τ)}{δX_i} = [Φ(τ_{j-1} - \sum_n β_n X_{n,i}) - Φ(τ_j - \sum_n β_n X_{n,i})]β.$$

The average marginal effect of post-secondary education on the probability of each outcome level, as in Caroll (2019) is $A.M.E = \frac{1}{n} \sum_{i=1}^{n} ME_j$. However, given that the independent variables are categorical, the average marginal effect is given as the difference between the predicted probability of the current category and that of the reference category, i.e., $\text{Prob}(LSi = j \mid X_i = 1) - \text{Prob}(LSi = j \mid X_i = 0)$.