EFFECTS OF MINIMUM WAGE ON YOUTH EMPLOYMENT AND SCHOOL ENROLLMENT IN CANADA

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ABSTRACTS

Based on the Public Use of Microdata of Survey of Labour and Income Dynamics, we examine the effects of changes to minimum wage on youth employment and school enrollment across Canada over the period 2005–2011. Using multinomial logistic model, our estimate confirms the postulated neoclassical model disemployment effects for low-skilled workers who are mostly regarded as youth. Our result suggests that a 10 percent increase in the minimum wage is associated with approximately 3.96 percent decrease in youth employment. More interestingly, we found that a positive relationship between minimum wage and school enrollment such that a 10 percent increase in minimum wage is associated with a 3.6 percent increase in school enrollment among youth of 16 to 19 years of age. In addition, estimating the transition probabilities among the possible employment-enrollment activities for youth, we found no substantial evidence to support substitution of students for nonstudents or students leaving school to queue for higher minimum wage jobs. Hence, we refuted that substitution and queuing hypotheses earlier proposed in literature as we found no evidence to support the hypotheses for Canada.

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CHAPTER ONE

1.1 INTRODUCTION

Across developed nations, the campaign for a minimum wage increase has gained momentum and become the subject of much media attention with labour unions, policymakers, and political aspirants calling for its increase. While some jurisdictions in North America have already raised their minimum wage, others are in the process of doing so. Minimum wage legislation is intended to improve the employment outcome of low-skilled workers, address poverty, promote social justice, and improve the living standard of the low-income earners (Government of Canada, 2005).

Unfortunately, increasing minimum wage may have some negative effects for some youth. Prominent among these is the disemployment effect of minimum wage increases which has attracted a large number of empirical studies, many of which were conducted and published in the United States. For instance, there was consensus among early studies in the 1960s and 1970s in the US based on time series data that a 10 percent increase in minimum wage reduces youth employment by 1 percent when the elasticity is -0.1 and by 3 percent when it is -0.3 (Brown et al. 1982). Several studies conducted in the early 1990s have challenged this earlier consensus indicating that employment elasticities for youth (16-19 years of age) and adults (20-24 years of age) were in fact, closer to zero. Using new estimation techniques, recent studies in the United States suggest a stronger consistency with the earlier consensus.

However, there have been recent concerned that increasing minimum wage may reduce youth investment in education. This argument is plausible only if changes to

minimum wage cause an increase in youth participation in the labour market by increasing either the hours worked or their search efforts. In this regard, interest from researchers in finding out the relationship between minimum wage and school enrollment has increased in recent times.

In Canada, as in the United States and other developed countries (e.g., United Kingdom, Portugal, New Zealand, France), the majority of past studies focused mainly on the employment effects of the minimum wage rather than the effects on youth school enrollment or human capital development. Despite the considerable number of studies that have been conducted, there still exists no consensus on the direction of the relationship. Findings from past studies vary from substantial adverse effects (Castillo-Freeman & Freeman, 1992; Neumark & Wascher, 1995b; Deere et al. 1995; Kim & Taylor, 1995; Currie & Fallick, 1996) to an insignificant or statistically positive effect (Wellington, 1991; Card, 1992b; Katz & Krueger, 1992).

While there is no consensus on how minimum wage affects employment in the United States, the consistent disemployment effect is well documented in Canadian studies. The majority of the studies affirm the traditional standard labour market predictions of dis-employment effects, such that a 10 percent increase in minimum wage will result in a 3 to 6 percent reduction in youth employment (Campoleiti et al. 2005a). This makes Canada an ideal laboratory for testing the effects of minimum wage because minimum wage is under the provincial government jurisdiction with considerable variation over time. These variations make it possible to detect the effects of minimum wage increases on employment, unlike the US where the minimum wage is set federally with changes seldom occurring.

Most of the earlier studies in the United States used Census data or National Longitudinal Survey data (Cunningham, 1981; Ehrenberg & Marcus, 1980; Ehrenberg & Marcus, 1982) while others use time series data (Mattila, 1981) and pooled time series cross-sectional data (Card, 1992), both aggregated at the state level. However, all but two studies conducted in Canada combined aggregate time-series provincial data into panel data: Yuen, (2003) and Campolieti et al. (2005b) both use individual panel data sets. The evidence indicates, the result of each study largely depends on the variables considered, the methodology used or adopted, the period of study and the region of study. Campolieti et al. (2005b) assert that some researchers consistently run alternative model specification to obtain results consistent with economic theory.

The main purpose of this study is to re-examine the common findings of disemployment effects of minimum wage increases among Canadian teenagers by using more recent data and variables which have the potential to influence youth employment, while extending our study to examine the empirical effects of minimum wage increase on youth human capital development (i.e., school enrollment). With our focus on Canadian youth, this study recognises that minimum wage policy has an indirect impact on the labour market over the long-run by influencing households' investment in education. Hence, a wide range of policies can be informed by a better understanding of how minimum wage affects employment and human capital development among Canadian youth.

1.2 OBJECTIVE OF THE STUDY

Having identify lack of consensus among past empirical studies on the direction and size of the effect of minimum wage increase on school enrollment and employment in

the United States, New Zealand, Portugal and United Kingdom. The purpose of this thesis is to apply Canadian considered to be a "desirable laboratory" (Hamermesh, 2002) data to re-examine:

- the extent to which the minimum wage increase negatively affects youth (16 to 24 years of age) employment and human capital development (i.e., net enrollment and net employment) over the period 2005–2011;
- the transition effect of minimum wage increases among youth (i.e., the transition between school enrollment and employment activities).

The long-term success of labour market outcomes for youth could be disrupted today by early exposure to higher minimum wage jobs, especially given the ambitious plan of some provinces in Canada (particularly Alberta and Ontario governments to increase the provincial minimum wage to $15 an hour by 2018 and 2019, respectively). It is therefore necessary to examine empirically the possible effect of such a policy. Also, it remains unclear from past studies if an increase in minimum wage induces youth to quit school in favour of minimum wage jobs, as findings are mixed from past studies.

This research will utilise recent data over a 7-year period (i.e., 2005–2011) that also includes a recession which lasted 7 months (i.e., November 2008 – May 2009). The dis-employment and enrollment effects will be identified through a large number of minimum wage changes of different magnitudes in different provinces between 2005 and 2011. Using Canadian data to estimate empirically the dis-employment and enrollment effects among Canadian youth will allow us to offer important policy advice on the consequences of minimum wage changes, regarding possible effects on school enrollment as well as the effect on the employment-enrollment transition among youth across Canadian provinces.

1.3 JUSTIFICATION OF THE STUDY

Theoretically, it is possible to envisage the possible direction of the demand and supply of labour for an increase in minimum wage. The neoclassical model believes an increase in minimum wage will hurt the economy (Mark, 2012). This is because the cost of wage increase is assumed to be borne by a certain group of workers, generally believed to be youth who are regarded as having little to no skill or work experience. The neoclassical model predicts that an increase in minimum wage will reduce employment, especially for the low-skilled whose competitive wage rate falls below the new binding wage rate.

These adverse effects could be in the form of slower employment growth, embargos on employment, or reductions in hours of work rather than outright layoffs of workers whose marginal productivity falls below the current wage rate. While some youth may be induced to quit school to queue for minimum wage jobs, thereby reducing enrollment, some displaced will enrol to increase their human capital accumulation beyond the new minimum qualification required for employment (Landon, 1997). Hence, an increase in minimum wage can either increase or decrease school enrollment.

In Canada, studies that have attempted to examine the relationship between minimum wage, employment, and school enrollment have mainly focused on one or a few provinces. To the best of our knowledge, only Campolieti et al. (2005b) has conducted a comprehensive study covering the 10 provinces. Evidence from past Canadian studies (Yuen, 2003; Campolieti et al. 2005b; Baker, 2005, Baker et al. 1999) shows a consistent disemployment effect of minimum wage increases, such that a 10 percent increase in the minimum wage reduces youth employment by 3 to 6 percent. However, not much empirical

work has been conducted on the enrollment effect of minimum wage increases among youth in Canada.

Hence, given the contrasting evidence on the direction and size of the effect of minimum wage increase from past studies, the recent agitation for minimum wage increase, and the policy of the Alberta, Ontario and other provincial governments, it is imperative to re-examine empirically the effect of a minimum wage increase on youth employment and human capital development using recent datasets. The result will offer insights into the consequences of minimum wage variation on both short- and long-term employment and school enrollment.

1.4 ORGANISATION OF THE STUDY

The remaining part of this thesis will be organised as follows: Chapter 2 discusses background information on minimum wage, exemptions from minimum wage policy, the purpose of minimum wage legislation, and the trends of minimum wage in Canada. Chapter 3 discusses the theoretical relationship between minimum wage, employment, and school enrollment. It also provides literature reviews of past empirical studies on minimum wage, employment, and school enrollment in and outside Canada. Chapter 4 discusses the methodological approach, empirical approach, data, and variables included in the model. Chapter 5 presents the econometric results and major findings. Importantly, this chapter also compares the results to conventional elasticities of the minimum wage effect. Finally, Chapter 6 discusses the policy implications based on the findings of the thesis.

CHAPTER TWO

2.1 BACKGROUND TO THE STUDY

Today, many countries around the globe have minimum wage legislation to protect their workers against exploitation from employers. The policy was first established in New Zealand in the 1890s to improve the conditions for workers in certain industries. In Canada, minimum wage legislation started with the Fair Wage Policy that started in 1900 (Government of Canada, 2005). The policy aimed at ensuring that non-unionized and low-skilled workers in certain industries could secure adequate payment for a job rendered to an employer in the province where such work was carried out.

British Columbia and Manitoba were the first provinces to adopt a minimum wage policy in 1918. By 1920, several other provinces had adopted the policy. Many of the initial regulations only covered women and minors, but over the course of the century, minimum wage has evolved to become a labour market standard of equal pay for men, women, and minors across different industries. Presently, minimum wage is under provincial jurisdiction legislation with changes made yearly based on each province's economic and social environment.

There are a number of reasons why minimum wage law was enacted in Canada. Prominent among these is to ensure that low-skilled workers and non-unionized workers are not exploited by employers. Another motivation was to improve the standard of living of the low-skilled workers, reduce poverty levels by increasing the income of low-skilled workers and thereby protecting them from living below the poverty line. Again, the policy

aimed to bridge the widening income inequality gap between the high-income earners and low-income earners.

Despite these objectives, empirical studies have focused mainly on the disemployment effect of minimum wage increases, with an emphasis on teenagers (16 to 19 years of age) and young adults (20 to 24 years of age). The former group has received more attention in past studies since they are most likely to have a viable school/work choice. The justification for studying this group is that they are assumed to have little or no prior work experience and thus make a good proxy for unskilled or low-skilled workers who are vulnerable to the disemployment effect (Neumark & Wascher, 1992). In fact, 49 percent of teenagers (15 to 19 years of age), 15 percent of adults (20 to 24 years of age) in the labour force earned the minimum wage in 2014 (Statistics Canada, 2015).

The percentage of youth participating in the labour market can be attributed to variations in minimum wages across Canadian provinces which often induce them to alter their school/work decision. As of 2014, 29 percent of enrolled students earned minimum wage relative to 5 percent of the non-student population while 20 percent of employees with less than high school diploma education earned minimum wage (Statistics Canada, 2015). Consequently, studying the employment impacts and transition effects of minimum wage among youth allows for some deductions to be made on how changes to minimum wage affect the enrollment-employment transition among youth.

2.2 EXEMPTION FROM MINIMUM WAGE POLICY

Minimum wages are nearly universal in Canada, but still, many Canadian workers are not covered by minimum wage legislation (Government of Canada, 2007). Those in the informal labour market (e.g., self-employed, independent contractors, students in training programs or volunteering, and sales employees paid exclusively on commission) are not covered in many province and territories. Provinces have their own independent minimum wage policies that either exclude some categories of workers from coverage or allow lower wage rates to be paid to some group of workers. For example, Saskatchewan and Manitoba allow a person with disabilities to be paid a lower wage than the base minimum wage if a permit has been issued. British Columbia and Ontario allow employers to pay less to workers who serve alcohol or otherwise accept tips, while Ontario still allows students to be paid less (i.e., the subminimum wage) relative to the adult wage rate. New Brunswick excludes domestic workers and live-in care workers from minimum wage law coverage. Meanwhile, Alberta abolished the subminimum wage for those who serve alcohol on October 1st, 2016.

Certain groups of workers are altogether excluded from the minimum wage in most jurisdictions. These includes supervisory and managerial employees, participants in job experience and rehabilitation programs; registered apprentices; members and students of designated professions, counsellors or instructors at non-profit educational camps and playgrounds; extras in film or video production; volunteers in religious, charitable or political organizations; persons engaged in work on fishing vessels; teachers; offenders performing community service; and residential caretakers are exempted in some province.

In addition, youth or individuals on volunteering jobs gaining work experience (i.e., internships) are not covered under the minimum wage policy.

Those earning minimum wage are mostly likely to be youth and women with low educational levels (Battle, 2003). In addition, they are students holding part-time positions and work in retail, hospitality or restaurants. As Neumark & Wascher, (1995b) asserts that most of the students earning minimum wage work part-time to support themselves through school while some still live with their parents. Others are older men and women working to support their pension income. In 2013, the proportion of all employees earning the minimum wage was 6.7 percent, up from 5.0 percent in 1997. Most of the increase took place between 2003 and 2010. The increase in the population of minimum wage earners during this period is attributed to the increases in the minimum wage rate in many provinces. For instance, the proportion of young employees (15 to 19 years of age) who were paid the minimum wage rose from 30 percent in 2003 to 45 percent in 2010. In fact, 87.5 percent of Canadians earning minimum wage in 2012 lived in households above the Low-Income Cut-Off (LICO), a widely-used measure of relative poverty. Moreover, the vast majority of workers (83.4 percent) from households living below the LICO threshold earned more than the minimum wage. In 2014, 58.4 percent of those earning minimum wage were youths aged 15 to 24. 56.8 percent of all minimum wage earners were living with family, while 19.9 percent were married to a spouse who are also employed. These data undermine the popular image of minimum wage earners being single breadwinners supporting a family. In fact, only 2.2 percent of those earning minimum wage were unmarried heads of household with at least one minor child. (Statistics Canada, 2014).

2.3 MINIMUM WAGE TRENDS IN CANADA

In Canada, minimum wage legislation is under the provincial jurisdiction, which allows for frequent variation from one province to another. A value for the minimum wage for Canada can be obtained by calculating the average of provincial minimum wage, weighted by the overall employment level of each of the 10 provinces since 1975. This value can then be adjusted for inflation using the Consumer Price Index (CPI) for each province to obtain a Canadian real minimum wage (in 2015 dollars). According to Daine & Eric (2014), the real minimum wage has varied several times between $7 and $11, peaking in 1975 and 1976. Subsequently, the average minimum wage declined to under $8 in the mid-1980s and did not change much until 2005. It then began rising again, reaching approximately $10 in 2010 and stayed around this level up to 2013. As of 2016, the average real minimum wage stands at $11 per hour across Canada.

In effort to improve labour standards and welfare, policy makers have used minimum wage policy in the hope of redistributing income and reducing poverty, among other objectives (Government of Canada, 2005), but it remains unclear if this is an effective step towards raising the employment level and the welfare of the people. However, the effect of the policy on labour market dynamics remains unknown and thus has been a subject of much debate. The weak link between minimum wage and low-skilled workers indicates the minimum wage is a crude method of achieving such objectives. The neoclassical model predicts that raising minimum wage will do considerable harm to the economy by reducing employment opportunities for low-skilled workers, the very group the legislation is meant to help.

To avoid the loss of value to minimum wages resulting from inflation, each province now indexes its minimum wage rate based on its current economic and social environment. For example, Nova Scotia and the Yukon adjust their minimum wage rate on April 1st of every year, while Saskatchewan and Alberta adjust their minimum wage on October 1st of each year based on the percentage change in the CPI and percentage change in the average hourly earnings in the previous year. In December 2016, New Brunswick started reviewing its minimum wage on a yearly basis to reflect changes to its social and economic environment with cost of living being one of the key indicators to consider.

2.4 THE PURPOSE OF MINIMUM WAGE LEGISLATION

Many of the objectives of minimum wage legislation are at cross-purposes. Over the years, studies have shown that the effects of the policy are inconsistent in achieving intended objectives. A prominent rationale for legislating the policy is the alleviation of poverty. This seems to be a plausible policy in that the binding wage helps to increase the wages of workers earning minimum wage, and thus helps to ensure that low-income earners are not trapped below the poverty line.

While minimum wages might seem to be an effective tool in reducing poverty, many economists have argued that the overall disemployment effect of the minimum wage is more severe on the targeted group (low-skilled workers), the very group the policy is meant to help. The disagreement stems from assessing the magnitude of this effect. Many of the targeted poor do not work or perhaps work only a few hours. Statistics show that majority of the low-income earners are teenagers (16 to 19 years of age), some still living

with their parents working to sponsor themselves through school. Battle (2003) asserts that of those aged 25 to 64 years of age, those whom poverty is likely to be of greatest concern, only 3 percent work in a minimum wage job. Conversely, almost two-thirds of minimum wage workers are youth (47 percent are teenagers ages 16 to 19 years of age, and 16 percent are young adult ages 20-24), most of whom live with their parents, 25 percent are couples (of which 75 percent have a spouse employed at a job above the minimum wage rate), 11 percent are unattached individuals, and 2.2 percent are single heads of families.

Youth rarely get stuck in minimum wage job as the job is only held temporarily to help them through school or after graduation, after which they get more reliable and higher paying jobs. As asserted by Statistics Canada (1998), many youths often lack the experience or education to command higher wages, or are interested in only short-term employment, leading them to accept minimum wage jobs. Some youth often work on minimum wage jobs to supplement the growing burden of financing postsecondary education.

The debate over minimum wage is centered on whether the current rate is too low or high. Some scholars argue that it should be increased as a policy instrument for tackling income inequality and poverty alleviation (Goldberg & Green, 1999; Black & Shaw, 1998). Others such as Shannon & Beach (1995) argue that increasing the minimum wage will yield no positive result but end up hurting the same people it is meant to help (i.e., low-skilled workers). They argue that a high minimum wage rate forces employers to reduce the quantity of labour demanded as they find substitutes for the now costly labour inputs. Meanwhile, the new increase in the minimum wage is expected to increase the supply of labour and thus, unemployment is also expected to increase. (Law, 1999; Sarlo, 2000; Shannon & Beach, 1995).

Relative to the need, the minimum wage is targeted at income and paid to individuals irrespective of their family background. Thus, it affects all low-income wage earners. However, the policy only has a marginal effect on a small fraction of the low-income population's earnings. Gunderson (2008) asserts that minimum wage is not only a weak tool for reducing poverty but also harmful and may worsen poverty levels if it causes individuals to lose their jobs or reduce individuals' average working hours. The negative effect of the policy comes not only from its dis-employment effects, the policy restricts employers from providing on the job training to individuals and hinders individuals from accepting low-wage jobs that provide on the job training and experience that could help in moving them out of poverty.

Minimum wage legislation comes from the background that it protects unprotected workers from exploitation in certain industries who have little or no bargaining power from exploitation. Basically, minimum wage policy ensures non-unionized workers and low-skilled workers secure reasonable payment for jobs rendered to an employer.

Effective demand is another reason for the minimum wage. The rationale is that increasing the minimum wage increases income, which increases consumption expenditures of low-income earners, which then increases aggregate demand through the macroeconomic multiplier. This rationale is only plausible if low-income earners have a higher marginal propensity to consume. The marginal propensity to consume (MPC) for low-income earners is higher than the high-income earners. This is because the low-income earners spend a higher proportion of their income on consumable items relative to high-income earners. However, the minimum wage policy is poorly targeted at the poor. For instance, an individual who becomes displaced or has his or her hours lowered due to a

minimum wage increase will obviously not see his or her income increase. An increase in consumption from increased income could be offset by a decline in investment spending as firms strive to pay the new wage. A decrease in consumption could ensue if the higher cost of production is transferred to consumers in the in the form of higher price.

CHAPTER THREE

3.1 THEORETICAL FRAMEWORK

Several theories have been used to explain the effect of minimum wage on employment and human capital development. In the same way, several empirical studies have been conducted to estimate the magnitude of the neoclassical model predicted disemployment effect. This section looks at some of these relevant theories and past empirical studies. The basic model that relate minimum wage to employment is the neoclassical model which focuses on a single complete competitive labour market and homogenous labour in the covered sectors (i.e., those industries covered by the minimum wage policy). In recent times, other theories have also been used to explain the relationship between minimum wage and employment. Some of these theories are discussed below.

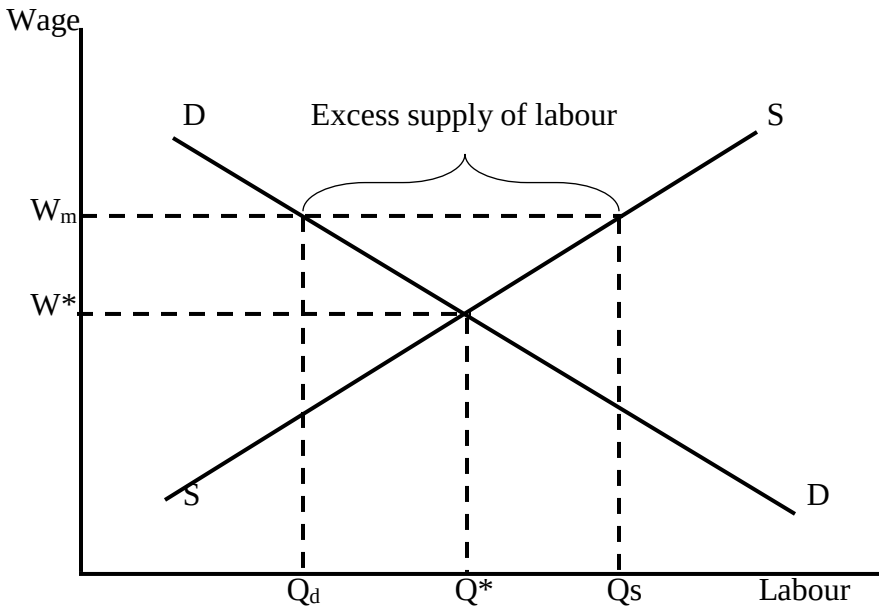
3.1.1 PERFECTLY COMPETITIVE LABOUR MARKET

The neoclassical model of demand and supply of labour is the primary model for evaluating the disemployment effect of the minimum wage. The neoclassical model predicts that wage increases will lead to unemployment in the economy, as firms will be forced to reduce their quantity of labour demanded in response to the higher wage. In a perfectly competitive labour market, where the wage rate is determined by the market, rather than by individual firm, each firm is a wage taker. This implies that the demand curve for individual firm is flat or perfectly elastic reflecting the fact that the individual takes the market price as given. Hence, any binding wage rate above the equilibrium market rate will have a disemployment effect for two reasons. First, employers will substitute away from

the now more expensive low-skilled labour towards other inputs, such as equipment and other capital. Second, the higher wage and new input mix imply higher prices, in turn reducing product demand and ultimately quantity of labour demanded.

The neoclassical model postulates that the equilibrium wage rate is set in the competitive markets where workers earn the value of their marginal product of labour. Thus, an introduction of minimum wage in the competitive labour market reduces the employment level, relative to what it would have been in the absence of minimum wage. Figure 1 depicts the scenario where the quantity of labour demanded and supplied set the wage rate in the competitive labour market and the effect of minimum wage introduction.

Figure 1: Competitive Labour Market



In an unregulated free market (i.e., a competitive labour market, firms will pay W* and hire Q* units of labour. The imposition of minimum wage at W_m which is higher than the market equilibrium rate W* will force employers to reduce their quantity demanded for

labour to Q_d. Hence, the disemployment effect of a minimum wage introduction is reflected by $Q^* - Q_d$. However, with the minimum wage higher than the previous market equilibrium rate, some individuals will be induced into supplying more labour and others will enter the labour market; this additional labour supply is captured in $Qs-Q^*$. In this situation, the disemployment effect of minimum wage is more than expected. The total disemployment effect of minimum wage is represented in Q_s-Q_d. Q^*-Q_d represent the magnitude of employees who lost their job due to the introduction of minimum wage, while $Qs-Q^*$ is the magnitude of labour who are attracted to the labour market because of the minimum wage increase but unable to find employment. The magnitude of the disemployment effect is, however, usually larger where labour demand is elastic in sectors such as restaurants, and retail, which are prone to the negative effects of the minimum wage especially in the long-run. This reflects the availability of substitute inputs and products as well as the fact that labour costs are often a substantial proportion of the total cost of these businesses.

3.1.2 MONOPSONY

A monopsony is a firm which sets the wage at which it hires workers because of its large size relative to other firms. A monopsonist faces labour supply which is upward sloping implying that he can choose any wage rate along the curve and, if the wage is reduced, the firm will not lose all his employees (as is the case in the perfectly competitive labour market model). As asserted by Stigler (1946), a well-known exception to the neoclassical model of the disemployment effect of minimum wage is the monopsony case. In a monopsony labour market, an increase in the minimum wage above the equilibrium wage could as well increase employment at the same time raise it wage. Labour in a

monopsonist firm usually earn a lower wage than their marginal cost which indicates different conclusions for the analysis of minimum wages in the perfectly competitive market.

Figure 2: Minimum Wage and Monopsony

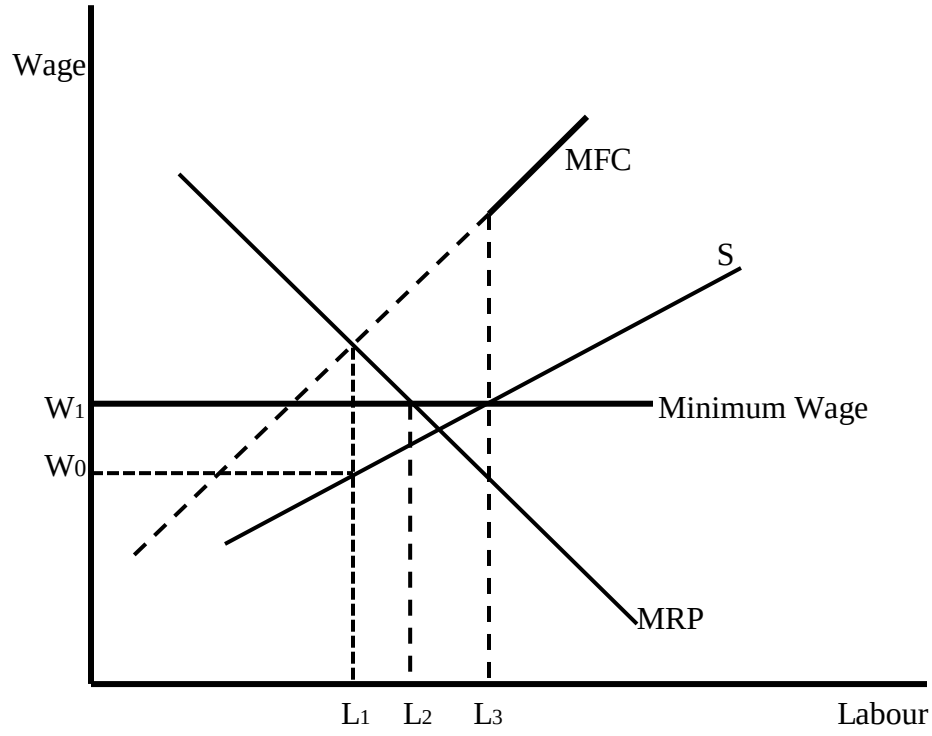


Figure 2 shows the Marginal Factor Cost (MFC) above the labour supply curve faced by the monopsonist. The employer maximises profit by employing L_1 quantity of labour and paying a wage rate of W_0 below the firm's MRP. The introduction of minimum wage at W_1 makes it illegal to employ and pay such employee below the new minimum wage. To employ additional quantity of labour, the employer must pay both new and existing employees the minimum wage indicating the section of the supply curve showing quantities of labour supply below W_1 is irrelevant. To add additional labour than L_3 quantity of labour, the employer must pay the wage rage given by the supply curve. The firm will still employ

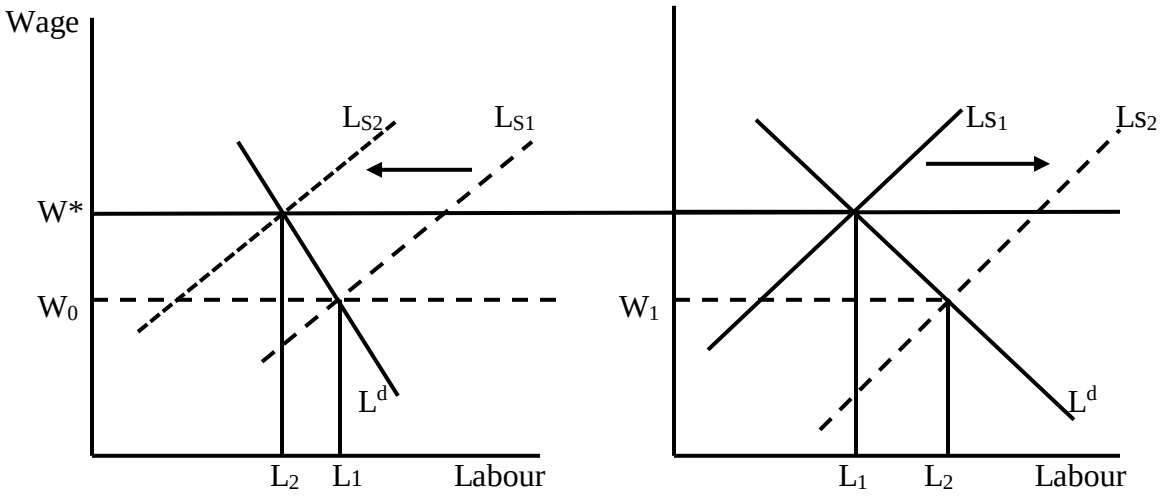
labour up to the point that MFC equals MRP which occurs at L_2. The firm thus increases its employment of labour in response to the minimum wage increase.

3.1.3 TWO SECTOR MODELS

Minimum wage policy coverage is not universal in most developed countries (e.g., the United Kingdom, France, New Zealand, Portugal, and the USA), but the coverage is gradually expanding compared to when the policy was first initiated. Still, compliance with the policy or law is not complete. Particularly in the United States, coverage under the Fair Labour Standard Act has since expanded gradually as the first provision granted exemptions to certain industries. The importance of non-compliance with the minimum wage law was highlighted by Ashenfelter & Smith, (1979) who argued that non-compliance is important as it increases the actual size of the uncovered sector.

Gilroy (1981) asserts that nearly 80 percent of the low-income workers in the covered sector will witness a disemployment effect with the introduction of minimum wage, while the quantity of labour demanded in the uncovered sector will continue to depend on the market-determined wage rate. The disemployment effect in the covered sector will cause those displaced to move to the uncovered sector, causing the wage rate to fall because of the increase in labour supply. However, as wage rate falls in the uncovered sector, some workers including those displaced from the covered sectors whose reservation wage rate is higher than the existing wage rate, will be discouraged from working.

Figure 3: Covered Sector **Figure 4: Uncovered Sector**



Source: Croce G. (2009)

For instance, an introduction of minimum wage in the covered sector (Figure 3) from W_0 to W* will lead to decline in the quantity of labour demanded by firm thereby causing outflow of labour from covered sector. Prior to the introduction of minimum wage, there exists an initial equilibrium at the competitive wage rate in both the covered and uncovered sectors at W_0 and W*, respectively. Introducing minimum wage at W* in the covered sector though increases labour supply but firms reduce quantity of labour demanded either by outright layoffs, reduction in working hours or embargo on employment as they strive to lower the cost of production causing employment level to fall from L_1 to L_2. Those displaced from the covered sector move into the uncovered sector (Figure 4) characterised by wage flexibilities thereby shifting the labour supply curve rightward (rightward shift of L_{S1} to L_{S2}) in (Figure 4) which lead to decrease in wages from W* to W_1, and an increase in the employment in the uncovered sector from L_1 to L_2. The increase in labour supply is absorbed in the uncovered sector through a reduction in the wage rate from W^* to W^1. The

minimum wage causes reallocation of jobs and a larger wage differential between these sectors, with no loss of employment only if there is a perfect inter-industry mobility.

Hence, the effect of minimum wage on total employment depends on the elasticity of demand and supply of labour in the uncovered sector, the reservation wage of those working in the uncovered sector, and the size of the covered sector. Brown (1999) asserted that the activities in the uncovered sector may dilute those in the covered sector, but not enough to totally offset the disemployment effects of minimum wage.

3.1.4 HETEROGENOUS LABOUR

The minimum wage is intended to increase the wages of low-skilled workers and potentially have indirect effects on those earning a higher wage rate. With the main attention on low-skilled workers, there is no observable skill indicator that neatly divides workers into those whose wages depend directly on the minimum wage and those earning more. Thus, in any low-wage group such as high school dropouts, hospitality, and retail, there will be a mixture of those directly affected by the minimum wage increase and those who are better paid.

An increase in minimum wage increases the labour costs of unskilled workers and thus makes inputs that are good substitutes for such workers more attractive. Workers in low-wage groups who earn a little higher than the minimum wage and perform the same task as the unskilled workers are likely to become a perfect substitute for the low-skilled workers. The variation in employment for the group member reflect the balance of these losses and gains. As long as low-skilled labour is also a substitute for the composite non-

labour input, total employment will fall in response to an increase in the minimum wage as the use of non-labour inputs increases. But small overall employment impacts may reflect an unattractive balancing of gains by relatively advantaged workers and losses by those directly affected (Deere et al. 1995; Freeman, 1996).

If the minimum wage is set low enough that it affects only a small share of employment, the effect of the minimum wage on total employment is likely to be small and in any case, quantitatively insignificant. This justifies the focus of analysis on low-income earners, where the proportion directly affected is larger and so the anticipated effect of wage increase is expected to be larger.

3.1.5 SHOCK EFFECT MODEL

Firms often make effort to react to minimum wages by increasing the productivity of their workers in order to offset the minimum wage increase. The shock effect may reduce the disemployment effect of minimum wage increases but might still be unable to eliminate it completely. Firms often increase productivity through the introduction of costs saving devices that could have been introduced without a minimum wage, while workers themselves might also be motivated by the high wage rate (i.e., the efficiency wage) or because they feel threatened by the possibility of losing their jobs owing to the increase in exogenous labour supply.

However, several scholars have cast doubt on the effectiveness of the shock effect in preventing the disemployment effect. West & Mckee (1981), for example, assert that the shock effect might reduce the dis-employment from minimum wage increases but it is

unlikely to eliminate it. This is because it is hard for firms to supervise and provide continuous incentives which encourage greater productivity especially with frequent changes to minimum wage.

3.1.6 EFFICIENCY WAGE MODEL

Efficiency wages provide another explanation for the possibility of increased productivity after a rise in minimum wage. Efficiency wage theory indicates that paying wages above what is expected in the perfectly competitive model can improve worker productivity, increase efficiency, loyalty, lower turnover rates, and other associated costs. Hence, firms may find it beneficial to pay higher wages above the prevailing market wage to their workers. Lazear (1981) asserts that higher paid employees carry stronger socialised norms of attendance and work performance compared to their lower-paid counterparts. Akerlof (1982) asserts that workers who are explicitly overpaid will regard this as a gift and will respond by an equivalent gift of effort. Hence, high morale reduces the need for supervision and monitoring, as long as self-supervision and voluntary exertion of efforts compose one portion of the gift exchange. The difference between the firm's wage and the perfectly competitive labour market wage that clears the market is the size of the efficiency wage gift.

The assumption that relative wage or higher wage impact worker effort has gained a great deal of theoretical support (e.g., Yellen, 1984; Katz, 1986, Lazear, 1981). In efficiency wage theory, the attention is on the relative level of the wage itself. In the models, the wage is above the market clearing level. Efficiency wage theory states that the capacity of the firm to produce depends on worker effort as a function of wage, the number of

workers hired, and the amount of capital. Considering the basic production function of a firm

$$Q = F(L, K) \quad where\ Q = quantity\ of\ output, L = labour\ and\ K = capital$$

efficiency wage theories add the element $e(w)$, worker effort as dependent on wages. The new production function becomes

$$Q = F[e(w)L, K]$$

where quantity produced is a function of worker effort (contingent on wage) as well as the number of workers employed and the amount of capital. Profit maximising firms select the wage, $w*$, at which the elasticity of worker effort with respect to the wage is one. Over the range of values $w < w*$, effort falls faster than does the wage, increasing total labour costs; over the range of value $w > w*$, effort grows more slowly than does the wage, pushing up the cost of labour. The wage of unitary elasticity, w*, emerges as the low-cost or efficiency wage.

3.1.7 HUMAN CAPITAL THEORY

The human capital model predicts that an increase in wages of workers with low level of education relative to workers with high level of education will reduce investment in schooling because the relative rate of return to additional years of schooling are diminished. As asserted by Mincer (1958) and Becker (1964), the decision of an enrolled individual to drop out of school will depend on factors such as employment level and the wage rate of youth both in covered and uncovered sector. If the discounted value of the flow of earnings for low-skilled worker is greater than the present value of the flow of

earnings of an individual who remains in school, the individual will drop out of school. However, an individual will remain in school to gain more years of education if the present value of the flow of earnings for an individual is greater than the discounted value of the flow of earnings if an individual who drops out of school.

There could be shocks to the labour market that might influence the decision to either dropout or remain in school. First, consider a shock that raises the wage of dropouts and school graduates by the same amount. This might induce some youth, especially those with high discount rates, to drop out of school, but should not have a substantial effect on school enrollment. While this will have the effect of increasing the opportunity cost of attending school, it will not change the wage differential between graduates and dropouts.

Second, a transitory shock that creates demand for low-skilled workers will in the meantime increase the wages for school dropouts relative to high school graduates. This transitory shock might increase the opportunity cost of a school diploma and may decrease the wage gap between graduates and dropouts for the first year of work. A temporary shock, however, will have a negligible effect on the return to a high school diploma estimated over the student entire working life meaning school enrollment will be marginally affected.

For a local labour market shock to have a significant effect on high school enrollment, it must generate a long-term increase in the wage of dropouts relative to graduates. Such a shock will both increase the opportunity cost of a high school diploma by narrowing the wage gap between dropouts and graduates for a significant period. In this instance, youth will drop out of school as the minimum wage increases.

3.2 REVIEWS OF RELATED LITERATURE

There is a direct relationship between minimum wage and employment according to Stigler (1946) who documented the neoclassical view of minimum wage effects on employment. The effects are substantial and negative. A large body of empirical and theoretical literature have upheld Stigler's theory, most of which are published in the United States. There was a consensus among early studies conducted in the United States using time series national data in the 1970s that there exists a negative effect on youth employment, such that a 10 percent increase in minimum wage is associated with 1 percent to 3 percent decline in youth employment (Brown et al. 1982). In the 1990s, studies by Card & Krueger (1994) questioned the conventional wisdom and earlier results. They argued that minimum wage essentially has zero or positive impacts on employment which opened a new line of debate on the subject. Evidence from Canada using different datasets and approaches where the minimum wage is under the provincial government jurisdiction, however, affirms the earlier consensus in the United States with a much larger magnitude. Some of these empirical studies are reviewed below.

3.2.1 MINIMUM WAGE AND EMPLOYMENT

In his study challenging the conventional wisdom and the work of Neumark & Wascher (1995b), Card (1992b) compared the experience of California workers between 1987 and 1989 during which the wage rose sharply compared to the experience of states with no minimum wage increase. Using a difference-in-difference (DID) approach, Card found no evidence of disemployment effects because two-thirds of youth in California were already earning more than the minimum wage amount in 1990. Rather, income increased

by 5 to 10 percent for youth in California relative to other states with no increase. They found that youth earning more got an increase in wage rate while some of those displaced gained employments in the uncovered sector. Card's result suggests that covered firms affected might have monopsony power to increase wage rate higher than the market equilibrium wage rate.

Burkhauser et al. (2000) used pooled data by state and relied on the gaps between states and federal minimum wage to identify the disemployment effect. In their study, minimum wage was defined as the highest of federal and state minimum wage with no adjustment to the industries covered under the minimum wage legislation at both levels. Contrary to Card's (1992b) result, they find a significant disemployment effect among teenagers. Their estimates indicate that a 10 percent increase in minimum wage reduces teenage employment by 8.7 percentage point based on data obtained from the Survey of Income and Program Participation while estimates from the Current Population Survey (CPS) suggest a 5.9 percent decline in teenage employment. They concluded that the disemployment effect of a minimum wage increase is more severe on black teenagers relative to young adults.

Deere et al. (1995) adopted a parsimonious approach like Card & Krueger (1994). Using state level CPS data from 1985 to 1992, they disaggregated their data into sex and race, and found that teenage employment for males and females were 7 and 11 percent lower in 1991-1992 than what it would have been without a minimum wage increase. Their estimate indicates a 10 percent disemployment effect for black teenagers, marginally larger than the average estimates for males and females for all races.

Taking advantage of the 1987 increase in minimum wage by 49.3 percent in Portugal, Pereira (2003) examines the impact of a minimum wage increase on youth (18 to 19 years of age). Using panel data from the Statistics Department of the Portuguese Ministry of Qualification and Employment, their study found a substantial and statistically significant disemployment effect for teenagers, but an increase in the employment of 20-25 years old young adults. The results suggest substitution effects towards young adults. Pereira concluded that firms adjust teenagers' employment through outright layoffs and a reduction in the number of working hours.

In a more recent study in the United States, Zavodny (2000) investigated the effects of minimum wage changes on average hours with the difference-in-difference (DID) approach using both individual level data and state level data. He found a disemployment effect with state-level data but hours of work remained intact for youth who retained their jobs while the individual level data did not show any decline in hours of work for individuals who are more likely to be displaced. He concluded that low-skilled youth are more vulnerable to losing their jobs as employers lay off workers whose marginal productivity is below the current binding minimum wage. His estimate suggests that the disemployment effect of the minimum wage need not be outright layoffs but can also be reduced hours of work.

Guiliano (2013) used personnel data from large retail firms in the United States to estimate firm responses to the 1996 federal minimum wage hike. He found that the increase had negative but insignificant effects on net employment. He, however, also found that the increase led to an increase in the employment of teenagers. The result was contradictory to the competitive labour market model which predicts disemployment, especially for youths

since they are regarded as having little or no skill. His result is consistent with Card's (1992b) study on California and suggest that firms have monopsony power.

In a related study in China, Wang & Gunderson (2012) estimated the effect of minimum wage on employment and wages in eastern China using the difference-in-difference (DID) approach. They found that although the minimum wage had a disemployment effect, the effect was statistically insignificant and quantitatively inconsequential. As predicted by basic neoclassical theory, they found that minimum wage dis-employment effects were larger in market-driven sectors (uncovered sectors) and in the low-wage retail and wholesale sectors, most especially among women.

In Canada, several studies have attempted to examine the relationship between minimum wage and employment. Most of these studies only examine one or few provinces using different estimation techniques.

Using time-series regression, Cousineau (1979) estimated the effect of minimum wage on women and teenagers living in Quebec in 1968-1977. He found a substantial statistical disemployment effect caused by wage increase, such that a 10 percent increase in minimum wage led to 2.9 percent increase in youth unemployment, while women's unemployment rate increased by 1.7 percent This result is consistent with the earlier result by Brown et al. (1982) in the US using time series data further affirming the neoclassical model disemployment prediction.

Estimating minimum wage effects on Canadian teenagers for the period 1975-1993, Baker et al. (1999) used ordinary least square (OLS) and found that a 10 percent increase in minimum wage is associated with a roughly 2.5 percent decrease in teenagers'

employment. Having filtered the minimum wage into low and high frequency as opposed to the full employment equation used in their study, the authors found that their result was driven by low-frequency variation in the minimum wage capturing cycles of approximately 6 years and longer, while the high frequency in the elasticity was positive and insignificant. They concluded that minimum wage increase had substantial long-run negative effect on youth employment. However, their research design does not state whether spatial heterogeneity across Canadian provinces is associated with low variation in minimum wages.

Campolieti et al. (2014) estimated the effect of minimum wage on employment on permanent and temporary job positions between 1997 and 2008 using the "At-Risk" and Gap methodology (which utilises information on the magnitude of the minimum wage changes that have occurred). They found that a recent increase in the minimum wage reduced the probability of being employed by about 2 percentage points for teens 15-19 years and youth 20-24 years combined, with the effect larger for teens relative to youth. Their estimate is at the lower end of the range of -0.3 to -0.6 disemployment elasticities mostly found in Canadian studies for earlier time periods. These adverse employment effects imply minimum wage elasticities around -0.16 for teens and youths combined. More importantly, they concluded that the adverse effects of the minimum wage are substantially greater for permanent workers compared to temporary minimum wage workers; they are statistically insignificant for temporary minimum wage workers.

Sen et al. (2010) using Labour Force Survey estimated teen employment, poverty, and the minimum wage for the period of 1981 to 2004. Using difference-in-difference methodology, ordinary least squares, and instrumental variable estimation, they found the

disemployment effect of a minimum wage increase to be 3 to 5 percent on teen employment and a 4 to 6 percent rise in the proportion of families living under Low Income Cut-Off (LICO). Their result agrees that minimum wage as affirmed by Gunderson (2008) and Campolieti et al. (2012) is not an effective tool in addressing poverty. The authors estimates reveal that a higher minimum wage might paradoxically result in a substantial negative shock to low-income families.

3.2.2 MINIMUM WAGE AND SCHOOL ENROLLMENT

Unlike the disemployment effects of minimum wage increase, the enrollment effect of minimum wage increase has largely been understudied.

Neumark & Wascher (1995b) used state-level data for the period 1973 to 1989. They divided youth population into four mutually exclusive activities (i.e., Schooling and Employed [SE], Employed not Schooling [ENS], Schooling not Employed [SNE] and Neither Schooling nor Employed [NSNE]) using individual major activity obtained during the survey week. They found that an increase in the minimum wage is associated with statistically significant disemployment among teenagers. Their estimates suggest a disemployment effect for enrolled youth (SE and SNE) and an increase in the proportion of neither enrolled nor employed (NSNE). They explained their results with substitution and queuing hypotheses. The substitution hypothesis predicts substitution towards highly skilled enrolled youth, while the queuing hypothesis suggests that higher minimum wage induces youth to drop out of school, while some working part-time increase their labour supply, but may be faced with difficulties in finding employment at the higher wage rate thereby ending up in neither enrolled nor employed (NSNE).

Mattila (1981) used time-series data from October 1947-1977 extracted from Current Population Survey (CPS). In contrast to the neoclassical model prediction of disemployment effect, he found that minimum wage and school enrollments are positively correlated. He argued that a higher minimum wage creates a barrier to employment which helps enrollment to increase. Hence, Mattila's conclusion suggests that since working is the best alternative to studying, youth displaced from work will return to school as minimum wage increases.

Chaplain et al. (2003) criticized the employment status recode of Neumark & Wascher (1995a) because it excludes part-time students from the enrollment-employment categories. They argued that using Current Population Survey (CPS) in analysing the employment and enrollment transition predisposed the researchers to exclude respondents who changed status during the study period. Hence, estimates based on CPS data may erroneously indicate that minimum wage increases unemployment and school dropouts. Instead, Chaplain et al. (2003) used the Common Core of Data which contain the entire population of all public schools in the United States. They found minimum wage to have a negative effect on school enrollment only in states where youth can drop out of school before the age of 18 years. They concluded that the negative enrollment effect can be prevented if states increase the legally allowed school drop-out age to 18 years and reduce the number of hours youth can work during the school session.

Gustman & Steinmeier (1981) adopted the discrete multivariate algorithm technique to estimate the effect of a minimum wage increase on unemployment, school enrollment and labour supply. Using data from the Survey of Income and Education extracted from the 1976 Current Population Survey, they found that higher relative wage

reduces youth school enrollment, while low unemployment rate induces non-white male youth to increase their labour supply. Their result indicates that there exists a negative relationship between both a higher wage rate and low unemployment and school enrollment for non-white youth.

Crofton et al. (2009) used panel data across Maryland counties and annual observations from 1993-2004 to investigate if the real minimum wage has differing effects on high school dropout rates across students of various races and ethnicities (whites, African Americans, Hispanic, and Asians). They found higher real minimum wage increases to be associated with higher dropout rates for Hispanic students, but not for other races and ethnicities after controlling for the unemployment rate, teenager pregnancy rates, real income, and educational attainment among adults.

With an emphasis on the early 1990s increase in the federal minimum wage in the United States, Turner & Demiralp (2001) examined the employment and enrollment transitions between January to April 1991 and January to April 1992. They found that higher minimum wage is correlated with a greater likelihood of youth dropping out of school in order to work. Their results indicate that some youth are more likely to become neither schooling nor employed (NSNE) while youth who are not enrolled are less likely to become enrolled (SE or SNE) following minimum wage increase. However, they conclude that the wage increase tends to reconnect idle youth (NSNE) with the labour market after a long time of absence.

Testing the hypotheses that the effect of minimum wages on teenager's education decisions is asymmetrical across family income classes such that youths from low-income family reduce their level of schooling and children from higher-income families increase

their educational attainment, Ehrenberg & Marcus (1982) used a multinomial logistic model on data obtained from the 1966 National Longitudinal Survey for young males and the 1968 National Longitudinal Survey for young females. The authors disaggregated their data into race and found that increases in the minimum wage induces some white teenagers from low-income families to shift from schooling and employed to full-time schooling, while the data for non-white youth yielded the "a prior" expectation that the effect is more severe for male children from low-income families with the increase inducing them to shift from full-time schooling to full-time employment.

Lio (2001) used a multinomial logistic model to estimate the effect of minimum wage on employment and school enrollment using the National Longitudinal Survey from 1980 to 1984. He found the disemployment effect of the minimum wage as indicated by Cunningham (1981) and a positive school enrollment as affirmed by Matilla (1981). His result suggests that the negative effect of the minimum wage on part-time positions outweighs the full-time increase in employment, leading to a negative net employment change. The result also indicates that an increase in the minimum wage is positively associated with increases in youth school enrollment as found earlier by Mattilla (1981). He concluded that some youth who are initially in school do dropout to work full-time at a higher minimum wage, and those dropping out are more likely to have poor academic performance because they have considerably lower returns on schooling relative to students with good academic records.

Taking advantage of the coal boom and bust in Kentucky and Pennsylvania between the 1970s and 1980s to test the human capital theory. Black et al. (2005) found that high school enrollment in these two states declined in the 1970s during the boom and increased

in the 1980s as the boom subsided. They also found that the wages of high school dropouts declined relative to graduates compared to countries without coal. Hence, the estimate suggests that a long-term 10 percent increase in the earnings of low-skilled workers could decrease high school enrollment rate by as much as 5-7 percent. Their estimates indicate that in the short run tight labour market conditions adversely affect enrollment decisions, while increases in low-skilled workers' earnings reduce the relative long-term returns to education which induce youth to drop out of school to queue for minimum wage jobs.

In New Zealand, Gail & Amy (2007) adopted three panel least squares models on a panel data obtained from the Household Labour Force Survey to examine the effect of minimum wage on educational enrollment. Their results indicate that the minimum wage have essentially insignificant effects on the enrollment of youth (16-24 years of age) and a sub-group of these youth (20-24 years of age). However, they found a statistically significant negative effect of a minimum wage increase on the enrollment of the 16-19-year-old sub-youth. The 2004 minimum wage reform in New Zealand increased teenagers' wages to 91 percent of the adult wage rate and reduced adult wage eligibility from 20 to 18 years of age. According to the atuhors' estimates, the disemployment effect was severe on teens due to the absence of compulsory school leaving age. Their result is consistent with Chaplain et al. (2003) which found that youth drop out of school only in states where the compulsory school leaving age is lower than 18.

Landon (1997) used a pooled cross section-time series of annual provincial-level data in six Canadian provinces (Nova Scotia, Saskatchewan, Ontario, Manitoba, New Brunwick, and Alberta) between 1975 to 1989 to examine the effect of minimum wages and education spending on high school enrollment in Canada. He found a statistically

significant negative effect of a minimum wage increase on school enrollment for 16 and 17 years old males and 17 years old females indicating that a $0.50 increase in minimum wage will have a 0.7 percentage point decline in the proportion of 16 and 17 years old enrolled in school. The author affirmed that educational spending has no systematic impact on enrollment. He concluded that there are also social costs (e.g., high unemployment, high crime rates, a widening income inequality gap) associated with the high dropout rates which should be evaluated when considering minimum wage increases.

Baker (2005) examines the minimum wage and human capital investments of workers. He found that minimum wage increase has no effect on teenagers' (15-16 years of age) enrollment because they are subject to a compulsory school leaving age and a modest positive effect on those who can make their own school/work decisions (17-19 years of age and 20-24 years of age). Baker's result indicates that an increase in the proportion of unemployed and a disemployment effect on employed youth following a minimum wage increase.

Examining the effect of the increase in the oil price shock between 2001 and 2008 on young men's labour market involvement and school enrollment, Morissette et al. (2015) used data obtained from the Labour Force Survey for three oil-rich Canadian provinces (Alberta, Newfoundland and Saskatchewan). They found a dual effect of wage increase for young men. First, male youth tend to reduce their full-time school enrollment at least temporarily and secondly, an increase in the wage rate reduces the proportion of those who are neither enrolled nor employed. This is because the wage increase reconnects them (NSNE) with the labour market after a long time of absence.

Using an approach similar to Neumark & Wascher (1995b) in estimating how minimum wage affects the schooling-employment outcomes of youth, Campolieti et al. (2005b) used data from the master file of Survey of Labour and Income Dynamics (SLID) between 1993 and 1999. Using a multinomial logistic model estimation technique, they found that minimum wage increases led to a large and statistically significant reduction in the employment of youth, while the increase in minimum wages had no effect on youth net enrollment as the coefficient was negative but quantitatively insignificant.

In a related study Campolieti et al. (2005a) found that the increase in minimum wage caused 6 percentage point disemployment among low-skilled workers with an elasticity of -0.4 suggesting that a 10 percent increase in minimum wage will have a 4 percent disemployment effect on the low-skilled workers generally believed to be youth. The estimates suggest there is a negative relationship between minimum wage and youth employment consistent with the neoclassical prediction and previous studies.

It remains unclear how minimum wage affects employment and enrollment amidst prior contrasting theoretical and empirical evidence. Youth from poor families work part-time to support themselves through school, while some are induced to quit schooling to work full-time.

Evidently, minimum wages can have a complex effect on different enrollment-employment outcomes and the net effects are not moving in the same direction. As such, it becomes imperative to appeal to more empirical evidence.

CHAPTER FOUR

4.1 METHODOLOGY

In this chapter, we describe the data used in the empirical analysis as well as explicitly discussing the methods of econometric analysis. In estimating the effects of minimum wage on employment, school enrollment, and its effects on the employment-enrollment transition among youth, as well as evaluating the virtue of public policies to address the result, we adopt a multinomial logistic model. We start by discussing the adoption and modification of the econometric model to be used while also making justifications for its choice.

Logistic regression is a type of regression analysis used to predict the outcome of a categorical variable, a variable that can adopt two or more possible values based on the independent variables or predictors. The discrete choice type of model is often the most suitable tool for our analysis. Past empirical studies have used conditional and multinomial logistic regression to estimate the effects of minimum wage on employment and school enrollment. For instance, Neumark & Wascher (1995a) used the conditional logit model, while Ehrenberg & Marcus (1982), and Campoleiti et al. (2005b) adopted the multinomial logistic model, although both estimation techniques produce similar results. However, considering the ease of computation, analysis, interpretation of results, the frequent usage in some past empirical studies and our desire to estimate the transition from initial activity of an individual to actual activity, the multinomial logistic model is adopted in the analysis of this thesis. It also provides the ability to incorporate the heterogeneity of all provinces into the analysis.

4.2 PRIOR EVIDENCE

While there exists a consensus among most Canadian studies on the disemployment effect of minimum wage increases, evidence on the effect of a minimum wage increase on school enrollment effect is mixed within Canada and elsewhere. While some researchers found negative effect in the United States (Neumark &Wascher, 1995b) and in New Zealand (Gail &Amy, 2007). Baker (2005) in Canada and (Ehrenberg & Marcus, 1982) in the United States found the effect to be limited to sub-group. Others found positive effects of minimum wage increase on school enrollment (Mattila, 1981), while other researchers found essentially no effects on school enrollment (Card, 1992; Campolieti et al. 2005b).

Most of the past studies suffer from methodological setbacks. First, some of the studies consider a narrow range of years or use inadequate variables that fall short of determining youth school/work decisions as the minimum wage rises. For instance, Campoleiti et al. (2005b) considers a very narrow range of variables excluding family size and prior youth activities in their analysis. In our analyses, we model the impact that family size and youth prior activity might have on their actual school/work decision as well as their transition from their initial to final activity resulting from frequent changes to minimum wage.

Second, many of the past empirical studies suffered from unsatisfactory measurement of the dependent variables: enrollment-employment activities. Chaplain et al. (1995) criticised the employment status recode of Neumark & Wascher (1995b) because it excludes part-time students from the employment category. They argued that using CPS in analysing the employment and enrollment transition predisposed the researcher to exclude respondents who changed status during the study period. Hence, estimates based on CPS

data may erroneously indicate that a minimum wage increases unemployment and school drop-outs. In Canada, most studies used aggregate data, e.g., (Baker et al. 1999; Baker, 2005; and Landon, 1997). Hence, using micro-data, we adopt a broader measure of enrollment-employment status in categorising youth into the four mutually exclusive activities.

Third, most of the past studies such as Neumark & Wascher (1995a, b) and Campolieti et al. (2005b) added year dummies as independent variables. Meanwhile, Burkhauser et al. (2000) noted that adding year dummies will eliminate the influence of changes in minimum wage, although differences in the results a not expected to be much. In addition, province dummies have also been added to account for cross-province differences in factors such as compulsory schooling age, education policies, and quality. The marginal effect becomes statistically inefficient under this approach. However, this is not to be interpreted as minimum wage not having an impact on school/work transitions, but instead, it means the inclusion of province and year dummies in the specification almost eliminate the variation in minimum wages across provinces. Hence, by adding the year and provincial dummies in the multinomial logit model, the regressions exhibited multicollinearity and results become highly inefficient with large standard errors. Thus, we model our analyses to exclude both provincial and year dummies to avoid these problems.

4.3 EMPIRICAL PROCEDURE

Expected Utility Theory states that the decision maker chooses between risk and uncertainty prospects by comparing their expected utility values. (i.e., the weighted sums obtained by adding the utility values of outcomes multiplied by their respective

probabilities). Hence, an individual will choose the course of action which promises a highest level of satisfaction or maximum utility. In making a choice within a set of alternatives, an individual weighs the cost and benefit of available alternatives with each choice being influenced by a set of endogenous, exogenous, and individual level variables. With an increase in the minimum wage rate, youth are faced with choices to either quit schooling to queue for minimum wage jobs, remain in school to build on their human capital as the minimum productivity required to gain employment rises or some combination of both or neither of these. Youth are expected to remain in school (desired outcome) only if the long-term returns to education outweigh present value of quitting school (working), while they will quit schooling to queue for higher minimum wage jobs if the increase in minimum wage increases the income of low-skilled workers implying a decline in long-term return to education.

This modelling strategy assumes that youth choose among a series of alternatives with each choice subject to influence from both endogenous and exogenous variables and other individual-specific unobserved effects. Following the approach used by Ehrenberg & Marcus (1980, 1982), Neumark & Wascher (1995b), and Campolieti et al. (2005b), we dichotomize youth's enrollment-employment outcomes into four possible mutually exclusive activities: SNE (Schooling Not Employed), SE (Schooling and Employed), ENS (Employed Not Schooling), and NSNE (Neither Schooling Nor Employed), and then estimate the determinants of the probabilities that an individual is observed in one of the four categories using the multinomial logistic analysis technique.

Specifically, we are interested in estimating the effects of minimum wage increases on youth employment and enrollment, as well as estimating their transition from initial

enrollment-employment activity to actual activity caused by frequent changes to minimum wage.

Let the utility for being in each category be indexed by j (SE, $ENS, NSE, or\ NSNE$) for individual *i* in province *k* at time *t* be written as:

$$U_{ikt}^{j} = X_{ikt}^{j}\beta_j + \mathcal{E}_{ikt}^{j} \quad (1)$$

where $j: 1 \ldots 4, K: 1 \ldots .10, t: 1 \ldots .7, and\ i: 1 \ldots . n$

In this utility function, *U* is the dependent variables estimated on a set of explanatory variables *X* which are both individual and provincial level characteristics. More precisely, we can explicitly write $X_{ikt}^{j}\beta_j$ which contain all individual and provincial level variables influencing individual choice as follows:

$$X_{ikt}^{j}\beta_j = \beta_0 + MW_{kt}^{j}\beta_j + X_{ikt}^{j}\lambda_j + Z_{kt}^{j}\alpha_j \quad (2)$$

Substituting equation (2) into (1) above yields:

$$U_{ikt}^{j} = \beta_0 + MW_{kt}^{j}\beta_j + X_{ikt}^{j}\lambda_j + Z_{kt}^{j}\alpha_j + \mathcal{E}_{ikt}^{j} \quad (3)$$

Assuming $\mathcal{E}_{ikt}^{j}$ has an extreme-value distribution, this leads to the multinomial logit model as suggested by McFadden (1973) which assumes that the random errors are independent and identically distributed (*iid*) with type I extreme value distribution (i.e., log Weibull).

In equation (3), U_{ikt}^{j} is the variable showing the enrollment-employment activity for individual *i* residing in province *k* at time *t*. MW_{kt}^{j} is the relative minimum wage index for province *k* at time *t* calculated as the ratio of provincial minimum wage to provincial

average hourly manufacturing wage rate. X_{ikt}^{j} is the vector of individual characteristics (age, sex, CMA, family size and family income) that may affect the schooling-enrollment choice of an individual and labour market characteristics. Z_{kt}^{j} is the provincial variable (prime-males age unemployment rate) influencing individual enrollment-employment outcomes, while ε_{ikt}^{j} denotes the individual-specific random error. We did not adjust minimum wage for coverage as done in most empirical studies in the United States because coverage is almost universal in Canada as noted by Baker et al. (1999).

Since the reduced form of equation (3) is equation (1)

where X_{ikt}^{j} is a matrix containing the set of explanatory variables specified in equation (2) and β is a vector containing the parameters. Multinomial logit estimation will calculate the β vector such that its elements maximize the U in equation (1) for each activity j (SE, ENS, SNE, and NSNE). After the multinomial logit estimation, the probabilities of an individual being in one of the enrollment-employment activities can be computed as

$$Pr(U_i = J|X_i)\ \frac{\exp(X\beta_j)}{[1+\sum_j \exp(X\beta_j)]}. \qquad (4)$$

However, the coefficients of interest are not the probabilities but the derivatives of these probabilities (i.e., marginal effects) with respect to the variable of interest (i.e., the minimum wage). The partial derivative of the probability of being in alternative j with respect to the m^{th}element of the matrix X is calculated by Nuemark & Wascher (1995b) as:

$$\frac{\partial P_j}{\partial X_m} = P_j[\beta_{mj} - (P_j\ \beta_{mj})] \qquad (5)$$

This expression produces the percentage change in the probability of being in each of the activity *j* (i.e., SNE, SE, NSE, and NSNE) relative to a percentage change in the minimum wage variable specified in equation (3). In other word, equation (5) computes the marginal effects of relative minimum wage changes on the probabilities of being in each activity *j*.

The probabilities and the marginal effects in equation (5) depends on the values of all explanatory variables specified in equation (2). The best way to calculate the marginal effect is to estimate them at the sample mean of all explanatory variables. The results are the derivatives of the probability of an individual being in activity *j* (SE, ENS, SNE, and NSNE) with respect to the relative minimum wage for the entire sample, unconditional on their initial activities. Intuitively, these derivatives are useful in estimating the net effects of minimum wage increase on youth employment and enrollment, but they are insufficient in estimating the school to work transitions within youth subgroups, which are computed conditional on the initial (lagged) activities thus yielding sixteen coefficients (4 initial activities x 4 actual activities).

Taking advantage of the panel nature of our dataset, we use the estimate of the multinomial logit model to calculate the marginal effect of the probability of each enrollment-employment transition with respect to minimum wage variable. We calculate derivatives of switching to each possible enrollment-employment activity, conditional on being in each initial activity. Hence, we set the lagged activity to a dummy variable equal to one for the initial enrollment-employment activity being considered and set the others to zero. Thus, we calculate 16 partial derivatives (four initial activities x four final activities), rather than only four.

Specifically, the model predicting the probability of these outcomes is given as:

$$\ln\left(\frac{P_{SNEi}}{P_{ENS}}\right) = \exp\left(\beta_0 + MW_{kt}^{j}\beta_j + X_{ikt}^{j}\lambda_j + Z_{kt}^{j}\alpha_j + \mathcal{E}_{ikt}^{j}\right). \quad (6)$$

In this model, employed not schooling (ENS) is chosen as the baseline category because of its frequency. Schooling not employed (SNE) takes the value of one if an individual was enrolled in school, not employed, and not in labour force, and zero if otherwise. Schooling and employed (SE) takes the value of one if an individual is both enrolled and working and zero if otherwise. Employed not schooling (ENS) takes the value of one if an individual is employed but not enrolled, while Neither Schooling nor Employed (NSNE) takes the value of one if an individual is neither enrolled nor working and zero if otherwise.

4.4 DATA

The datasets for this research were obtained from Public Use Microdata File (PUMF) of the Survey of Labour and Income Dynamics (SLID) for the period 2005-2011. This period is the appropriate period of analysis since it witnessed several changes to minimum wages across provinces in Canada. The SLID obtains labour market information on survey respondents every January of the year. This data has information on school enrollment and employment status of all respondents and thereby will enable us to estimate the effect of a minimum wage increase on both employment and school enrollment.

The SLID identifies the province of residence and age of each respondent. Using this information, the individual level data are matched with province level variables, which are the minimum wage calculated as the ratio of nominal minimum wage to average hourly

manufacturing wage rate, male prime provincial unemployment rate (25-54 years), and the unemployment rate. We, however, used the sampling weight provided by SLID throughout our empirical analysis to adjust for the oversampling of certain demographic groups.

Individuals are considered employed if they had either a full or part-time job and are enrolled, if they were either enrolled full-time or part-time in school. This information is used to construct our four mutually exclusive employment-enrollment activities (SE, ENS, SNE, and NSNE). Our sample size is restricted to youth between 16-24 years of age who are single, not members of the armed forces, who are not graduates of high school, college or university. These restrictions reduced our sample size to 13,905 observations from 59,523 observations for the period 2005-2011. Our sample size represents 23.4 percent of the original sample size with most of the excluded individuals being high school, college, and university graduates, married individuals or those who are handicapped and received benefits or compensation from the government in the reference year. In addition, our observations for young adult (20-24 years of age) reduced the sample to 3,579 observations. These observations proved too small to make any statistical inferences as the regression output gave non-singular matrix issues after estimation. Hence, the sample size used for this study is youth between the ages of 16 to 19 years.

Our independent variables are minimum wage as a ratio of average hourly manufacturing wage rate as used in past empirical studies, individual after-tax income, family size, individual characteristics (age, sex and rural), and year dummies. Basic individual characteristics are included as base control variables. In our empirical specification, gender will be coded as a dummy variable, while the provincial unemployment rate for prime age males (i.e., those 25-54) is used as an indicator of the

labour market condition in each province. Our samples consist of unmarried men and women between 16 and 24 years of age, residents in one of the 10 provinces in Canada.

4.5 VARIABLES USED IN ESTIMATION

Below, we discuss the variables included in our estimated model. These variables are both the dependent and the independent variables:

4.5.1 ENROLLMENT-EMPLOYMENT ACTIVITIES

This study uses a broader measure of school enrollment compared to past studies. This measure combines all individuals enrolled either full-time or part-time. Notably, Neumark & Wascher (1995) used a narrow definition of enrollment which excludes all individual who answered working as their major activity during the survey week in their study even if they are enrolled part-time. However, Chaplain et al. (2003) faulted their conclusion as it excludes youth who study part time due to their work commitment. To have an accurate school enrollment measurement, the October files of the SLID are used. The month of October is within the fall academic session across Canada and its use allows for accurate measurement of youth who are enrolled in high schools, colleges, and universities in each province. Only students who fall within the age bracket 16-24 years, single (never married) and enrolled either part time or full time in any of the mentioned levels of education are counted as enrolled. We exclude high school, college, and university graduates, as well as youth in military service, as they do not have the same school/work options as high school enrollees and dropouts.

The effect of minimum wage increase is expected to have a different effect on youth depending on whether they are enrolled in school, are dropouts, or are graduates. The increase might induce enrolled youth and dropouts to alter their school/work decision, the effect of the wage increase is expected to be minimal on youth out of school because they do not have the school/work option. Thus, as stated earlier, the youth school enrollment and labour force status are used in creating youth activity (SE, ENS, SNE, and NSNE) based on the combination of activities in which youth are involved in during the survey week.

4.5.2 UNEMPLOYMENT RATE

In controlling for the business cycle effects and accounting for differences in labour markets across provinces, we include the province's unemployment rate for prime-age males (i.e., those aged 25 to 54) to control for aggregate economic activity. We strictly followed the conventional approach in past empirical studies in using this variable (Baker et al. 1999; Campolieti et al. 2005b). The unemployment rate acts as a signal to youth considering dropping out of school or increasing their labour supply. A higher provincial unemployment rate would mean a lower probability of finding a job and hence is expected to increase school enrollment, while a lower provincial unemployment rate would mean a higher probability of finding a job which will lower the enrollment rate. Our inability to

capture fully or account fully for the business cycle may lead to a spurious negative correlation between minimum wages and unemployment.[1]

4.5.3 MINIMUM WAGE

Minimum wages represent a binding wage rate in each province for which an employer can not employ any labour below this wage. Considering the frequent variation in minimum wage, with some provinces reviewing their minimum wage twice each year, the minimum wage in effect as of October 31^{st,} of each year is used in our estimation process. The minimum wage ratio is computed using the minimum wage and the average adult manufacturing wage in October of each year between 2005 and 2011. Past empirical literature has used this approach. The relative minimum wage variable is lagged by one year to account for the lags in the effects of minimum wage changes due to the inability to adjust to other forms of input quickly or because of the high cost of hiring and training (Neumark & Wascher, 1992).

4.5.4 FAMILY INCOME

We include the family income in the explanatory variable to account for the income effects on human capital development (education). Education becomes a normal good when individual income increases by making schooling more affordable to low-income earners

[1] Male youth at their prime age are more active in the labour market relative to their female counterpart who receive social benefits especially while they are nursing their children and thus have frequent breaks in their employment.

or when the discounted long-term flow of earnings is greater than the discounted flow of the present earnings. In this instance, the demand for education will increase among the low-income earners who are more interested in increasing their human capital (Mattila, 1981). Also, increases in the minimum wage (or earnings in general) could also reduce the demand for education as seen in previous studies (Neumark & Wascher, 1995b; Ehrenberg & Marcus, 1982).

4.5.5 YOUTH INITIAL ACTIVITIES

Youth enrollment-employment activities are lagged to account for individual school/work status in the previous year. This is done to understand how the initial activities and changes to minimum wage influences youth transition from their initial activities to their actual activity. This variable has been used in previous studies in the United States such as Neumark & Wascher (1995b), but our study is the second to incorporate the variable in estimating the minimum wage effect of enrollment in Canada; the first study was Campolieti et al. (2005b) who used the lagged individual enrollment-employment activities to estimate the transition between groups caused by minimum wage increases.

4.5.6 FAMILY SIZE

We include family size in the explanatory variable to see the effect family size will have on the enrollment-employment activities. The primary mechanism thought to

responsible for this effect has been referred to as the dilution effect.[2] This implies that as numbers of children increase, resources available to an individual child decrease which might affect youth enrollment-employment decisions. Resources are defined broadly to include parental time, attention, and emotional investments as well as financial assets (Blake 1989).

[2] See Blake (1989), Polit (1982), and Terhune (1974).

CHAPTER FIVE

In particular, the sample size consists of panel data on the 10 provinces in Canada for the period 2005-2011. Included in the panel data set are provincial minimum wage variables, prime-male unemployment rates, family size, family income, gender, residency, age composition of the sample size (16-19 years of age), and the enrollment-employment activities. Finally, while 16 years of age is used as the reference category for the age, while employed not schooling (ENS) is used as the as the reference category for enrollment-employment activities being estimated. Out of the 13,905 total individuals in the dataset, 27.56 percent were in schooling and employed (SE), 36.27 percent are in employed not schooling (ENS), schooling not employed (SNE) account for 30.13 percent, and the proportion of neither schooling nor employed is 6.04 percent. We use the data to estimate the effect of minimum wage increase on youth employment and enrollment, while controlling for the prime-age male unemployment rate, residence, family size, and family income for youth 16 to 19 years of age. The data include employment and enrollment status of all individuals, with the former taken from the employment status recode, the latter was taken from the major activity recorded during the survey week.

Because a unit change in the relative minimum wage implies doubling the minimum wage level, while holding the average hourly wage constant, the marginal effect computed using equation (5) should be interpreted as the effects of a 100 percent increase in the minimum wage level on the probability of an individual being in each activity *j* (SE, ENS, SNE, and NSNE). A simple and clear interpretation, then, is to divide the derivative by 10, which will thus be interpreted as the effect of a 10 percent increase in the minimum wage level on the probability of an individual being in each activity *j* (SE, ENS, SNE, and NSNE)

Table 1*:* ***Descriptive Statistics***

Variable	Mean	Standard Deviation
Minimum Wage index	0.395683	0.042096
Male Unemployment Rate (%)	6.439666	2.607685
Male	0.527607	0.499255
Rural Area	0.168776	0.374567
Family Income ($'000)	4,876.82	7,394.43
Family Size	3.991443	1.183095
Age Dummies		
[16 years]	0.3205146	0.466691
17 years	0.2605702	0.438961
18 years	0.2273296	0.419122
19 years	0.1327538	0.339320
Lagged Activity Dummies		
SNE	0.2677564	0.442811
SE	0.2985374	0.457638
[ENS]	0.4178377	0.493226
NSNE	0.0604149	0.238265

Note: *Excluded reference group are bold and in brackets.*

To understand the estimates from the multinomial logistic regression better and for easy elucidation, the multinomial logistic estimates were converted to marginal effects of the probability of an individual being in the enrollment-employment activities for an increase in minimum wage using equation (5). These are presented in Table 2.

Table 2: Marginal Effect of a Minimum Wage Increase Among Youth Aged 16-19 Year)

GROUP	SE	ENS	SNE	NSNE
MWage index	0.1604**	-0.3966**	0.3623**	-0.1261***
	[0.08]	[(0.20]	[0.20]	[0.06]
Male	0.0085	-0.0695***	0.0524**	0.0087
	[0.007]	[0.017]	[0.016]	[0.006]
Family Income	-0.0001***	0.00004***	0.6260*	0.00715***
	[0.007]	[0.016]	[0.003]	[0.079]
Unempl	0.0014	0.0028	-0.0035	-0.0007
	[0.001]	[0.003]	[0.003]	[0.001]
Mean	0.27149	0.4168	0.2969	0.05946
Observation	10,326	10,326	10,326	10,326

*Note: Robust standard errors are in parenthesis. Significance level is denoted by ***, **, * at the 1, 5, and 10 percent levels of significance, respectively.*[3]

Our estimates reported in Table 2 suggest that minimum wage increase is associated with a statistically significant increase in the probability of being in schooling and employed (SE), such that a 10 percent increase in minimum wage led to 1.6 percentage point increase in the probability of being in schooling and employed (SE). The marginal effect of a minimum wage increases on the probability of being employed not schooling (ENS) is negative as reported. Consistent with neoclassical model prediction, the minimum wage increase is associated with a statistically significant decline in the probability of being in employed not schooling (ENS). Our estimates suggest that a typical 10 percent increase in minimum wage led to a 3.96 percentage points decline in the probability of being in employed not schooling (ENS). However, there was an increase of 3.6 percent in the probability of being in schooling and employed (SNE) following a 10 percent increase in

[3] We report robust standard error because the sample weight given with the Survey of Labour and Income Dynamic data set were used throughout the regression.

minimum wage. Both coefficients are statistically significant at 5 percent and 10 percent significance levels, respectively.

The fourth column in Table 2 indicates that minimum wage increase reduced the probability of being in neither schooling nor employed (NSNE), suggesting that a 10 percent increase in minimum wage is associated with a statistically significant decrease of 1.3 percentage points in the probability of being in neither schooling nor employed (NSNE). The result is consistent with Morissette et al. (2015) findings that wage increase reduces the proportion of youth in neither schooling nor employed (NSNE), as many were re-enter the labour market after a long time of absence.

In the fifth row of Table 2, we provide the elasticity estimates for each enrollment-employment activity. For the probability of being in schooling and employed (SE), the elasticity of 0.0023 implies that the effect of a 10 percent increase in minimum wage is to increase the proportion of schooling and employed (SE) by 0.023 percent, a 0.048 percent increase in the proportion of schooling not employed (SNE), a decrease of -0.044 percent in the proportion of employed not schooling (ENS), and a decrease of -0.088 percent in the proportion of neither schooling nor employed (NSNE).[4]

In relation to other variables, the adult male unemployment rate is estimated to have a positive, but statistically insignificant, effect on schooling and employed (SE) and

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4 Since the estimated marginal effect with respect to minimum wage for SE is 0.16, the mean of the minimum wage variable is 0.39, overall proportion of the sample in the SE category is 27.56, the relevant elasticity is 0.0023 [{0.16/27.56}/ {1/0.39}]. Thus, the effect of a 10 percent increase in minimum wage is to increase the proportion of SE by 0.023 percent. Similar calculation applies to the elasticity of other enrollment-employment activities.

employed not schooling (ENS). Earnings were estimated to have positive and statistically significant effect on both enrollment and employment. However, despite the quantitative insignificant effect on employment, the positive effect on schooling not employed (SNE) is substantial as a 10 percent rise in wage led to 6.26 percent increase in family income thereby increasing school enrollment, while the estimate also reflects a positive effect of earnings on enrollment and employment.

An increase in minimum wages could have both substitution and income effects. An increase in minimum wages could increase enrollment if it makes schooling more affordable (income effect) to those affected by the wage increase. Also, enrollment could rise if the discounted value of future inflow becomes greater than the present discounted value of the inflow of earnings. However, higher minimum wage rate reduces the quantity demanded for low-skilled labour shifting the demand towards high skilled labour. If high-skilled youth are enrolled and view schooling as perfect substitute to working, the increase in the quantity of labour demanded will result in a decline in enrollment as the high-skilled youth quits schooling for work (substitution effect). In addition, the high-skilled labour will displace some low-skilled labour, mitigating the overall employment loss associated with the minimum wage increase. The coefficient for earnings indicate that schooling not employed (SNE) rises by 6.26 percent as minimum wage rises suggesting that enrollment and family income have a positive relationship. The male dummy variable is statistically significant at the 1 percent level of significance for enrollment (SNE) and employment (ENS). This result indicates that male youth respond more to minimum wage and are more likely to transits between the employment-enrollment activities relative to female youths.

5.1 ENROLLMENT-EMPLOYMENT STATUS RECODE

Following similar approach to the one used by Neumark & Wascher (1995b), we divide individuals in our sample size into three major categories using youth employment status during the survey week as: (1) Employed (E = SE + ENS), (2) Schooling not Employed (SNE), and (3) Neither Schooling nor Employed (NSNE). So, we use a narrower definition of enrollment. Hence, we observed all individuals who indicate "working" as their major activity as employed despite their school commitment. This step is taken to understand if the reduced form of employment equation (i.e., E = SE + ENS) will mask a significant shift in enrollment rates as minimum wage rises. The result of our multinomial logistic estimates based on status recode for the reduced form is consistent with the estimates where youth are grouped into four enrollment-employment categories (SE, SNE, ENS, and NSNE). To better understand this result, we converted the coefficients of the multinomial logistic estimates into marginal effects of the probability of an individual being in any of the three enrollment-employment activities. These are presented in Table 3.

Table 3: Marginal Effect of a Minimum Wage Increase Among Youth Aged 16-19 Years

GROUP	E	SNE	NSNE
MWage index	-0.2851***	0.6269***	-0.3418***
	[0.079]	[0.011]	[0.078]
Male	0.0088	-0.0217**	0.0129**
	[0.007]	[0.010]	[0.008]
Family Income	0.00960***	-0.0000***	0.00701***
	[0.000]	[0.000]	[0.000]
Unempl	-0.0035**	0.0016	0.00194
	[0.002]	[0.002]	[0.001]
Mean	0.11363	0.83894	0.04743
Observations	10,461	10,461	10,461

Note: Standard errors are in parenthesis. Significance level is denoted by ***, **, * at the 1%, 5%, and 10% significance levels, respectively.

Our estimates suggest that a minimum wage increase is associated with a statistically significant increase in the probability of schooling not employed (SNE), such that a 10 percent increase in minimum wage led to a 6.3 percentage point increase in the probability of being in schooling not employed (SNE).

Our results indicate that an increase in the minimum wage reduces the proportion of youth in employment in both approaches with the sum of the minimum wage coefficient statistically significant at the 1 percent levels of significance and both negative. This is consistent with past empirical studies (e.g., Matilla, 1981) where minimum wage increases induce youth to increase their educational investment as the disemployment effect increases. Typically, Matilla (1981) found that minimum wage creates barriers to employment and hence, conclude that a minimum wage increase has a positive relationship with school enrollment. Mattila's conclusion is well reflected in our results with the marginal effect of employed suggesting that minimum wage increase led to a 0.285 decline in a youth employment. This result implies that a 10 percent increase in minimum wage that occurred between 2005 and 2011 led to a decline of 2.9 percentage points in the probability of being in employed (E).

As our estimate suggests in the last column of Table 3, an increase in minimum wage increase is associated with a statistically significant decline in the probability of being neither schooling nor enrolled (NSNE) such that a 10 percent minimum wage increase led to a 3.4 percentage point fall in the probability of being in neither schooling nor employed (NSNE).

From these results, it is evident that the disemployment effect of minimum wage was absorbed by enrollment. In other words, those displaced from work enrolled back in

school being their best alternative. This is reflected in the positive coefficient of schooling not employed (SNE), while some of those who were initially neither schooling nor employed (NSNE) might also enrolled after unsuccessful attempt in securing employment following the minimum wage increase which induced them to re-enter the labour market. Hence, the positive effect of enrollment outweighs the disemployment effect of minimum wage increase on youth.

Our estimates suggests that the major primary objective of minimum wage increase is to reduce the proportion of employed youth as well as the proportion of neither schooling not employed (NSNE) and increase the proportion of enrolled youth (E). Consistent with Campoleiti et al. (2005) which also found positive coefficient for school enrollment following minimum wage increases. Our estimates find positive relationship between minimum wage increase and school enrollment. Though, the magnitude of our estimates is larger relative to the coefficient found by Campolieti et al. (2005). However, while, we found that minimum wage reduces the proportion of youth in neither enrolled nor schooling (NSNE), Campoleiti et al. (2005) found the minimum wage to be statistically insignificant on this group of youth.

Consistent with the estimates reported earlier in Table 2, the effect of the minimum wage increase is similar under the reduced equation form in Table 3 such that an increase leads to a decline in the proportion of employed youth (ENS), while the proportion of enrolled youth (SNE) rises. However, the estimates in both equations show a decline in the proportion of youth neither schooling nor employed (NSNE) consistent with Morissette et al. (2015). These results affirmed that the primary motive of minimum wage increase is reducing the proportion of employed youth either in full-time or part-time employment.

5.2 NET ENROLLMENT-EMPLOYMENT OUTCOME

In estimating the overall effect of minimum wage increase on school enrollment and employment in Canada between 2005 and 2011, we computed the overall net enrollment and employment using each enrollment-employment activity elasticity provided in the fifth row of Table 2. Following the approach used by Neumark & Wascher (1995b), we computed net school enrollment effects as the sum of elasticity for the enrollment-employment activity in which the individual is enrolled (net enrollment = SE + SNE), and net employment effects as the sum of the elasticity for the enrollment-employment in which the individual is employed (net employment = ENS + SE). This is presented in Table 4.

Table 2: Net Enrollment-Employment Outcome

	SE	ENS	SNE	NET
Net Enrollment (SNE + SE)	0.0023		0.0048	0.0078
Net Employment (ENS + SE)	0.0023	-0.0044		-0.0021

The net enrollment of 0.0078 indicates an increase in school enrollment as minimum wage increases. Hence, a typical 10 percent minimum wage increase that occurred over the period of 2005-2011 is associated with a 0.078 increase in enrollment. This increase in enrollment is statistical significant but quantitively insignificant. This result is consistent with Campoleiti et al. (2005b) who found a 10 percent minimum wage increase on net enrollment to be statistically significant, but quantitatively insignificant.

The net employment elasticity of -0.0021 indicates that a 10 percent increase in minimum wage is associated with 0.021 percent decline in youth employment. Our estimates suggest that, overall, there is a decline in employment following minimum wage increase between 2005 and 2011, although, the coefficient is quantitatively insignificant.

Using microdata, our estimates are consistent with past empirical studies such as Campolieti et al. (2005b) in Canada and Card (1992), Card & Krueger (1992) in the United States.

5.3 IMPACTS ON ENROLLMENT-EMPLOYMENT TRANSITIONS

We have over time estimated and analysed the impact of a minimum wage increase on the probability of being in any of the four enrollment-employment activities (SE, ENS, SNE, and NSNE). These probabilities are the results of various flows across the four enrollment-employment states. It is imperative for an in-depth understanding to analyse youth transition between enrollment-employment activities conditional on their initial activity (SE_1, ENS_1, SNE_1, and NSNE_1). For instance, the extent to which minimum wage increases induce a substitution between enrolled youth and those not in school, and the extent to which youth are induced to dropout out of school to queue for jobs at a higher minimum wage. Hence, we estimate the effect of an increase in minimum wage on the probability of youth transitioning from their initial enrollment-employment activity to their actual activity.

Following Neumark & Wascher (1995b), this process allows an understanding of the ways through which changes in the probabilities of being in the enrollment-employment activities are affected by changes to minimum wage. Using this approach, we estimate the transition of youth as well as test the validity of the substitution and queuing hypotheses proposed in Neumark & Wascher (1995b).

We can estimate the transition of youth from employed not schooling (ENS) to schooling not employed (SNE), transition to employed not schooling (ENS) from neither schooling nor employed (NSNE), a transition from schooling and employed (SE) to neither schooling nor employed (NSNE), and so on. The derivatives of switching from one enrollment-employment activity to another activity dependent on initial activity are estimated using equation (5). Hence, we code the lagged activity dummy variable for the initial enrollment-employment activity being equal to 1 and set the others to zero. This approach will yield 16 possible transition outcomes with option to remain in the initial activity.

Table 3: Schematic of Transition Possibilities

ENROLLMENT-EMPLOYMENT POSSIBLE TRANSITION				
	Initial Activity			
Final Activity	**SE**	**ENS**	**SNE**	**NSNE**
SE	SE SE	ENS SE	SNE SE	NSNE SE
ENS	SE ENS	ENS ENS	SNE ENS	NSNE ENS
SNE	SE SNE	ENS SNE	SNE SNE	NSNE SNE
NSNE	SE NSNE	ENS NSNE	SNE NSNE	NSNE NSNE

Table 5 shows the possible transitions from one initial activity to actual activity for an individual with the option of remaining in the initial activity (the diagonal). The marginal effect of the sixteen possible schematic transition outcomes will provide a validity test for the hypotheses by Neumark & Wascher (1995b).

The substitution hypothesis is expected to cause transitions between some enrollment-employment activities if firms substitute low-quality youth not in school for

enrolled high-quality youth. The minimum wage increase will induce high-quality youth to quit schooling for employment. Hence, youth initially in schooling not employed (SNE) or schooling and employed (SE) are more likely to be affected. An increase in minimum wage will induce high-quality youth in schooling not employed (SNE) to drop out of school to become employed not schooling (ENS). Also, youth initially in schooling and employed (SE) might increase their labour supply to become employed not schooling (ENS) if they can secure full-time employment positions or they could become neither enrolled nor schooling (NSNE) if they are unsuccessful in finding full-time jobs. In other words, the substitution hypothesis proposed negative and positive probabilities for (SNE) and (ENS), respectively. The probability of schooling and employed (SE) is also expected to be negative. Furthermore, youth initially in employed not schooling (ENS) might end up in neither enrolled nor schooling (NSNE) if they are displaced by high-skilled youth from schooling not employed (SNE) and schooling and employed (SE). Hence, the predicted probability for employed not schooling (ENS) and neither schooling nor employed (NSNE) are negative and positive, respectively. Finally, youth initially in neither schooling nor employed (NSNE) are not expected to leave their initial activity, indicating an ineffective and insignificant effect of minimum wage increase on the group. It is rational to affirm that the substitution hypothesis is only plausible in a scenario where enrolled youth are classified as high quality.

The queuing hypothesis predicts that an increase in minimum wage will induce a transition from schooling not employed (SNE) to neither schooling nor employed (NSNE), and from schooling and employed (SE) to neither schooling nor employed (NSNE). The first group, being enrolled youth who choose to quit schooling to queue for employment,

either full-time (ENS) or part-time (SE) at higher minimum wage. Those who are unsuccessful in finding a job end up in neither schooling nor employed (NSNE), while they continue to search for employment. The queuing hypothesis predicts a positive probability for neither schooling nor enrolled (NSNE) and a negative probability for schooling not employed (SNE). The second group is made up of youth in schooling and employed (SE), who following minimum wage increase decides to increase their supply of labour by quitting school to take up full-time employment position or those displaced by highly skilled youth from schooling not employed (SNE). Hence, the transition probability is positive for neither schooling nor employed (NSNE) while it is negative for schooling and employed (SE).

The marginal effect of the transition probabilities are presented in Table 6.

Table 4: Minimum Wage Effects on Transition Probabilities

	Initial Enrollment-Employment State			
Final Activity	**SE_1 (i)**	**SNE_1 (ii)**	**ENS_1 (iii)**	**NSNE_1 (iv)**
SE	0.17***	0.15**	0.16**	0.12*
	(0.08)	(0.77)	(0.08)	(0.06)
SNE	0.35**	0.38*	0.36*	0.44***
	(0.20)	(0.20)	(0.20)	(0.20)
ENS	-0.40**	-0.38**	-0.40**	-0.25
	(0.20)	(0.20)	(0.19)	(0.21)
NSNE	-0.12***	-0.15**	-0.12**	-0.31**
	(0.06)	(0.08)	(0.06)	(0.18)

Note: Standard errors are in parenthesis. Significance level is denoted by ***, **, * at the 1, 5, 10 percent significance levels, respectively.

Notable in Table 6 is the negative (reduced) probability of being in employed not schooling (ENS) and neither enrolled nor employed (NSNE) across all initial activities for the period 2005 to 2011. These negative probabilities affirm the neoclassical model's

disemployment prediction of minimum wage increase. Also, the minimum wage induces youth who are neither enrolled nor employed (NSNE) to enter the labour market consistent with the result obtained by Morrisette et al. (2015). In their study, they found that higher wage reconnects youth with the labour market after a long time of absence.

From the first column of Table 6, youth who are initially in schooling and employed (SE) are more likely to remain in their initial position because of the disemployment effect on full-time position (ENS) following the wage increase. Our estimate is contrary to that of Ehrenberg & Marcus (1982) who found that white teenagers from low-income families are expected to quit school to work full-time following an increase in minimum wage. However, our estimates suggest that youth initially in schooling and employed (SE) prefer to remain in their initial position because full-time positions are difficult to obtain consistent with Campolieti et al. (2014). Enrolled youth initially in schooling and employed (SE) are less likely to become employed not schooling (ENS), but the probability of becoming schooling not employed (SNE) is high at 0.35. This is because those displaced from their part-time positions will enroll back in fully in school as it is their best alternative.

In the second column of Table 6, our estimates suggest that the probability of becoming employed not schooling (ENS) dropped significantly at -0.38 for youth initially in schooling not employed (SNE_1). The result shows that displaced youth will combine employment with schooling (SE) subject to availability. This result is contrary to the findings of Neumark & Wascher (1995b) that youth often drop out of school to queue for higher minimum wage jobs. It is very reasonable to think that youth will weigh the possibility of finding a job before quitting school as the only alternative to schooling is working. Hence, with the disemployment effect more severe on full-time employment

position, as employers strive to cut costs, youth considering quitting school will remain in school, or, at least, look to combine schooling with employment (SE). This result does not support the queuing hypothesis in Neumark & Wascher (1995b).

In the third Column of Table 6, we report the estimates for youth initially in employed not schooling (ENS_1). Our results indicate a significant and substantial decline in the probability of remaining in the same position and an increase in the probability of transition to schooling not employed (SNE). Our estimate suggests that displaced youth increase their demand for education. However, the positive and statistically significant effect of schooling and employed (SNE) indicates that some youth who are initially working full-time but are displaced or those whose family income increased might transit to schooling and employed (SE) if they can secure part-time position. Lastly, the negative and significant effect of neither schooling nor employed (NSNE) suggest that youth displaced from employed not schooling (ENS) do not transition to neither schooling nor employed (NSNE) to queue for employment, but will rather return to full-time schooling (SNE) being the best alternative, or combine schooling with employment (SE).

In the last column of Table 6, we report the marginal effect of transition for youth initially in neither schooling nor employed (NSNE). The probability of youth remaining in this enrollment-employment activity is reduced significantly. Our estimates suggest that youth are induced out of neither schooling nor employed (NSNE) to schooling not employed (SNE). Considering the disemployment effect on employed not schooling (ENS), youth from neither schooling nor employed will enrol in school to increase their human capital to increase their chances of future employability. The positive and significant of schooling and employed (SE) coefficient indicate that youth exiting neither schooling nor

employed (NSNE) and employed not schooling (ENS) will work part-time while schooling if they can find a job at the higher wage rate. This result is consistent with Morissette et al. (2015) who found that the proportion of youth in neither schooling nor employed (NSNE) declined following an increase in wage as many re-enters the labour market. They assert that the hike in wages was instrumental in reuniting with the labour market those who have lost connection with it for a long time.

It is plausible to think that youth will confirm their employment opportunities before opting out of school as minimum wage increases since schooling and working are the two best alternatives available to an average youth below the age of 19. Hence, youth weigh the costs and benefits of schooling and working before making their choice. An increase in the earnings of low-skilled labour caused by a minimum wage increase will cause both enrolled and non-enrolled youth to alter their schooling and employment decisions. This does not imply that all youth who quit schooling or are attracted to the labour market after a long time of absence will successfully find a job. Also, some youth as indicated by our estimation will prefer to combine schooling with employment (SE).

However, considering the severe disemployment effect on full-time employment position (ENS), those displaced from their jobs including those newly attracted into the labour market but who could not successfully find a job at the higher wage rate will reasonably enrol in school because it is their best alternative. Furthermore, an increase in minimum wage might increase their and/or their family's income, thereby making education affordable to them. If this could increase the discounted inflow of future earnings relative to discounted inflow of present earnings (working), those displaced will enrol back

in school to gain more years of education and skills, increase their productivity, and boost their chances for future employability.

Youth who are initially in neither schooling nor employed (NSNE) are believed to be engaged in some form of activity. However, an increase in the minimum wage will induce them to re-enter the labour market, while their inability to secure a job because of the disemployment effect on full-time employment positions will force them to transit to schooling not employed (SNE) being their best alternative.

5.4 COMPARISONS TO CONVENTIONAL MINIMUM WAGE ELASTICITIES

The benefits of higher minimum wages come from the higher wage for affected workers, some whom are in poor or low-income families. A potential downside is that a higher minimum wage may lower firms' quantity demanded for low-wage, low-skilled workers that the minimum wage policy is intended to help. Research findings are not unanimous, but evidence from many countries suggest that minimum wage reduce employment opportunities for low-skilled workers. However, using the PUMF version of SLID between 2005 and 2011, this study finds several similarities and identical implications for minimum wage on employment and enrollment compared to the ones in the past empirical studies conducted in Canada, New Zealand, and the United States. Our estimates for both net employment and enrollment are similar to past empirical studies in some ways. The positive net employment estimated is identical to the positive, but insignificant effect of minimum wage increase found by Card (1992) and Card & Krueger (1994).

The negative net employment reflects the impact of a higher minimum wage on youth. Though, our marginal effect estimate found a disemployment effect caused by the increase in minimum wage and a corresponding increase in school enrollment. However, the elasticity of both the enrollment and employment are quantitatively insignificant. We refuted Neumark & Wascher (1995b) substitution and queuing hypotheses in our analyses, as we find no evidence to support the hypotheses. Our transition estimates conditional on initial activities suggest that there is no substitution among youth as minimum wages increase. Our results indicate that youth who are initially enrolled full-time (SNE) prefer to remain enrolled or alter their schooling-employment decision by transiting to schooling and employed (SE) at the very least, while youth initially in schooling and employed (SE) prefer to remain the same activity or enrol full time (SNE) if they are displaced.

Evidence from our estimates indicate that youth displaced from employed not schooling (ENS) enrol back in school rather than being idle (NSNE), while youth initially in neither schooling nor employed (NSNE_1) are also induced to increase their human capital investment after an unsuccessful attempt to secure employment at the higher wage rate or because the higher wage rate increased their family income making schooling affordable. Hence, these results contradict both the queuing and substitution hypotheses as predicted by Neumark & Wascher (1995b). Furthermore, we find no evidence to support that youth drop out of school to work, as the estimates for both schooling and employed (SE) and schooling not employed (SNE) are positive. This affirms that enrolled youth prefer to remain in their initial position following minimum wage increases. It is plausible to think that youth weigh the benefit of schooling and working before choosing which enrollment-employment activity to transition to. Also, youth considering quitting school

will secure a job before doing so since the best alternative to schooling is working, and vice versa. In addition, our results are consistent with Mattila's (1981) findings that higher in minimum wage creates disemployment effects which helps enrollment to increase.

Ehrenberg & Marcus (1982) disaggregated their dataset into race (black and white), and found that minimum wage increase has postulated effects for white males and females. That is, higher minimum wage induces some youth from low-income families to switch from schooling and employed (SE) to schooling not employed (SNE). The authors, however, found that non-white youth, especially males from low-income families, reduce their educational investment by transiting from schooling not employed (SNE) to employed not schooling (ENS). Also, Brown (1982) affirmed the disemployment effect of minimum wage but added that displaced youth often return to school to increase their productivity. Consistent with Campolieiti et al. (2005b) in Canada and Card (1992) and Card & Krueger (1994) in the United States, we found insignificant negative effect of minimum wage on net employment between 2005 and 2011.

In Canada, our estimates are consistent and share similarities with some past empirical studies emphasising the disemployment effect of minimum wage among youth. For instance, our estimated positive effect on school enrollment is consistent with Campolieti et al. (2005b) which found positive but insignificant effects of minimum wage increases on school enrollment between 1993 and 1999. According to the authors, a 10 percent increase in minimum wage led to 1.5 percent increase in school enrollment, while our estimate suggests a 10 percent increase in minimum wage is associated with a 0.078 percent increase in enrollment, both coefficients are quantitatively insignificant. Campoleiti et al. (2005a) used "at-risk" methodology and found disemployment elasticities

in the range of 0.2 to 0.4 and similar to those found by Currie & Fallick (1996). Yuen (2003) found disemployment effects of 1.5 percent for a 10 percent increase in minimum wage using individual data. However, our estimates reveal that, although there does exist a disemployment effect of -0.40 percent, the net employment effect is negative and insignificant at 0.021. While we adopted micro-data and found a disemployment effect of -0.40, Baker et al. (1999) used aggregate data and found disemployment among youth in the range of -0.22 and -0.30 between 1975 and 1993. Campoleiti et al. (2005b) used the SLID Master file with limited variables between 1993 and 1999. They found disemployment effect of -2.49 percent and a 1.5 percent increase in enrollment. Using a more recent dataset from PUMF SLID and more variables capable of influencing the school/work decision of youth, we found statistically significant disemployment effect of minimum wage increase as well as increase in school enrollment among Canadian youth aged 16-19 years between 2005 and 2011.

CHAPTER SIX

6.1 SUMMARY OF FINDINGS

The main objective of this thesis is to analyse how changes to minimum wage affect youth employment and school enrollment among youth in Canada. To study the relationship between minimum wage, enrollment, and employment, we have broadened the analysis of the effect of minimum wage increases using a multinomial logit model of alternative enrollment-employment outcome. Using data from the Public Use Micro-data file of the Survey of Labour and Income Dynamics (SLID), the main finding of this study indicates that there exists a negative relationship between minimum wage increases and employment affirming the neoclassical model hypothesis that higher minimum wage lead employers to lower quantity demanded for labour. However, despite the disemployment effect, there exist a strong positive relationship between minimum wage increases and school enrollment.

Having relied on the substantial variation in minimum wages across Canadian provinces between 2005 and 2011 in estimating youth's probability of being in one of the four enrollment-employment activities and transiting between the enrollment-employment activities conditional on initial activity. Our estimates, produce some important conclusions which are summarised below:

1. The increase in minimum wage is negatively correlated with employment as predicted by the neoclassical model. In other words, higher minimum wages reduce employer's quantity demanded for low-skilled workers as affirmed by the neoclassical model. In addition, we found that increase in minimum wage rate is

positively correlated with school enrollment, which is consistent with Mattila (1981), Brown (1999), and Landon (1997).

2. Our transition estimates suggest that an increase in the minimum wage reduces the probability of youth being in employed not schooling (ENS) and neither schooling nor employed (NSNE). The results further indicate higher minimum wages reduce employment opportunities for youth in (ENS) while the probability of youth increasing their investment in human capital (SNE and SE) increases.
3. The negative and statistical significant estimates of neither schooling nor employed (NSNE) implies that youth displaced from employed not schooling (ENS) as minimum wage rises transition to full-time school (SNE or SE) rather than staying in neither schooling nor employed (NSNE).
4. Evidence from our estimates suggests that increasing minimum wage is positively related to increases in school enrollment among youth for the period 2005–2011. Our marginal effects and transition estimates indicate transition from employed not schooling (ENS) and neither schooling nor employed (NSNE) to full-time schooling (SNE), while schooling and employed (SE) also increased.

Our estimates refute the substitution and queuing hypotheses proposed by Neumark & Wascher (1995b) as we find no evidence to support these. Overall, we find that the positive effect of higher minimum wages on enrollment outweighs the negative effect on employment. Also, we are aware that there is in place compulsory school legislation in different provinces which prevents youth from dropping out of school before a certain age. These ages are not the same across Canadian provinces. However, we could not incorporate this variable into our study due to lack of data.

6.2 CONCLUSION AND POLICY IMPLICATIONS

Our findings add to the growing body of empirical debate and provide more evidence on the effects of minimum wages on employment and school enrollment in Canada. In this study, we took advantage of the variations in minimum wages across Canada over time to estimate the relationship between minimum wage, employment, and school enrollment. Hence, the statistical inferences from this study affirm that the effect of higher minimum wage is not the same in all countries but largely depends on region, the methodology adopted, and period of study. Statistical evidence presented in this study based on a panel data of youth (16-19 years old) in Canada affirmed the neoclassical model prediction. Most importantly, we found evidence to support that increasing minimum wage is positively related to increase in school enrollment among youth in our estimates and transition estimates for the period 2005–2011. We found that youth displaced from their jobs, rather than being idle, choose to increase their human capital accumulation by transitioning to schooling not employed (SNE) or schooling and employed (SE).

Understandably, each province in Canada reviews its minimum wage yearly while some do so twice a year (e.g., Manitoba, British Columbia, Nova Scotia, and Newfoundland all reviewed their minimum wages twice in 2009). We, however, took advantage of this variation and found that although higher minimum wages have neoclassical model predicted disemployment effects for youth, the net effect is positive and quantitatively insignificant as the net enrollment outweighs the negative employment effect. Thus, considering the recent government policy of increasing minimum wages – especially the Alberta and Ontario governments' policies to increase minimum wage to a record high of $15 an hour by 2018 and 2019, respectively, it is our prediction from our estimates that the

policy is bound to create adverse effect on employment but school enrollment will increase among youth between the age of 16 and 19 years.

It is imperative that the government know the negative implications of minimum wage effects on youth employment. Having emphasised successful school to work transition in recent times, policy makers should be more interested in designing a policy that will mitigate or reduce the disemployment effect of minimum wage increase during these periods. This is necessary as the adverse effect of minimum wage increases is more severe on the very group of people it is meant to help.

The effect of the increase on youth human capital development and employment should be evaluated against other major goals of minimum wage legislation when considering its increase. Evidence from United States and New Zealand suggests that raising the school leaving age is an effective policy instrument for ensuring that youth remain in school up to certain age before having the legal option to quit.

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APPENDICES

Table 7: Multinomial Logistic Estimates for Youth 16-19 Years of Age

Variable	Coeff.	Std. Error	Z	Pvalue
Schooling and Employed				
MWAGE INDEX	2.49546	0.9755607	2.56	0.011
UNEMPL	0.0077046	0.0171637	0.45	0.654
MALE	0.2375302	0.0842163	2.82	0.005
RURAL	0.08634	0.1002736	0.86	0.389
FAMILY INC	-0.0006254	0.0000544	-11.50	0.000
FAMILY SIZE	0.0441658	0.0359954	1.23	0.220
A17YRS	-0.2396494	0.1026968	-2.33	0.020
A18YRS	-0.1945621	0.1047938	-1.86	0.063
A19YRS	-0.2943779	0.1428239	-2.06	0.039
SNE	0.3744510	0.3054887	1.23	0.220
SE	0.4347493	0.3043522	1.43	0.153
ENS	0.4731923	0.3033756	1.56	0.119
Cons	-0.3466827	0.5068009	-0.68	0.494
Schooling not Employed				
MWAGE INDEX	1.775757	0.8992837	1.97	0.048
UNEMPL	-0.0149485	0.015396	-0.97	0.332
MALE	0.2834001	0.0751434	3.77	0.000
RURAL	0.2262926	0.0889495	2.54	0.011
FAMILY INC	-0.00007	7.48e-06	-9.35	0.000
FAMILY SIZE	0.0082578	0.0321477	0.26	0.797
A17YRS	0.0574287	0.0934839	0.61	0.539
A18YRS	0.0036006	0.0965087	0.04	0.970
A19YRS	-0.1528011	0.1197942	-1.28	0.202
SNE	0.0583613	0.2727299	0.21	0.831
SE	-0.0083386	0.2720505	-0.03	0.976
ENS	0.0821779	0.2699804	0.30	0.761
Cons	-.6924051	0.4631426	-1.50	0.135
Neither Schooling nor Employed				
MWAGE INDEX	-1.933173	1.515961	-1.28	0.202
UNEMPL	-.0218334	0.0278299	-0.78	0.433
MALE	0.3436956	0.1358164	2.53	0.011
RURAL	0.5534933	0.1594671	3.47	0.001
FAMILY INC	0.0000725	7.12e-06	10.17	0.000
FAMILY SIZE	-.0568524	0.0583232	-0.97	0.330
A17YRS	-1.242062	0.2530842	-4.91	0.000
A18YRS	-.0187828	0.1748887	-0.11	0.914
A19YRS	0.3543787	0.1639464	2.16	0.031
SNE	-0.8494535	0.4034172	-2.11	0.035
SE	-1.14677	0.404973	-2.83	0.005
ENS	-1.113172	0.3993198	-2.79	0.005
Cons	-0.4764565	0.720982	-0.66	0.509
Number of Observation				*10,326*

Wald chi2(36)	*430.33*
Prob > chi2	*0.0000*
Log pseudolikelihood	*-5324463.3*
Pseudo R2	*0.1828*

Note: Employed and not in schooling (ENS) is the base category.

Table 8: Marginal Effect Estimates for Youth in Schooling and Employed (SE)

Variable	dy/dx	Std. Err.	Z	P>|z|	X
MWAGE INDEX	0.160405	0.08074	1.99	0.047	0.397704
UNEMPL	0.0013591	0.00138	0.99	0.323	6.32652
MALE*	0.0085166	0.00667	1.28	0.202	0.537781
RURAL*	-0.0043311	0.0078	-0.56	0.579	0.09995
FAMILY INC	-0.0000529	0.00712	-15.42	0.000	4532.39
FAMILY SIZE	0.0038392	0.00288	1.33	0.183	4.11523
A17YRS*	-0.0183072	0.00764	-2.40	0.017	0.235596
A18YRS*	-0.016616	0.0079	-2.10	0.035	0.248893
A19YRS*	-0.0206839	0.01047	-1.98	0.048	0.164958
SNE*	0.0365279	0.02724	1.34	0.180	0.26732
SE*	0.0465942	0.02778	1.68	0.094	0.294775
ENS*	0. 044677	0.02518	1.77	0.076	0.42283

(*) dy/dx is for discrete change of dummy variable from 0 to 1

Table 9: Marginal Effect Estimates for Youth in Schooling Not Employed (SNE)

Variable	dy/dx	Std. Err.	Z	P>|z|	X
MWAGE INDEX	0.3623042	0.19841	1.83	0.068	0.397704
UNEMPL	-0.0034843	0.00335	-1.04	0.298	6.32652
MALE*	0.0523572	0.01638	3.20	0.001	0.537781
RURAL*	0.0390341	0.01988	1.96	0.050	0.09995
FAMILY INC	0.626000	0.01620	2.37	0.018	4532.39
FAMILY SIZE	0.0012752	0.00703	0.18	0.856	4.11523
A17YRS*	0.0403173	0.02098	1.92	0.055	0.235596
A18YRS*	0.008475	0.02127	0.40	0.690	0.248893
A19YRS*	-0.032942	0.02567	-1.28	0.199	0.164958
SNE*	0.0108684	0.05808	0.19	0.852	0.26732
SE*	-0.0034761	0.05749	-0.06	0.952	0.294775
ENS*	0.0195824	0.05716	0.34	0.732	0.422838

(*) dy/dx is for discrete change of dummy variable from 0 to 1

Table 10: Marginal effect Estimates for youth Employed Not Schooling (ENS)

Variable	dy/dx	Std. Err.	Z	P>|z|	X
MWAGE INDEX	-0.3966156	0.19777	-2.01	0.045	0.397704
UNEMPL	0.0028331	0.00345	0.82	0.411	6.32652
MALE*	-0.0695329	0.01669	-4.17	0.000	0.537781
RURAL*	-0.0574097	0.01935	-2.97	0.003	0.09995
FAMILY INC	0.0000395	0.00302	19.60	0.000	4532.39
FAMILY SIZE	-0.0023212	0.00715	-0.32	0.746	4.11523
A17YRS*	0.019593	0.0212	0.92	0.355	0.235596
A18YRS*	0.00819	0.02157	0.38	0.704	0.248893
A19YRS*	0.0315846	0.02657	1.19	0.235	0.164958
SNE*	-0.0141082	0.06172	-0.23	0.819	0.26732
SE*	-0.0002393	0.06167	-0.00	0.99	0.294775
ENS*	-0.014771	0.0612	-0.24	0.809	0.422838

(*) dy/dx is for discrete change of dummy variable from 0 to 1

Table 11: Marginal Effect Estimates for Youth in Neither Schooling Nor Employed (NSNE*)*

Variable	dy/dx	Std. Err.	Z	P>|z|	X
MWAGE INDEX	-0.1260936	0.06219	-2.03	0.043	0.397704
UNEMPL	-0.000708	0.00116	-0.61	0.542	6.32652
MALE*	0.0086591	0.00567	1.53	0.127	0.537781
RURAL*	0.0227067	0.00914	2.49	0.013	0.09995
FAMILY INC	7.14e-06	0.07910	12.97	0.000	4532.39
FAMILY SIZE	-0.0027933	0.00243	-1.15	0.250	4.11523
A17YRS*	-0.0416031	0.00589	-7.07	0.000	0.235596
A18YRS*	-0.0000489	0.00729	-0.01	0.995	0.248893
A19YRS*	0.0220414	0.00882	2.50	0.012	0.164958
SNE*	-0.0332881	0.01150	-2.89	0.004	0.26732
SE*	-0.0428788	0.01151	-3.72	0.000	0.294775
ENS*	-0.0494883	0.01522	-3.25	0.001	0.422838

(*) dy/dx is for discrete change of dummy variable from 0 to 1

MULTINOMIAL LOGISTIC REGRESSION
ELASTICITIES ESTIMATION

Table 12*:* **Elasticity Estimates for Youth in Schooling and Employed (SE)**

Variable	ey/ex	Std. Err.	Z	P>|z|	X
MWAGE INDEX	0.6501806	0.31355	2.07	0.038	0.397704
UNEMPL	0.0876365	0.08573	1.02	0.307	6.32652
MALE	0.0465251	0.03609	1.29	0.197	0.53778
RURAL	-0.0036684	0.00804	-0.46	0.648	0.09995
FAMILY INC	-2.445543	0.26371	-9.27	0.000	4532.39
FAMILY SIZE	0.1610249	0.11895	1.35	0.1760	4.11523
A17YRS	-0.0430702	0.01945	-2.21	0.027	0.235590
A18YRS	-0.0438176	0.02088	-2.10	0.036	0.24889
A19YRS	-0.0364547	0.01903	-1.92	0.055	0.164958
SNE	0.0943489	0.06342	1.49	0.137	0.26732
SE	0.1318092	0.06963	1.89	0.058	0.294775
ENS	0.1879393	0.09961	1.89	0.059	0.42283

Table 13: **Elasticity Estimates for Youth In Schooling Not Employed (SNE)**

Variable	ey/ex	Std. Err.	Z	P>|z|	X
MWAGE INDEX	0.3639519	0.1988	1.83	0.067	0.397704
UNEMPL	-0.055679	0.05363	-1.04	0.299	6.32652
MALE	0.0711931	0.02227	3.20	0.001	0.537781
RURAL	0.0103198	0.00497	2.08	0.038	0.09995
FAMILY INC	0.0716264	0.03128	2.29	0.022	4532.39
FAMILY SIZE	0.0132554	0.07303	0.18	0.856	4.11523
A17YRS	0.0269203	0.01231	2.19	0.029	0.235596
A18YRS	0.0055037	0.01327	0.41	0.678	0.248893
A19YRS	-0.0131005	0.0109	-1.20	0.229	0.164958
SNE	0.0098519	0.0392	0.25	0.802	0.26732
SE	0.001198	0.04311	0.03	0.978	0.294775
ENS	0.0226034	0.06134	0.37	0.713	0.422838

Table 14: Elasticity Estimates for Youth in Employed Not Schooling (ENS)

Variable	ey/ex	Std. Err.	Z	P>|z|	X
MWAGE INDEX	-0.3422743	0.17102	-2.00	0.045	0.397704
UNEMPL	0.0388932	0.04719	0.82	0.410	6.326520
MALE	-0.0812141	0.01969	-4.12	0.000	0.537781
RURAL	-0.0122981	0.00423	-2.90	0.004	0.099950
FAMILY INC	0.3888871	0.02502	15.55	0.000	4532.39
FAMILY SIZE	-0.0207275	0.06386	-0.32	0.746	4.11523
A17YRS	0.0133903	0.01073	1.25	0.212	0.235596
A18YRS	0.0046075	0.01159	0.40	0.691	0.248893
A19YRS	0.0121052	0.00956	1.27	0.205	0.164958
SNE	-0.0057492	0.03597	-0.16	0.873	0.26732
SE	0.003656	0.03961	0.09	0.926	0.294775
ENS	-0.0121445	0.05644	-0.22	0.830	0.422838

Table 15*:* Elasticity Estimates for Youth in Neither Schooling Nor Employed (NSNE)

Variable	ey/ex	Std. Err.	Z	P>|z|	X
MWAGE INDEX	-1.111105	0.55863	-1.99	0.047	0.397704
UNEMPL	-.0992364	0.16353	-0.61	0.544	6.32652
MALE	0.1036189	0.06762	1.53	0.125	0.537781
RURAL	0.0430234	0.01495	2.88	0.004	0.09995
FAMILY INC	0.7173183	0.03759	19.08	0.000	4532.39
FAMILY SIZE	-0.2546881	0.22268	-1.14	0.253	4.11523
A17YRS	-0.2792349	0.0568	-4.92	0.000	0.235596
A18YRS	-0.0000674	0.04023	-0.00	0.999	0.248893
A19YRS	0.0705626	0.02452	2.88	0.004	0.164958
SNE	-0.2328247	0.09387	-2.48	0.013	0.26732
SE	-0.3343831	0.10403	-3.21	0.001	0.294775
ENS	-0.4828362	0.14677	-3.29	0.001	0.422838

MULTINOMIAL LOGISTIC REGRESSION
EMPLOYMENT RECODE STATUS

Table 16: Multinomial Logistic Estimates

VARIABLE	Coeff.	Std. Error	Z	PValue
Employed				
MWAGE INDEX	-4.596294	1.182019	-3.89	0.000
UNEMPL	-.0496641	0.0233181	-2.13	0.033
MALE	0.1453464	0.1093197	1.33	0.184
RURAL	0.2539322	0.1259919	2.02	0.044
FAMILY INC	0.0001424	8.33e-06	17.10	0.000
FAMILY SIZE	-0.2136802	0.0458831	-4.66	0.000
A17YRS	-0.8376824	0.1545589	-5.42	0.000
A18YRS	0.1273428	0.1413904	0.90	0.368
A19YRS	0.7877921	0.1397302	5.64	0.000
SNE	-0.7638668	0.3125309	-2.44	0.015
SE	-0.7227935	0.3078299	-2.35	0.019
ENS	-0.7462853	0.3056851	-2.44	0.015
Cons	0.5621999	0.6040634	0.93	0.352
Neither Schooling Nor Employed				
MWAGE INDEX	-7.632028	1.681738	-4.54	0.000
UNEMPL	0.0374132	0.0292093	1.28	0.200
MALE	0.2879215	0.1648483	1.75	0.081
RURAL	-0.1005179	0.1795297	-0.56	0.576
FAMILY INC	0.0000259	0.0000167	1.56	0.120
FAMILY SIZE	-0.2228202	0.0712962	-3.13	0.002
A17YRS	-0.675878	0.244288	-2.77	0.006
A18YRS	0.432290	0.1909403	2.26	0.024
A19YRS	1.033749	0.2194943	4.71	0.000
SNE	0.4016993	0.6917915	0.58	0.561
SE	0.4908754	0.6911284	0.71	0.478
ENS	0.3905281	0.6887247	0.57	0.571
Cons	0.0370179	0.9606466	0.04	0.969
Number of Observation				*10,461*
Wald chi2(36)				*633.66*
Prob > chi2				*0.0000*
Log pseudolikelihood				*-2429395.3*
Pseudo R2				*0.1590*
SNE is the base category				

MARGINAL EFFECTS ESTIMATION

Table 17: Marginal Effect Estimates Employed Youth (E)

Variable	ey/ex	Std. Err.	Z	P>|z|	X
MWAGE INDEX	-0.2850803	0.07939	-3.59	0.000	0.397753
UNEMPL	-0.0035154	0.00158	-2.22	0.026	6.32625
MALE*	0.008816	0.00732	1.20	0.229	0.538235
RURAL*	0.019277	0.01001	1.93	0.054	0.099834
FAMILY INC	9.60e-06	0.00000	14.95	0.000	4494.58
FAMILY SIZE	-0.0137323	0.00307	-4.48	0.000	4.11217
A17YRS*	-0.0462906	0.00772	-6.00	0.000	0.233023
A18YRS*	0.0070644	0.01002	0.71	0.481	0.249219
A19YRS*	0.0591601	0.01371	4.31	0.000	0.167102
SNE*	-0.0464875	0.01582	-2.94	0.003	0.268117
SE*	-0.0454291	0.01642	-2.77	0.006	0.295627
ENS*	-0.0503204	0.01929	-2.61	0.009	0.421448

(*) dy/dx is for discrete change of dummy variable from 0 to 1

Table 19: Marginal Effect Estimates for Enrolled Youth (Schooling not Employed)

Variable	ey/ex	Std. Err.	Z	P>|z|	X
MWAGE INDEX	0.6269076	0.11121	5.64	0.000	0.397753
UNEMPL	0.0015777	0.00207	0.76	0.446	6.32625
MALE*	-0.0217197	0.01041	-2.09	0.037	0.538235
RURAL*	-0.0137876	0.01262	-1.09	0.275	0.099834
FAMILY INC	-0.0000103	0.00000	-10.19	0.000	4494.58
FAMILY SIZE	0.0234236	0.00448	5.23	0.000	4.11217
A17YRS*	0.0716332	0.01119	6.40	0.000	0.233023
A18YRS*	-0.0289774	0.01399	-2.07	0.038	0.249219
A19YRS*	-0.1198076	0.02129	-5.63	0.000	0.167102
SNE*	0.0230616	0.04242	0.54	0.587	0.268117
SE*	0.0172581	0.04324	0.40	0.690	0.295627
ENS*	0.0286562	0.03992	0.72	0.473	0.421448

(*) dy/dx is for discrete change of dummy variable from 0 to 1

Table 19: Marginal Effect Estimation for Neither Schooling Nor Enrolled (NSNE)

Variable	ey/ex	Std. Err.	Z	P>|z|	X
MWAGE INDEX	-0.3418273	0.07758	-4.41	0.000	0.397753
UNEMPL	0.0019377	0.00138	1.40	0.160	6.32625
MALE*	0.0129037	0.00772	1.67	0.095	0.538235
RURAL*	-0.0054894	0.00776	-0.71	0.480	0.099834
FAMILY INC	7.01e-07	0.00000	0.89	0.372	4494.58
FAMILY SIZE	-0.0096913	0.00328	-2.96	0.003	4.11217
A17YRS*	-0.0253426	0.00857	-2.96	0.003	0.233023
A18YRS*	0.021913	0.01084	2.02	0.043	0.249219
A19YRS*	0.0606475	0.0179	3.39	0.001	0.167102
SNE*	0.0234259	0.03933	0.60	0.551	0.268117
SE*	0.0281710	0.03998	0.70	0.481	0.295627
ENS*	0.0216641	0.03470	0.62	0.532	0.421448

(*) dy/dx is for discrete change of dummy variable from 0 to 1