Minimum Wage Effects in the Canadian Labour Market (1981-2000)

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ABSTRACT

This thesis examines the effect of minimum wage changes on employment, labour force participation and schooling using Canadian provincial data for the period 1981 to 2000. This study uses two measures of schooling namely enrollment rates and continuation ratios. The analysis also includes the effect of the minimum wage on the employment and labour force participation of both teenage and adult age groups. The minimum wage variable in the regression analysis is the real adult minimum wage rate. Coverage of the minimum wage is not incorporated in the formula since minimum wage coverage is almost complete for the period being analyzed. Results show that the minimum wage has a significant negative effect on both employment and labour force participation rates for most age-sex groups studied. The effect of the minimum wage on enrollment rates and continuation ratios were insignificant for most grade and transition-sex groups with positive results observed in most cases where significant results were obtained.

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ACRONYMS

Table 1: Acronyms

Acronym	Definition
AVAGE	The average age of teachers
AB	Alberta
BC	British Columbia
CPI	Consumer Price Index in 1992 dollars
CONBOVER	The overall continuation ratio
CONRB	The continuation ratio for both sexes
CONRF	The female continuation ratio
CONRM	The male continuation ratio
DEP_{t-1}	Lag of the dependent variable
DIV	The divorce rate
DW	Durbin-Watson
EMPRB	The employment rate for both sexes
EMPRF	The female employment rate
EMPRM	The male employment rate
ENRRB	The enrollment rate for both sexes
ENRRF	The female enrollment rate
ENRRM	The male enrollment rate
GDP	The real per capita Gross Domestic Product in thousands of dollars
LM	Lagrange Multiplier
MB	Manitoba
MINW	Minimum wage rate controlled for inflation using the provincial consumer price index
NB	New Brunswick
NLD	Newfoundland
NS	Nova Scotia
ONT	Ontario
PEI	Prince Edward Island
PARTRB	The participation rate for both sexes
PARTRF	The female participation rate
PARTRM	The male participation rate
POPBRW	The population of the relevant age group expressed as a percentage of the total working age for both sexes
POPFRW	The population of the relevant age group expressed as a percentage of the total working age population for females
POPMRW	The population of the relevant age group expressed as a percentage of the total working age population for males
QUE	Quebec
SK	Saskatchewan
STRATIO	The student teacher ratio
UNRP	The unemployment rate for prime age males (25–54 years)

Source: Author's compilation

Chapter 1

Introduction

1.1 Introduction

So much debate exists in minimum wage literature on the effect of the minimum wage on important labor market variables such as employment, labor force participation and school enrollment of teenagers. Some of the existing empirical evidence contradicts the textbook prediction that a minimum wage increase has the effect of lowering general employment levels while others (in the majority) uphold that hypotheses. Evidence to support the effect of the minimum wage on participation rates and on school enrollment also is inconclusive as different authors obtain different results depending on the method of estimation used.

These contradictory results have created a lot of confusion among all concerned, individuals and the society at large as to the actual effect of the minimum wage on the welfare of the lower income group, which it seeks to protect. This division continues to be manipulated by decision makers who continue to use the situation to support their policy intentions concerning the minimum wage. This creates a hole, which needs to be filled in the minds of citizens as to the actual intention of these decision makers.

This trend of using the minimum wage as a pawn has gone on for so long in Canada, United States and worldwide. In Canada where the minimum wage is under provincial jurisdiction, fluctuations in the minimum wage have become the order of the day with

many of the provinces changing the value of the minimum wage more than once during the course of one calendar year.

Expectations as to the effect of the minimum wage on employment do not exist on its own. There are spillover effects of the minimum wage effect on employment. Labor force participation rates and school enrollment of teenagers (who are usually in the lower income bracket due to their level of experience) are also affected by a minimum wage increase that affects employment rates. This raises the question of how long the Canadian public can withstand the continuous barrage by politicians on the economy with bogus claims of what the minimum wage can and cannot do.

1.2 Some Important Facts and Definitions

Minimum wage legislation in Canada is under provincial jurisdiction and a federal minimum wage set equal to the provincial minimum wage exists in each province for federal workers residing in the respective jurisdictions. Data shows that enough variation exists in the minimum wage for each of the provinces to allow for a minimum wage study of the sort being carried out here. A minimum wage legislation sets a wage floor for employers to abide by and depending on whether coverage is complete or incomplete, this wage may either apply to all or specific persons and industries. In the respective jurisdictions in Canada, this coverage is found to be partially complete as the legal minimum is found to apply to all workers with the exception of certain industries and occupations in some provinces.

Educational attainment in Canada is under provincial jurisdiction and is free in the public school category. Four types of schools exist in Canada in the elementary-

secondary category, namely public schools, private schools, federal schools and schools for the disabled (Statistics Canada, 2000). According to the Webster's English Dictionary (concise edition, 1997), education is defined as the process of learning as well as the training that accompanies the learning. Enrollment rates can be defined as the number of enrolled persons expressed as a percentage of the population of high school students in each jurisdiction. High school enrollment rates in Canada vary by province.

The labour force variables of employment and participation rates in the different provinces are reported by age and gender groups. Employment rates are defined by Statistics Canada as the number of people employed expressed as a percentage of the population in that group. Employed persons are defined by labour force Canada as any person who did any work at all or had a job but was absent from work.

Participation rates are defined by Statistics Canada as the number of employed and unemployed in each demographic group expressed as a percentage of the population in that group. Employed plus unemployed persons make up the labour force or participant population.

1.3 The Objectives of the Study

Contradictory evidence on the effect of the minimum wage exists in the United States, Canada and in the rest of the world. This leaves individuals and the society as a whole at a loss as to the actual effect of the minimum wage on important labor market variables such as employment, participation and enrollment rates.

In effect, the objectives of this study are as follows:

- to examine the economic relationship between minimum wage changes and employment rates
- to examine the economic relationship between minimum wage changes and participation rates using empirical evidence for various demographic groups in ten Canadian provinces.
- to examine the effect of the minimum wage on high school enrollment rates and continuation ratios
- to reconcile the different kinds of evidence obtained in early and recent minimum wage literature

The new evidence will be aimed at helping policy makers make rational decisions with legislations involving the minimum wage. Also as the popular saying goes, 'information is power' and with this new evidence, individuals may now be able to access their leaders based on their stand on the minimum wage amongst other things and not rely on bogus claims to make voting decisions.

1.4 The Importance of the Study

The welfare of the individual and the society relies heavily on such labor market variables such as employment, labor force participation and educational attainment. A lot is at stake with a policy that may alter the levels of these important variables.

Canada is a country with enough variation in its minimum wage to allow for this kind of study as minimum wage in Canada is under provincial jurisdiction and allows enough variation for a minimum wage study with enough regression power to draw a decisive conclusion on the effects of the minimum wage.

Despite the attractive nature of the Canadian minimum wage data, a review of the existing empirical work in Canada shows that a lot is lacking. Firstly, no available work studies the impact of the minimum wage on the three economic variables that remain the focus of this study. Several studies in Canada by Swidinsky (1980) and Schassfma and Walsh (1983) study the effect of the minimum wage on employment and participation rates using the same data set while others by Baker and Stanger (1999) have studied the effect of the minimum wage on employment and yet others like Landon (1997) have tried to estimate the effect on high school enrollment. This study will attempt to estimate the impact of the minimum wage on employment, participation and enrollment rates using the same data set. Since there may be spillover effects from one variable to the other this study will also attempt to capture the quantity of that effect.

This study will attempt to use two panel data methods (pooling and differencing) in order to determine the validity of claims made in past studies reviewed in chapter two and to see to what extent this might change the results. These previous studies have derived varying results depending on the estimation method used.

In addition to the above, this study will attempt to use the most recent available data spanning through the 1980's to the year 2000 in order to reveal the most recent evidence on the effect of the minimum wage on our variables of interest.

When this work is completed, decision makers will effectively use their rights to decide whom to put into office based on their minimum wage policy. In addition, this will provide a tool based on a recent and reliable study for policy makers in the Canadian environment to utilize for formulating policies regarding the minimum wage. Most importantly, individuals faced with a decision to employ, participate in the labor force or

attain education will be effectively armed to make their decisions based on the results obtained in this study.

1.5 Thesis Organization

This thesis is organized into six chapters. The first chapter is an introduction, while chapter two is a review of existing literature. Chapter three covers the theoretical concepts surrounding the minimum wage, employment, participation, education and human capital attainment. Chapter four deals with econometric specifications, data and descriptive statistics. Chapter 5 presents the estimated results and chapter 6 is a conclusion.

Chapter 2

Facts and Literature

This chapter first discusses the minimum wage levels in the different Canadian provinces. It also goes further to provide a description of the minimum wage labour market and schooling enrollment patterns in Canada. Finally, the chapter provides a thorough literature review of past minimum wage literature covering the United States, Canada and the international scene.

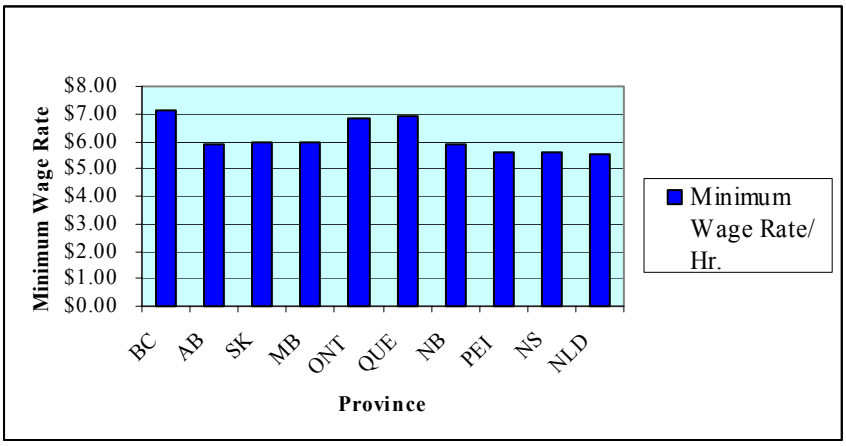
2.1 Minimum Wage in Canada

Minimum wage legislation in Canada is under provincial jurisdiction although a Federal minimum wage set equal to the provincial minimum wage existing in each province for federal workers residing in the respective jurisdictions has existed since July 17, 1996. The coverage of the adult minimum wage is extensive as it applies to the majority of the Canadian workforce although on rare occasions, coverage is incomplete. Also in rare instances, small differentials ranging from 25 to 45 cents an hour exist in the minimum wage in some jurisdictions. For instance there is incomplete coverage for farm workers in Saskatchewan, Manitoba and Alberta while youth differentials exist in Ontario and British Columbia (Battle, 2003).

Minimum wage rates across the provinces and territories as of the year 2000 vary from $5.5 per hour in Newfoundland to $7.15 per hour in British Columbia. Figure 2.1

below shows the hourly minimum wage in September 2000 for each province under study (Human Resources Canada, 2003).

Figure 2.1: Minimum Wage Rate by Province (2000)



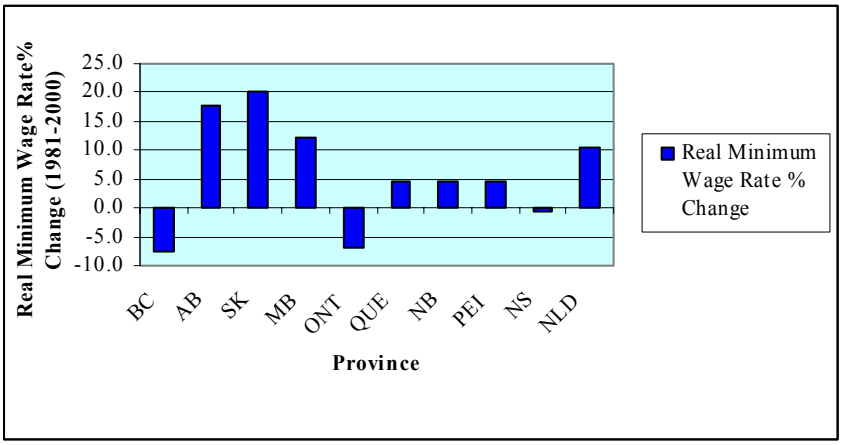
Source: Author's configuration using data from Human Resources Canada, 2003

Figure 2.1 shows the variation in the hourly minimum wage rate that existed between the provinces. The minimum wage rate varied from $5.50 in Newfoundland, $5.60 in Prince Edward Island and Nova Scotia, $5.90 in Alberta, $6.00 in Manitoba and Saskatchewan, $6.85 in Ontario, $6.90 in Quebec, and $7.15 in British Columbia.

The minimum wage rate is set in nominal dollars and adjusted upward from time to time. For example, Alberta increased its minimum wage from $5.65 an hour in April, 1999 to $5.90 an hour in October 1999; British Columbia from $6.50 in March 1995 to $7.00 in October 1995; Manitoba from $3.35 in March 1981 to $3.55 in September 1981 and from $4.50 in April 1987 to $4.70 in September 1987 just to mention a few.

Figure 2.2 shows the percentage change in the real minimum wage rate deflated by the consumer price index in constant 1992 prices from the period 1981 to 2000 for each province under study.

Figure 2.2: Percentage Change in the Real Minimum Wage Rate (1992 Prices) by Province (1981-2000)



Source: Author's configuration using data from Human Resources Canada, 2003

The figure above shows that the percentage change from 1981 to 2000 in the indexed hourly minimum wage rate varied from a –7.5% in British Columbia, -6.8% in Ontario, -0.8%in Nova Scotia, 4.4% in Prince Edward Island, Quebec and New Brunswick, 10.5% in Newfoundland, 12.1% in Manitoba, 17.6% in Alberta and 20.1% in Saskatchewan. Both 2.1 and 2.2 show that enough variation exists in the minimum wage among provinces and over time to allow for a minimum wage study of the sort being conducted here.

2.2 Minimum Wage Labour Market in Canada

A Statistics Canada survey estimates that minimum wage workers in Canada made up about 4.6% of the 12.5 million employees in the Canadian workforce in the year 2000. Of the total 580,000 minimum wage workers, 62.1% were women while 37.9% were men. The same survey also showed that the probability of working for the minimum

wage was higher for younger persons. The 15 -19 age group for instance made up 6.6% of all employees but 47.1% of all minimum wage workers while the 20-24 age group made up 10.8% of all workers but 16.4 percent of all minimum wage workers. Going up the age ladder, the 25-44 age group made up about 52.7% of all workers and 23.2% of all minimum wage workers while the 45 and above age group made up 29.9% of all workers but only 13.4 percent of all minimum wage workers in the year 2000 (Battle, 2003).

The level of education one has also plays a very important role in the incidence of working for the minimum wage. Statistical evidence shows that postsecondary and university graduates are less likely to work for the minimum wage than high school graduates are. Evidence also shows that part-time work increases the likelihood of working for the minimum wage as 26.3% of part-time workers earn minimum wage when compared to 5.7% of full-time workers. It is very common for young people to combine school and part time work (Battle, 2003).

The same study by Ken Battle shows that the incidence of working for the minimum wage also varies by family status. In 2000, 60.2% of minimum wage workers of which more than half were part-time workers were older children living with parents. Members of couples (married or co-habitants) made up 25% of minimum wage workers, unattached individuals made up 10.7% of minimum wage workers while family heads without a spouse made up 4.1% of minimum wage workers.

Differences also exist by industry in the percentage of their workforce that are paid the minimum wage and can be ranked as follows for some of the affected industries: Accommodation and food services (19.4%), agriculture (15.4%), trade (8.8%), other

services (7.7%), information, culture and recreation (6.2%), management, administrative and other support (5.1%) (Battle, 2003).

2.3 Education in Canada

The importance of education cannot be overestimated as it encompasses all areas of life. It has been defined in so many different ways but according to the Cambridge advanced learners dictionary (2003), education is the knowledge acquired from teaching and learning or the process of teaching and learning in a formal setting. This definition although appropriate for the kind of education referred to in this study makes light of the actual meaning of this concept as education in its entirety involves teaching and learning in both formal and informal settings.

Educational attainment plays a vital role in the development of any society and for this reason should never be taken for granted. High school (elementary-secondary level) education is of particular importance for its preparatory value to future education. Early school leaving is a detriment to the society as it is usually associated with higher criminal offences, lower paying jobs and an increased dependence on welfare. Several studies have been conducted to calculate the private and social returns to education. Vallaincourt (1995) conducted one of those studies in Canada. He found that the private and social returns of completing high school rather than dropping out were 33.4 and 11.9 percent for men and 38.5 and 9.1 percent for women.

In Canada, high-school education is under provincial jurisdiction and is free in the public school category. Four types of schools exist in Canada in the elementary-secondary category, namely public, private, federal schools and schools for the disabled

(Statistics Canada, 2000). The same report shows that by the 1998-99 school year, 15,911 elementary-secondary schools existed in Canada, a slight decline from 16,000 in the 1996-97 school year. The structure of education in Canada is such that the elementary school comprises the first six to eight years of compulsory schooling in most jurisdictions after which comes secondary schooling, which offers a choice of academic and vocational programs.

The point at which an individual makes the transition from elementary to secondary varies from jurisdiction to jurisdiction. Figure 2.3 shows the levels within elementary-secondary schools in the different provinces. High school education in Quebec ends with grade eleven and the structure of education in New Brunswick is dependent on the language of dominance (Statistics Canada, 1999).

Figure 2.3: Levels Within Elementary-Secondary Schools by Province

Newfoundland	1	2	3	4	5	6	7	8	9	10	11	12
Prince Edward Island	1	2	3	4	5	6	7	8	9	10	11	12
Nova Scotia	1	2	3	4	5	6	7	8	9	10	11	12
New Brunswick[1]	1	2	3	4	5	6	7	8	9	10	11	12
New Brunswick[2]	1	2	3	4	5	6	7	8	9	10	11	12
Quebec	1	2	3	4	5	6	7	8	9	10	11	
Ontario	1	2	3	4	5	6	7	8	9	10	11	12[3]
Manitoba	1	2	3	4	5	6	7	8	9	10	11	12
Saskatchewan	1	2	3	4	5	6	7	8	9	10	11	12
Alberta	1	2	3	4	5	6	7	8	9	10	11	12
British Columbia	1	2	3	4	5	6	7	8	9	10	11	12

	Elementary/Primary
	Junior High/Middle
	Senior High
	Secondary

[1] English speaking sector
[2] French speaking sector
[3] Includes O. A. C. = Ontario Academic course

Source: Statistics Canada (2000)

The Statistics Canada report for the Pan Canadian Education Indicators Program (1999) reveals that in 1995 (most current year of study by the Organization for Economic Co-operation and Development (OECD)), Canada had the highest investment in education and the second highest per student expenditure as a proportion of GDP when compared to the other G-7 nations.

In Canada, the legal school dropout age was 16 years of age for all provinces in the period 1981 to 1990 with the exception of Newfoundland, Quebec and British Columbia where the legal dropout age was 15 years of age. By the 1991-92 school years, the legal dropout age in all the provinces became 16 years of age. Compulsory schooling is required for 6 to 7 year olds depending on the jurisdiction (Elementary – secondary enrollment 1991 - 92). The outcome of educational attendance although mostly affected by population is also expected to be greatly influenced by the legal dropout age.

High-school graduation requirements are same for all jurisdictions with high-school diplomas granted to students who pass all compulsory and optional courses required for the completion of their study. At the completion of high school education, students may apply to universities to further their education. An exception exists for Quebec students who must earn a CEGEP diploma before they can proceed to the university (Statistics Canada, 1999).

The Statistics Canada report for the Pan Canadian Education Indicators Program (1999) shows that there has been an increase in the number of Canadians graduating from high school. There has been a decline in the proportion of 25-29 year olds with less than high school education from 20 to 13 percent between 1990 and 1998. In addition, the

percentage of university graduates increased from 17 to 26 percent between 1990 and 1998. The same study concluded that individuals with less than a high school education have a much higher incidence of being employed for part time work (even though full-time is preferred) than those with a high school.

The elementary-secondary schools are all under the jurisdiction of the provincial government in which they exist even though the federal government plays an important role in line with its goal of supporting human resource development. School boards exist in all jurisdictions to manage these schools. A lot of cooperation exists among these school boards especially for planning, purchasing, and curriculums development (The Council of Ministers of Education Canada (CMEC), 1996).

2.4 Past Studies on the Labour Market Impact of Minimum Wage

2.4.1 United States Empirical Evidence

The first state minimum wage law in the United States was passed in the state of Massachusetts in 1912. Even though this law was successfully challenged by the courts and eliminated as soon as it came into place, it was reinstated in 1937 with the establishment of a national minimum wage legislation. This legislation formed the basis for the Fair Labor Standards Act of 1938 (Card and Krueger, 1995).

Minimum wage issues have fascinated economists in the United States since the early nineteen hundreds. Most of the earliest studies were carried out with time series data and found a negative employment effect of the minimum wage. The estimating equation used by these early studies is of the following form:

$$Y_t = f(MW_t, X_{t1} \ldots\ldots X_{tk}) + e_t \qquad (2.1)$$

Where Y_t represents some measure of employment, unemployment, participation or enrolment in time t, MW_t is the minimum wage variable, f (.) is a function of a set of independent variables including the minimum wage in time t, the adult male unemployment rate (used as a cyclical variable) and the fraction of students enrolled in school and in manpower training programs just to mention a few and e_t is the stochastic error term. More generally, trend terms, interactions, and seasonal dummies have been included as some of the explanatory variables. The Kaitz index, originated by Kaitz (1970) has been a variable of interest in most of the early studies. This variable is basically the minimum wage deflated by some average wage variable and multiplied by the coverage rate of the minimum wage. Card and Krueger (1995) take an exception to the preference exhibited over the years for the Kaitz index. They claim that this index was developed because of the unavailability of wage data in the 70's for teenagers and low-wage earners who the minimum wage seemed to affect most. They criticized the use of the Kaitz index in recent times and noted that the logarithm of the actual minimum wage was more highly correlated with teenage wages than was the Kaitz index.

Mincer (1976) estimated the impact of minimum wage legislation on employment and labor force participation for 10 age-sex-colour demographic groups using quarterly data from 1954 to 1969. He found the net employment effect to be negative for all the groups studied except for non-white males. The net participation effect was also negative for all groups with the largest negative effects available for non-white teenagers and non-white adult males.

Gramlich, et al, (1976) used time series data from 1948 to 1975 to estimate the impact of minimum wage legislation on employment outcomes of both teenagers and adults working part-time and full-time. They found that the employment of teenagers was reduced by an increase in minimum wage while employment of adult males was increased. In addition, the proportion of adult males working part time increased with an increase in the minimum wage. From their study, they concluded that an increase in the minimum wage causes employers to substitute less experienced teenagers with adults and vice versa for a reduction in the minimum wage.

Using time-series data from 1963 to 1972, Ragan (1977) studied the effect of the minimum wage on employment, unemployment and labour force participation of youths. He used 16 youth sub-groups and sought to test the well-known hypotheses that an increase in minimum wage reduces youth employment while increasing youth unemployment. His dependent variables were the ratio of employed, unemployed and labour force to population. His independent variables include the minimum wage variable, the unemployment rate of prime aged males, a manpower variable, population and a set of seasonal dummy variables. His results were not novel as he found that a negative correlation exists between minimum wage and youth employment. This correlation was higher for non-white males than for any other group studied. He also found the relationship between participation of youths in the labour force and the minimum wage to vary depending on the youth sub-group in question. A more positive correlation was found to exist between minimum wage and participation rates for students than for non-students.

Brown, Gilroy and Kohen conducted a thorough literature review of some of the earlier US time-series studies in their paper titled '*The effect of the minimum wage on employment and unemployment*'. Brown, et al, (1982) summarized the results of these studies. Table 2.1 presents an excerpt from one of their summaries of the effect of minimum wage changes on the employment rate of different age-sex groups using time-series data.

Table 2.1: Effect of Minimum Wage on Employment

Estimated effect of a 10 percent change in the minimum wage of teenagers (16-19), Elasticity (*10)

Author	White males	White females	Nonwhite males	Nonwhite females	All workers
Kaitz (1970)	-1.210	-7.46	1.165	.438	-0.98
Kosters and Welch (1972)	-3.31	-2.41	-3.56	-3.01	-2.96
Kelly (1975)	-1.620	-0.700	-1.775	-0.80	-1.204
Kelly (1976)	-0.35	-0.96	_	_	-0.66
Mincer (1976)	-0.205	_	-4.65	_	-2.31
Welch (1976)	_	_	_	_	-1.78
Ragan (1977)	-0.81	-0.09	-0.35	-0.10	-0.65
Mattila (1978)	-0.72	-0.1.00	_	_	-0.84
Freeman (1979)	_	_	_	_	-2.46
Wachter and Kim (1979)	-1.883	-2.722	-3.290	-7.710	-2.519
Iden (1980)	-2.31	_	-3.81	_	2.26
Abowd, et al, (1981)	_	_	_	_	-2.13
Betsey and Dunson (1981)	-1.50	_	-0.33	_	-1.39
Boschen, et al, (1981)	_	_	_	_	-1.50
Brown, et al, (1981)	-1.08	_	0.16	_	-0.96
Hammermesh (1981)	_	_	_	_	-1.21
Ragan (1981)	-0.41	-0.35	-3.51	0.51	-0.52

Source: Brown, et al,(1982)

Overall, we see that these authors mostly observed that the impact of the minimum wage on employment is a negative one. The magnitude of this impact depends on the method of estimation and also on the group being studied.

Solon (1985) and Wellington (1991) have been some of the more recent economists to study the impact of the minimum wage using time –series data. They found a smaller negative relationship (-0.99 and -0.60) to exist between the minimum wage and the employment rates of teenagers when compared to the studies done by most of their contemporaries. The time-series elasticity estimates of the impact of the minimum wage have been the most supportive of the traditional minimum wage theory in early and recent times.

The problem with these times-series studies is that the series are really short and measure the effect of the minimum wage across a broad band when cyclical factors in the economy may actually be affecting the level of employment and participation rates. Using quarterly data to increase the number of observations for these regressions introduces some forms of seasonality thereby rendering the results unreliable for inference.

More recent studies of the minimum wage in the United States have been conducted with cross-sectional and panel data. Since this study makes use of panel data, I will review the panel data evidence in detail for readers to compare with the current work at hand. These studies are presented in the next section as most of the studies reported using this technique also included an estimation of the enrollment impact of the minimum wage. Equation 2.2 shows the general format for the estimating equation used by authors such as Baker and Stanger (1999) and Swidinsky (1980) who conducted minimum wage studies using panel data with only a few modifications existing from study to study.

$$Y_{it} = B_o + f(MW_{it} + X_{it} + t + ai\ ) + e_{it} \qquad (2.2)$$

Where Y_{it} represents some measure of employment, unemployment, participation or enrolment in time t. MW_{it} is a minimum wage variable, which is usually a variant of the Kaitz index in state form. X_{it} is a set of independent variables including the prime aged male unemployment rate, gross domestic product, and possibly school enrollment rate just to mention a few. The acronyms *ai* and *t* represent state fixed and time varying effects and e_{it} represents the stochastic error term.

The impact of the minimum wage has also been estimated by a series of natural experiments by a number of economists in the United States (Lester; 1946, Card and Krueger; 1994 and 1995, Deere et al; 1995 etc). This group of economists argues that using natural experiments are the way to go in estimating the impact of the minimum wage because when compared to other methods used for this study, a cause-effect relationship could be very easily determined with the use of natural experiments.

In a series of articles which were eventually culminated in their book '*Myth and Measurement: The New Economics of the Minimum Wage'*, Card and Krueger (1995) conducted a number of natural experiments which involved a control group and a treatment group to determine the impact of minimum wages on pay rates and employment. In one of these studies, they used a sample of over 400 restaurants in New Jersey where the minimum wage was increased and Eastern Pennsylvania, where the minimum wage was unchanged from its previous value. They found that employment increased in New Jersey where the minimum wage was increased. Similar experiments with similar results were conducted by the same authors in Texas, 1991 and in California, 1988 using a sample of fast-food restaurants in those areas.

These experiments mark a major turning point in minimum wage literature where the expected outcome of minimum wage hikes is to reduce employment as predicted by economists hundreds of years ago. Card and Krueger (1995) doubt the validity of these earlier studies and criticize them on a number of grounds for possible bias influenced by the conventional view on the minimum wage. Among their concerns is the problem of publication bias, which they claimed existed with the earlier published articles. They argue that authors tend to publish only those articles that support the conventional view of the minimum wage. They also claimed that the authors were induced to choose the specifications for their estimating equations, functional forms and age group studied in order to arrive at results that support the conventional view. They claimed that these earlier studies preferred the use of teenagers as their study group as this leads them to arrive at expected results. With the help of meta-analysis statistical method, (a test that tries to determine the relationship between the t-statistic and the sample size) they tried to determine if the t-statistics from these studies rise with the sample size. If it does not, then two possibilities exist; publication bias and inconsistencies due to structural changes in the economy. Their assessment of the possibility that those studies contained publication bias revealed that publication bias was at the root of the statistically significant results. They also expected that the short time-series that existed in those times gave a low power to the regression results thereby rendering the results unreliable. To verify this, they replicated some of those earlier studies with longer time series to find that the negative relationship earlier obtained between the minimum wage variable and employment rates got weaker as the length of the time series increased.

The natural experiment method used by Card and Krueger as well as some of their colleagues certainly have some advantages. The fact that no model is required to conduct these experiments eliminates the problem of the choice of an adequate model to use thereby eliminating bias in estimates. As long as the control group is properly selected, results from these experiments have a good chance of being influenced solely by the minimum wage change and not by any structural changes in the economy. This method may not be foolproof since the proper selection of a control group requires some preliminary steps to ensure that it is identical to the treatment group.

The contradictory results experienced in the United States literature show that the minimum wage still presents a puzzle. Different results were derived based on differences in estimation methods, model specification and in data selection. In the next section, we will examine Canadian minimum wage literature and see how it compares with that in the United States.

2.4.2 Canadian Empirical Evidence

The earliest minimum wage studies in Canada were conducted on specific low wage industries in specific provinces. To carry out these studies, the authors made use of questionnaire surveys to ascertain the impact of a minimum wage change. Swidinsky (1980) cited (Zaidi, 1970; Fantl and Wittingham, 1970; Rhodes, 1973; Dhruvaragan, 1974 and Maphangoh, 1976) in his work '*Minimum wages and teenage unemployment*'. He points out that the researchers all found statistically insignificant unemployment effects of the minimum wage.

Using the Labour Market Activity Survey of longitudinal data from 1988 - 1999, Yuen (1998) conducted the first micro data panel study in Canada on a sample of 9,379

individuals to investigate the impact of the minimum wage on the employment of teenagers and young adults. He worked with quarterly data and modeled the probability that an individual would be employed in the period following a minimum wage hike conditional on a set of control variables including the unemployment rate and Gross Domestic Product in province *i* in and in time *t*. He included four dummy variables in his regression as controls for the minimum wage, demography, province and time or season. The regression results indicate that teenagers and young adults in the minimum wage bracket were 6% to 10% less likely to be employed after an 8.4% minimum wage hike. His result confirmed findings in the United States by Currie and Fallick (1996) who used the same methodology as Yuen to carry out their study. Since this study and similar ones in the United States were criticized for making comparisons between high and low wage workers, Yuen (1998) reestimated his equation with only a sample of low-wage workers and found that there existed no statistically significant minimum wage effect on youth employment.

Swidinsky (1980) notes that the usefulness of Micro data for analyzing specific changes in minimum wage legislation by firms is diminished when the need for analyzing aggregate employment and labour force participation for successive changes in the minimum wage arises as is the case in Canada where minimum wage legislation is under provincial jurisdiction. He adopted the models operated by Mincer (1976) to examine the impact of the minimum wage on the unemployment of teens (14 – 19 years) with a pooled – cross-section of five Canadian regions from 1956 – 1975. He modeled the teenage employment rate, labour force participation and unemployment rate conditional on a set of explanatory variables that included a coverage-weighted minimum wage index

by gender, the prime aged male unemployment rate, a quadratic time trend, and regional dummy variables to capture region fixed effects. Swidinsky (1980) used region level panel data and found a statistically significant negative relationship between the minimum wage and employment/ labour force participation among males and females. This effect was stronger for males than for females contradictory to research results in the United States where similar specifications and methodology were used.

Schaafsma and Walsh (1983) conducted their study on the effect of the minimum wage on employment and labour supply for six age-sex groups using Canadian provincial data from 1975 - 1979. They modeled employment rate and labour force participation against a set of control variables which include the real minimum wage rate (as opposed to a coverage-weighted minimum wage variable used in most studies), the gross domestic product and provincial dummy variables. The results showed a negative correlation between the minimum wage and employment for five out of the six age-sex groups studied. The participation regression results showed that a negative relationship existed between minimum wage and labour force participation for all male groups and the female teenage group. The results also show that teenagers are less likely than other groups to withdraw from the labor force in the event of a minimum wage hike. Overall, these results showed that the minimum wage has a positive impact on the unemployment rate of the six age-sex groups.

Baker and Stanger (1999) studied the effect of minimum wage hikes on employment of teenagers in Canada over the period 1975 – 1993 using provincial level data. The dependent variable used for the model specification was the employment population ratio in the *i*th province in year *t*. The explanatory variables are the minimum

wage variable (ratio of the adult minimum wage to the average manufacturing wage), real gross domestic product, unemployment rate of prime-aged males, the ratio of teens to the working age population, province fixed effects, year effects and a quadratic trend. The models were estimated by ordinary least squares and weighted least squares in both linear and log forms. Table 2.2 below is a summary of their results in both the linear and log specifications used.

Column one results were controlled for a quadratic trend, while column two was estimated by weighted least squares. Column three is a weighted least square estimate corrected for heteroskedasticity and serial correlation, column four is estimated by weighted least squares without province effects while column 5 was estimated by weighted least squares without trend terms.

Table 2.2: Effect of the Minimum Wage on Employment

Linear	**1**	**2**	**3**	**4**	**5**
Minimum wage elasticity	-0.284	-0.305	-0.305	-0.502	-0.322
Logarithmic	**1**	**2**	**3**	**4**	**5**
Log minimum wage elast.	0.103	0.041	0.041	-0.390	-0.233

Source: Baker and Stanger (1999)

The results in the table above show the extent to which different results are obtained when different functional forms and estimation methods are used. The minimum wage elasticities were calculated at the sample mean and show that a one percent increase in the minimum wage would result in a .23 to a .50 percent reduction in the employment population ratio of teenagers. The authors also carried out a number of tests one of which is the Box-Cox test to ascertain the best specification. The linear specification was selected to be the more appropriate. A sensitivity analysis of the minimum wage variable deflated by the average manufacturing wage (with and without overtime), the average

industrial wage, the average wage in retail and the consumer price index (provincial and national) was also conducted. The result of this analysis showed that the elasticities fall within the same range in the linear specification.

Consequently, they took differenced the data in order to get reconciliation with previous studies where most zero or positive minimum wage effects were obtained as in the case of Card and Krueger (1995). The first differenced results showed insignificant and positive elasticities. Negative and more statistically significant elasticities were obtained by the time fourth differences were taken.

Shuk-Lin Kan and Sharir (1996) used pooled cross-sections to study the effect of the minimum wage on employment and participation rates for six age-sex groups in nine Canadian provinces. They found that the minimum wage had no effect on the employment rate of the teenage group while a negative effect was found to exist between the minimum wage and the employment rate of the older groups. The effect of the minimum wage on participation rates was negative for all groups studied leaving the authors to assume that the discouraged worker effect was dominant.

Using pooled data for four provinces, Goldberg and Green (1999) also found small disemployment effects of an increase in the minimum wage for all age-sex groups studied. They found no immediate disemployment effects to exist. Long run effects in the range of 0 to 2 percent decrease in employment due to a 1 percent increase in the minimum wage was obtained.

Results from this study agree mostly with the time-series and panel data evidence as opposed to the natural experiment used by Card and Krueger (1994). Card and Krueger's conclusions were obtained from their study of the effect of the minimum wage

in the fast food industry. These conclusions are consistent with the results obtained by the earliest minimum wage authors in Canada who studied the effect of the minimum wage on specific low wage industries. A panel study is more likely to capture the effect of the minimum wage on an aggregate basis. Other advantages associated with panel data are that they increase the power of a regression and function very well when there exists some heterogeneity between the cross-sectional units as is the case with Canada.

2.4.3 International Evidence

Minimum wage studies have been conducted in a number of industrialized countries that have minimum wage legislation. In many of these countries, a large number of differentials exist in their minimum wage structure and this makes it impossible for comparisons to be made between the countries where the effect of the minimum wage on labour market variables is concerned. A few of these studies will be discussed in this section just to get a clue on what goes on in other continents.

Starting with the United Kingdom, Stewart (2003) made use of individual level panel data to investigate effect of the introduction of the United Kingdoms minimum in April, 1999, on employment of workers currently earning the minimum in four selected demographic groups. He found neither a significant nor adverse employment effect to exist in his study. Machin, et al, (2002), using a different methodology conducted a study of the 1999 minimum wage introduction in care homes in the United Kingdom and found negative employment effects. Even though these results form evidence from the same country, they show the difference that the methodology used and the demographic group studied can create in the results obtained in minimum wage studies. In contrast, minimum wage studies in Portugal by Pereira (2000) to investigate the impact of the 1987 upgrade

of teenage minimum wage in Portugal to the existing adult rate resulted in a significant negative effect on the general employment rate in Portugal.

Conflicting results of this nature continually dominate the international minimum wage literature. Eriksson and Pytlikova (2002) sought empirical evidence on the impact of the minimum wage in the Czech and Slovak Republics and found no clear evidence of a negative employment effect as predicted by theory. Dolado, et al, (1996) in a study of the European experience found no significant minimum wage effect except for a selection of young workers. In Ireland, Nolan, et al, (2001) found that most industries in which labour constituted a major part of the wage bill suffered adverse employment effects with an increase in the minimum wage. In addition, O'Neill, et al, (2002) found a negative employment effect from a survey of firms in Ireland on the introduction of a national minimum wage for a group of firms mostly affected by the minimum wage change. Keil, et al, (2001) in a case for the German unification concluded that the adoption of minimum wage schedules in East Germany created adverse employment effects.

Evidence from Puerto-Rico is unique in the sense that Puerto- Rico adopts the US minimum wage. Reynolds and Gregory (1965) and Castillo-Freeman and Freeman (1992) studied the impact of a US minimum wage in a less boisterous economic environment, as is the case in Puerto-rico. One could hardly rely on their conclusions even though they seemed to support the textbook evidence. Therefore, the criticisms laboured on these studies over the years have been well founded as a US minimum when applied to Puerto-rico could hardly be relied on for a conclusive minimum wage study.

2.5 Past Studies on the Enrollment Impact of the Minimum Wage

In the United States Neumark and Wascher (1995b) used individual level panel data for all the states from the period 1979 – 1992 to estimate the impact of the minimum wage on the employment and school enrollment of teenagers. They categorized these teenagers into various school/ work activities (in school not employed, not in school not employed, not in school employed and in school employed) and estimated the impact of the minimum wage on the probability of each school-work activity. Their results indicate that the minimum wage reduces the probability of being enrolled in school whether employed or unemployed. The results also showed that the minimum wage is also significantly positively related to not being enrolled and employed. These results imply that the probability of participation in the labour force increases with hikes in the minimum wage even though the probability of employment does not increase. The elasticity of being employed with an increase in the minimum wage was less negative than that of being enrolled.

Evans and Turner (1995) criticized the enrollment measure used by Neumark and Wascher but continued to use the minimum wage variable supplied by them to reestimate their study. What Evans and Turner (1995) left out according to Neumark and Wascher (2003) is the use of an appropriate minimum wage variable for their estimates. Neumark and Wascher (2003) went ahead to re-estimate their regressions with a broader enrollment variable and the appropriate minimum wage variable. Their updated results show that minimum wage was significantly positively related to the probability of being employed but not enrolled and also to being unemployed and not enrolled.

Chaplin, et al, (2003) sought evidence to determine the impact of the minimum wage on teenage enrollment with state level panel data from the 1989-90 to 1996-97 school year. This study is of primary interest because they used a unique measure of school enrollment called grade continuation ratios. These grade continuation ratios were regressed over a set of explanatory variables that include the unemployment rate, manufacturing wage, dummies for legal dropout age and dummies for high school credit/ exit exams. The results of the regressions indicate that a negative correlation exists between higher minimum wages and the continuation ratio for grade 9-10's in states with legal dropout age below 18. The authors therefore concluded that older teenagers do not leave school as easily as the younger ones who have not accumulated enough human capital investment to realize the need for an education. This was also justified by the fact that states with legal dropout age over 18 experienced a lower negative correlation in comparison to others with lower legal dropout age.

A number of other economists in the United States estimated the impact of the minimum wage on school enrollment. Some of these authors (Neumark and Wascher, 1995b; Turner and Demiralp, 2001) find that higher minimum wages reduce school enrollment while others (Card, 1992 and Mattila, 1978) find a zero or positive correlation between minimum wage and school enrollment. Overall, the effect of the minimum wage on school enrollment is inconclusive as varying results were obtained. The differences in the elasticity outcomes can be explained by the fact that the various researchers used different methodologies and data sets.

Employment effects of the minimum wage have dominated minimum wage literature in Canada but few studies have been conducted to determine the impact of the

minimum wage on school enrollment. One of those studies was by Landon (1997) who investigated the impact of the minimum wage on school enrollment with pooled time – series data from 1975 – 1989 for six of the ten provinces in Canada. He modeled the enrollment rates of 16 and 17 year old males and females conditional on a set of explanatory variables, which he organized into four categories: the minimum wage variable, education spending and education structure variables, other economic variables and social structure variables.

The minimum wage variable was deflated by the average hourly wage. The education spending variables, which included the average teacher wage, student teacher ratio, spending on administration, spending on instructional supplies and operating expenses were found to be statistically insignificant. The results indicate that a 10% hike in the minimum wage caused school enrollment to reduce by 0.8 percent for 16-year-old males, 1.4 percent for 17-year-old males and 1.7 percent for 17-year-old females.

The enrollment measure used by Landon (1997) may need to be expanded to include enrollment rates by grade as opposed to enrollment rates by age. Enrollment rates by grade may better capture the effect of the minimum wage on schooling since it measures the effect of the minimum wage for definite groups of people.

Chapter 3

Theoretical Framework

3.1 Employment Effect of the Minimum Wage

In this section, we analyze the theory supporting the textbook evidence of the effect of the minimum wage on employment. Section 3.1.1 discusses the competitive market view, while section 3.1.2 looks at the monopsonistic view of a minimum wage effect.

3.1.1 The Competitive Model of Labour Supply and Demand

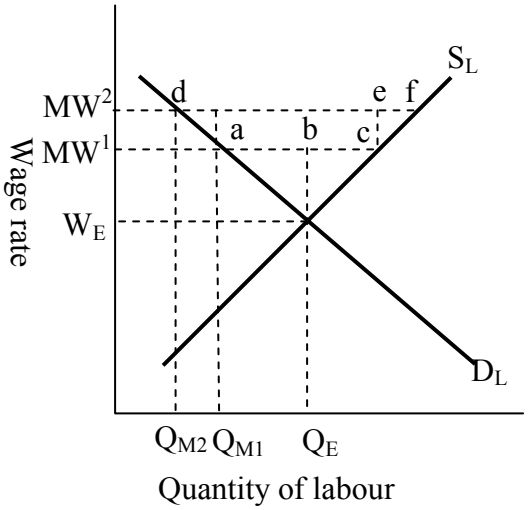
The competitive model of labour supply is the most basic model for analyzing the impact of a change in the minimum wage on such labour market variables as employment and participation rates. In this model, the market-clearing wage rate (W_E) and quantity of labour (Q_E) is determined by the intersection of labour demand and supply curves (D_L and S_L in Figure 3.1). This model assumes that homogeneity exists between all jobs and workers. It also assumes the employer to be a price taker. In reality, there are different categories of workers and jobs each commanding a different wage rate. Models of heterogeneous labour supply have been studied over the years for examples see Brown, et al, (1982) and Card and Krueger (1995).

Figure 3.1 below shows the upward sloping labour supply curve (S_L) that signifies an increase in labour market participation with an increase in wage rate. The marginal productivity of labour diminishes as wage rate rises thereby making labour less

affordable. The downward sloping labour demand curve (D_L = value marginal product) signifies the labour demand reduction that follows an increase in the wage rate.

The imposition of a minimum wage (MW) above the market-clearing wage (W_E) leads to a decline in employment as the employee's value marginal product falls below the minimum wage. In addition, the increase in participation rates that follows this wage increase creates an unemployment rates increase. Fig 3.1 below presents a graphical representation of the effect of the minimum wage (MW) in a competitive labour market with complete coverage of the minimum wage.

Figure 3.1: Minimum Wage in a Competitive Market



Source: Adapted from McConnell and Brue (1995)

The levels of employment at the equilibrium (market) and minimum wage at MW^1 are Q_E and Q_{M1} respectively. Notice from the graph that the minimum wage creates loss of jobs by the amount *ab*, as labour demand decreases to Q_{M1} thereby increasing participation by *bc* and causing unemployment by the amount *ac*. If this minimum wage

were well below the equilibrium wage, the allocation effects described in this analysis would not hold.

An increase in the minimum wage from MW^1 to MW^2 causes unemployment to increase to *df* and participation by *ef*. Textbook prediction therefore, in the context of the competitive model described above is that a minimum wage increase reduces employment and increases labour market participation rates.

Whether these theoretical assumptions actually reflect what goes on in reality with an imposition of the minimum wage is left to be seen from the results of this study. Existing empirical evidence as detailed in the literature review conducted in chapter 2 shows conflicting results as to the labour market allocation effects of the minimum wage legislation.

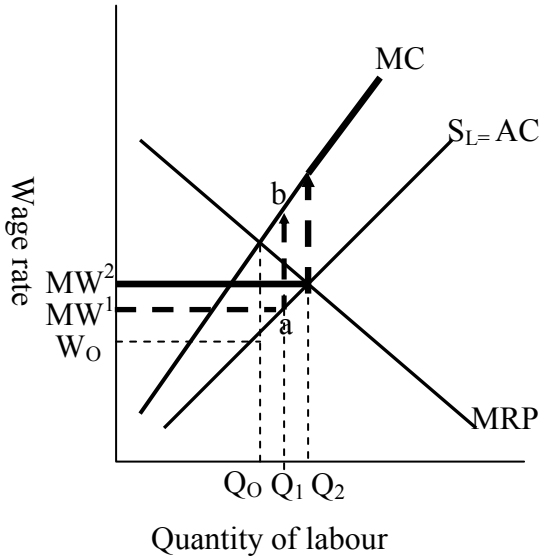
3.1.2 Minimum Wage and Monopsony

Monopsony is simply defined as a market with a single buyer of labour. The monopsonist faces an upward sloping labour supply curve (S_L=AC (average cost)) and in the absence of a minimum wage law, the monopsonist sets the wage rate (W_O) to be commensurate with the quantity of labour he needs to hire (Q_O in Figure 3.2 below). This wage is determined by the average cost of labour (AC) at that level of employment where the marginal revenue product (MRP) equals the marginal cost of labour (MC).

The non-discriminating monopsonist pays the same wage rate to all employees and finds that his extra cost of hiring one more worker (MC), is greater than the wage paid to that worker (AC). In the event of a minimum wage legislation where the imposed minimum wage (MW^1) is above the monopsonists wage rate (W_O), the monopsonist's average cost and marginal cost schedules become equal at the level of the minimum

wage. After the optimal hiring point (Q_1), the two schedules (MC and AC) return to their old shapes. Beyond (Q_1), the monopsonist will have to raise his wage rate if he needs to hire more workers.

Figure 3.2: Minimum Wage in the Monopsonistic Market (Case 1)



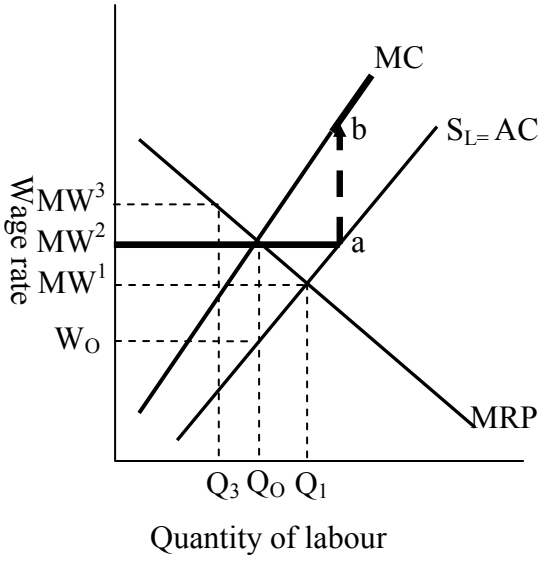
Adapted from McConnell and Brue (1995)

The monopsonist maximizes profit by equating his marginal cost (MC=MW^1abMC) to his marginal revenue product (MRP) at the same level with Q_1. Hence this minimum wage imposition had the effect of increasing employment from Q_0 to Q_1. Figure 3.2 above represents the effect of an increase in the minimum wage in a monopsonitic market with minimum wage levels below the competitive wage and the point of intersection of the MC and MRP curves. An increase in the minimum wage from MW^1 to MW^2 has the effect of increasing employment from Q_1 to Q_2 where the now horizontal marginal cost curve meets the marginal revenue product schedule.

Figure 3.3 below labeled as Case 2 represents the effect of an increase in the minimum wage for a monopsonist and in a situation where the initial minimum wage is on the level of the competitive wage. The effects of changes in the minimum wage are analyzed at and above the point where the MC curve intersects with the MRP curve.

At MW^1, employment is at Q_1. An increase in the minimum wage from MW^1 to MW^2 shifts the MC schedule to MW^2bMC. The point, at which the new MC schedule meets the MRP schedule, represents the optimal hiring position for the monopsonist (Q_0). A further increase in the minimum wage to MW^3 leads to a reduction in employment from Q_0 to Q_3 as the new MC curve MW^3 meets the MRP curve.

Figure 3.3: Minimum Wage in the Monopsonistic Market (Case 2)



Source: Adapted from McConnell and Brue (1995)

We can therefore conclude that the textbook evidence of the effect of the minimum wage in a monopsonistic market is either positive or negative and depends on the level of change in the minimum wage. Therefore the question of the effect of minimum wage on

the level of employment in the labour market remains an empirical one. In the same vein, since the employer raises his wage rate, labour force participation could increase in a bid to take advantage of the wage increases.

From the analysis carried out in this section, we see that the textbook evidence of the impact of the minimum wage on employment is either a positive or negative one. The direction depends on the type of labour market under consideration. Such extreme market forms rarely exist in the real world but different combinations of these forms can be found to exist.

3.2 Participation Decision

In this section, we explore some textbook evidence of the effect of the minimum wage on participation rates. Subsection 3.2.1 looks at the labour-leisure choice model, while 3.2.2 discusses discouraged and added worker effects.

3.2.1 Labour-Leisure Choice Model

In this model, the individual relies on his preferences for consumption goods (C) and leisure-time (L), which is a complement of labor supply to maximize his utility (U). Given his objective function U(C, L); the individual faces a number of constraints among which are the price of leisure (the wage rate) and the price of consumption goods. He then allocates time in each period between work and leisure and assuming all sources and use of funds have been exhausted, the constraints faced by the individual is represented by the following relationship:

$$PC = WH + V \qquad (3.1)$$

Where P is the price of a unit of consumption, C is a unit of consumption, W is wage rate (price of a unit of leisure), H is an hour of work, and V is non-labor income. Equation 3.1 above represents the equality between the total expenditure in goods and income. Given the wage rate, the individual decides whether to work or not and declines any offer to work if the wage rate is below his reservation wage. Reservation wage is defined as the wage rate below, which the individual chooses not to participate (Killingsworth, 1983).

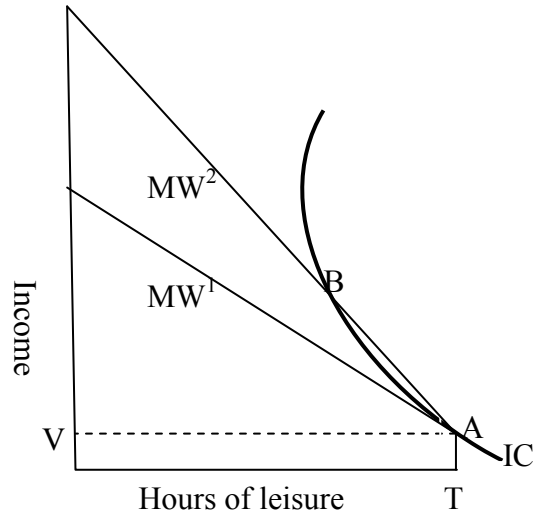
The consumer preferences can be graphically represented by indifference curves. Budget constraints are also used to demonstrate the individual's ability to choose from a range of work-leisure bundles depending on the wage rate available to the individual. The marginal rate of substitution for an individual depicts how much value he places on leisure time as opposed to work. A steep indifference curve as shown in Figure 3.4 and 3.5 below depicts an individual who requires a large amount of consumption in order to give up any additional leisure time. The market wage rate measures his ability to exchange leisure for income.

To maximize his utility, the individual will reach the highest possible indifference curve as constrained by his income. In the non-participant case, given MW^1 wage rate, highest level of utility possible is achieved at point (A) where the budget line meets the highest attainable indifference curve corresponding to maximum leisure (T), or zero hours of work. This is a corner solution since the equilibrium position occurs at one of the two extreme points on the budget line.

An increase in the minimum wage from MW^1 to MW^2 provides an incentive to the individual to participate in the labour market. This final decision is different for every

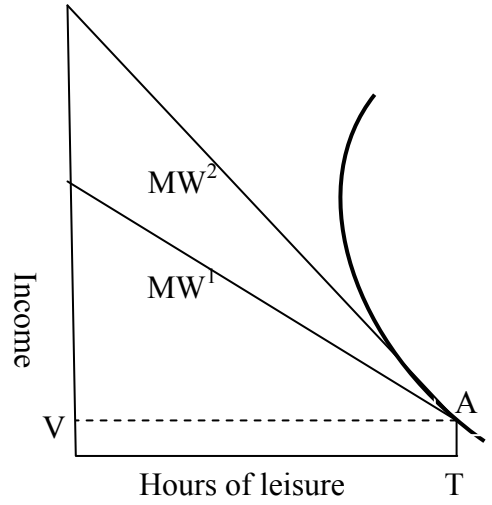
individual and the results are a function of his preferences, embodied in his indifference curves and also on the income and substitution effects of a wage change. The individual could become participant on AB segment (see Figure 3.4) or remain non-participant at point A (see Figure 3.5).

Figure 3.4: Non-Participant Equilibrium (Case 1)



Source: Adapted from Killingsworth (1983)

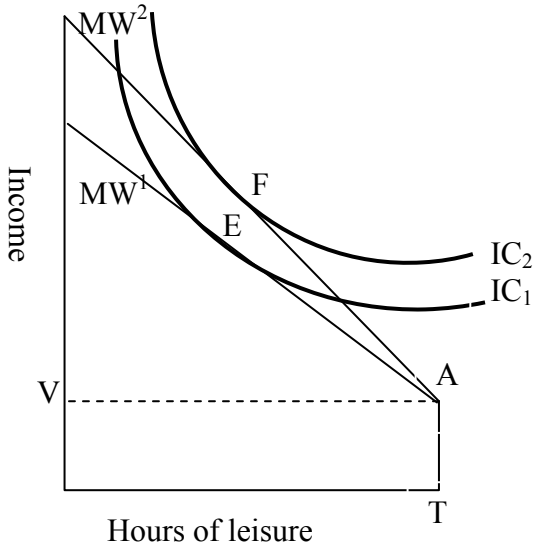
Figure 3.5: Non-Participant Equilibrium (Case 2)



Source: Adapted from Killingsworth (1983)

Figure 3.6 below represents a participant situation. In this interior solution, the equilibrium position (E) is achieved at the point of tangency between the budget line and the highest attainable indifference curve (Benjamin et al, 1998). For the participant, a minimum wage increase takes the individual to a higher indifference curve (IC_2) and a new equilibrium position (F). A number of unique possibilities exist for the individual, and these depend on his preferences as well as on the income and substitution effects of a wage change. For the participant, there is never an option to drop out of the work force.

Figure 3.6: Participant Equilibrium



Source: Adapted from Killingsworth (1983)

Overall, textbook evidence on the effect of minimum wage hikes on labour market participation is conclusive. The effect is an increase in labour market participation.

3.2.2 Discouraged/ Added Worker Effect

People's decision to participate in the labour force can also be affected by the state of the economy. This is evident in business cycle fluctuations and can be described

in the context of two important phenomena known as the discouraged and the added worker effects. The discouraged worker effect suggests that during a cyclical downturn participation rates decline. The rationale for the discouraged worker effect as suggested by McConnell and Brue (1995) is that expected wage rates (which represent the price of leisure) fall in these times thereby making leisure more affordable. Also when the probability of job finding falls, expected wage rates are low.

Killingsworth (1983) on the other hand describes this phenomenon in the context of reservation wages. He claims that during a cyclical downturn, a larger proportion of people get wage offers lower than their reservation wage and as a result of this, the participation rate falls since people will not work for wages below their reservation wage. The added-worker effect on the other hand has the opposite effect on labour market participation of affected workers. It involves spouses who become labour market participants to maintain their current standard of living after their spouses become unemployed Killingsworth (1983).

To determine the dominant phenomenon, some empirical work would be required. In general research shows that higher unemployment rates are accompanied by lower participation rates. McConnell and Brue (1995) suggest that the discouraged worker effect dominates because it is more representative of behavior in a majority of households. This is because these households may contain children as the unemployed members who may derive more benefit from attending school than joining the workforce to earn minimum wages.

Therefore based on all the textbook evidence given in this section, we can conclude that the effect of a minimum wage hike on participation rates is inconclusive. This effect

depends largely on the individual's choice based on his preferences and on the state of the economy.

3.3 Enrollment Decision

This section analyses the theory surrounding the effect of the minimum wage on enrollment rates. This will be done in the framework of the individual's choice of human capital investment model. A brief review of human capital theory will also be discussed in subsection 3.3.1.

3.3.1 Human Capital Theory

Adam Smith (1776) recognized that a nation's capital stock is made up of both human and physical capital and made comparisons between these two forms of capital. He pointed out that human capital as well as physical capital both involve costs and provide an opportunity for improved productivity for the individual and the nation alike. Some early works (Denison, 1962; Becker, 1962 and Mincer 1962) upheld this view and assumed that a large proportion of the income differentials observed in their studies was due to differences in educational attainment. Ben-Porath (1967) developed a model to demonstrate how various aspects of the production function affect an individuals lifetime earnings. He sought with the use of this model to examine the relationship between the accumulation of human capital and the lifetime of earnings.

3.3.2 Individual's Choice of Human Capital Investment

The individual exists within a lifetime objective function, which he seeks to maximize. He has a choice to make between investing in his human capital, and joining the labour market. The rationale behind human capital theory is the improvement of

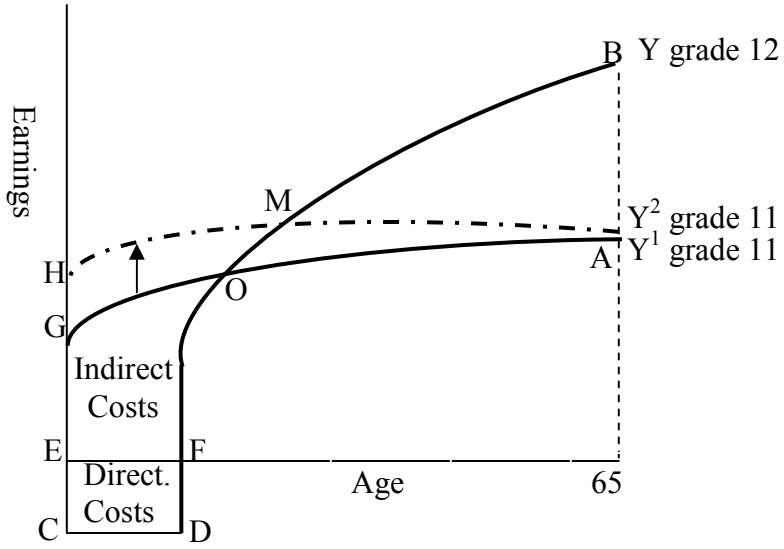
productivity and earnings through human capital investment. Education, which is a well-known form of human capital investment, involves both direct and indirect costs of schooling in the form of forgone earnings. The individual's decision to acquire additional education will be based on a cost-benefit analysis to determine how profitable additional education might be to him in terms of higher productivity and future earnings. He would need to gather all the information he needs to conduct this analysis to avoid ignoring hidden costs and benefits, which might make enormous differences in any conclusion made.

In order to decide, the individual compares the direct and indirect costs of investment with the benefits that could accrue from this investment. He/ she should invest if the present value of costs involved is less than the present value of benefits. The decisive factor for making an investment is based mostly on the internal rate of return, which is defined as the breakeven discount rate that equates the present value of costs and the present value of benefits. If the individual's internal rate of return is greater than the market rate of interest plus a risk premium, then he finds it profitable to invest, as his present value of benefits is greater than the present value of costs.

Given the internal rate of return, the individual has a rate of time preference (Δ), which makes him indifferent between the present and the future. The value of Δ is subjective and differs from one individual to the next. If $\Delta = 0.10$ or 10%, then a dollar now is equivalent to \$1.10 (\$1 + 10% of a dollar) next year. Present oriented people have higher Δ's and vice-versa for future oriented people. The individual's decision to invest will now depend on a comparison between his internal rate of return and his rate of time

preference. If his rate of time preference (Δ) is less than his internal rate of return (IRR), the individual may decide to invest.

Figure 3.7 Earnings Profiles for Grades Eleven and Twelve



Source: Adapted from Polachek and Siebert (1993)

Figure 3.7 above shows the earning profiles for grades eleven and twelve. It presents choices for an individual - to work or to continue attending high school up until grade 12. If the individual works, he earns \$G in the beginning and Y^1 grade 11 by the end of his working career. On the other hand, if he decides to attend grade 12 and possibly graduate, he would have negative earnings in the beginning (-\$C) as a result of the additional costs (both direct and indirect) incurred in that additional year. However, after he graduates, his earnings eventually rise to Y grade 12. Therefore, attending one more year of high school is beneficial as future earnings are enhanced by the vertical distance between OA and OB (Polachek and Siebert, 1993).

However, a minimum wage increase will have the effect of raising the individual's current earnings to H at the present and eventually to Y^2 grade 11. Y^2 grade 11 may be on the same level as Y^1 grade 11 because the minimum wage may eventually stop rising after it reaches a certain level in the individuals lifetime. In the same vein the indirect costs encountered if he chooses to attend school at the present rises from GOFE to HMFE. The individual may need to reevaluate his choice to work or not given the additional costs and benefits presented by the wage increase. A wage increase therefore may have the effect of either increasing or reducing grade twelve enrollments depending on the individual's considerations.

Chapter 4

Specification, Data, and Descriptive Statistics

In order to estimate the impact of the minimum wage on high school enrollment, employment and participation rates, we have estimated our regressions using the panel data technique. A number of reasons influenced the choice of panel data for carrying out this study. Firstly, minimum wage in Canada is under provincial jurisdiction unlike in the United States where it is under federal jurisdiction. Secondly, enough heterogeneity exists in minimum wage data in the different Canadian provinces to allow for this kind of study. Thirdly, due to data limitations, the choice of panel data would greatly increase the number of observations used and the power of the regression. Fourthly, the need for analyzing aggregate employment, labour force participation and enrollment for successive changes in the minimum wage also justifies the use of panel data. Lastly, the other techniques (time series and natural experiments, etc) all have inherent shortcomings, which could be mitigated by the use of panel data. This chapter discusses the four different specifications that have been employed, the estimation techniques, data used for this study and a detailed description of the data.

4.1 Alternative Specifications

Four different specifications have been used to carry out this study. Firstly, a level specification is used to estimate the effect of the minimum wage on schooling continuation ratios, enrollment, employment and participation rates. Continuation ratios

measure the tendency for one to move to the next grade. Equation 4.1 below presents a general form of this specification:

$$Y_{it} = Bo + B_m MW_{it} + B_x X_{it} + e_t \qquad (4.1)$$

Where Y_{it} is the enrollment, continuation, employment or participation rate in state i and in period t. MW_{it} is the minimum wage variable. X_{it} is a set of independent variables including the prime aged male unemployment rate, gross domestic product, and population ratio just to mention a few. B_o, B_m and B_x are the regression coefficients for the intercept, minimum wage and other independent variables in the regression while e_t is the stochastic error term.

The second specification is the differenced specification. In this specification, first differences of the data are taken with a loss of the first observation. This panel data technique is particularly advantageous as it helps eliminate the incidence of highly persistent time series processes. The intercept from this regression represents the change in the intercept from one period to the other. Equation 4.2 below presents a general form of this specification:

$$\Delta Y_{it} = B_0 + B_m \Delta MW_{it} + B_x \Delta X_{it} + \Delta e_t \qquad (4.2)$$

Where ΔY_{it} is the change in the dependent variable in state i and in period t from one year to the other. ΔMW_{it} is the change in the minimum wage variable from one year to the other. ΔX_{it} is the change in the set of independent variables from one year to the

other. Δe_t represents the change in the stochastic error term. B_0 represents the intercept coefficient, which in this specification is the change in the intercept from one year to the other.

The third and fourth specifications are both level estimates with a fixed effect specification where the former does not include any trend terms and the latter includes a quadratic trend. Quadratic trends were chosen to account for the unusual trending pattern of the data. Unobserved factors that may affect the outcome of our regressions exist between the provinces. These specifications will help account for those factors to help arrive at more efficient estimators. General forms of these two specifications are presented in equations (4.3) and (4.4) below:

$$Y_{it} = a_i + B_m MW_{it} + B_x X_{it} + e_{it} \qquad (4.3)$$

$$Y_{it} = a_i + B_m MW_{it} + B_x X_{it} + + B_t t + B_{t2} t^2 + e_{it} \qquad (4.4)$$

Where *ai* represents province fixed effects estimated as dummy provinces for each province. The t and t^2 represent trend and trend-squared which together constitute a quadratic trend. B_t and B_{t2} represent the regression coefficients for the trend and trend squared.

4.2 Estimation of the Employment Equation

In this section, we present our empirical specification for estimating the relationship between the minimum wage and employment, conditioning on a set of

explanatory variables. Data definitions and sources as well as discussions are also included.

4.2.1 Employment Specification

After some adjustments were made to the general form of the equation used by Ragan (1977), Mincer (1976) and Baker and Stanger (1999) to suit the purpose of this research, the employment equation which is an adaptation of the first specification (level) has the following form:

$$(EMPR)_{it} = B_0 + B_1 (MINW)_{it} + B_2(GDP)_{it} + B_3 (UNPR)_{it} + B_4 (POPBRW)_{it} + u_{it} \quad (4.5)$$

$\forall\ i = 1,\ldots\ldots, 10, \forall\ t = 1,\ldots\ldots, 20$

Where: $(EMPR)_{it}$ is the employment rate in the ith province at time t; $(MINW)_{it}$ is minimum wage in the ith province at time t controlled for inflation using the provincial consumer price index; $(GDP)_{it}$ is the real per capita Gross Domestic Product for the ith province at time t in thousands of dollars deflated by the provincial consumer price index in 1992 constant dollars; $(UNPR)_{it}$ is the unemployment rate for prime age males (25–54 years) for the ith province at time t; and $(POPBRW)_{it}$ is the population of the relevant age group expressed as a percentage of the total working age population (15-64 years) for the ith province at time t.

The minimum wage coefficient (B_1) should show the relationship between the minimum wage and employment. The expected sign for this coefficient remains a puzzle considering the variation in the results from the minimum wage literature studied in chapter 2. This result is also expected to vary with the demographic group being studied.

Lester (1964) believed that a minimum wage increase could increase employment if it reduces labour turnover and improves productivity. On the other hand, Stigler (1946) believed that a minimum wage increase caused a decline in employment among workers earning below the proposed minimum. The minimum wage variable is deflated by the consumer price index. Results from previous studies show that using different minimum wage deflators make no difference in the inference, see Baker and Stanger 1999. This equation is an adaptation of the model used by Baker and Stanger (1999). Differences exist between the definition of the minimum wage variable used by Baker and Stanger and the one used in this study. They used a minimum wage variable with the same form as the Kaitz index while the minimum wage variable used here is the real minimum wage.

Priori expectations are that the coefficient for the Gross Domestic Product (B_2) should be positive. This variable was included to capture the cyclical effects of the economy on the employment rate. The unemployment rate of prime age males in the economy was also included to capture the cyclical effects of labour demand conditions. This variable has been used in several past studies and has often been shown to have a good explanatory power. The expected sign for the coefficient of this variable (B_3) is negative as the variable reflects the level of demand for employment in the economy.

It's expected that the coefficient for the population of the relevant age group expressed as a percentage of the total working age population (B_4) will be positive since an increase in the relative supply of any group is likely to increase the rate at which they are employed. This is true because an increase in the relative supply of each group reduces the competition faced by that group from the other age groups. This will be

especially true if a high rate of job substitution exists between the different demographic groups. This variable is included in order to capture the supply-side effects of employment. This is necessary since the level of employment in any economy is determined by an interaction between demand and supply. A number of past studies have used the enrollment rate as a supply variable to capture this effect. This was not a consideration in this study, as enrollment rates are believed to be correlated with the minimum wage. Including this variable as an independent variable may create multicollinearity in the employment equation. The coefficient in the trend terms should show the rate at which the dependent variable changes on average from one period to the other all things being equal.

The alternative specifications discussed in section 4.1 above will be employed to run the regressions for the 'both sexes', male and female demographic groups before arriving at a conclusion. Also the minimum wage effect on employment will be estimated for males, females and both sexes in the 15-19, 15-24, 20-24 and 25-54 demographic groups in order to capture the differentials that may exist between these groups.

4.2.2 Employment Equation: Data and Sources

Data used in this study was obtained from the Canadian Socio-Economic Information Management system (CANSIM), Statistics Canada publications and Human Resources Development Canada (HRDC). Data ranges from 1981 to 2000 per province. See Appendix C for the complete series numbers of all the CANSIM data used.

Employment Rate:

This is the September value of employment rate for the different demographic groups (males, females and both sexes in the 15-19, 15-24, 20-24 and 25-54 age groups).

September value was used because September exemplifies the start of the school year. Data was obtained from CANSIM.

Minimum Wage:

This is the adult hourly minimum wage rate. The relevant minimum wage rate for the workers under federal jurisdiction is the adult minimum wage in the province where the job is held. For most provinces differential wage rates do not exist for youths and even when they exist is not significantly different from the adult minimum wage thereby justifying the use of the adult wage rate. Data used in this study was obtained through a special inquiry from Human Resources Development Canada website (2003). A number of the provinces under study operated with more than one minimum rate in the same calendar year in the period under study. When this is the case, the minimum rate to be used in any particular year will be that in existence in the month of September for the particular jurisdiction.

Gross Domestic Product:

This is the annual real per capita Provincial Gross Domestic Product in thousands of dollars deflated by the Provincial Consumer Price Index in 1992 constant dollars. Both series of data were obtained from CANSIM.

The Prime-age Male Unemployment Rate:

This is the September value of unemployment rate for males between 25 and 54 years. Data was obtained from CANSIM.

Population:

These are the annual population estimates. Population ratios were calculated using these population estimates. Data was obtained from CANSIM.

4.2.3 Employment Equation: Descriptive Statistics

Table 4.1 below presents the descriptive statistics for the variables used to estimate the employment equation.

Table 4.1: Employment Equation: Descriptive Statistics

Variable/ Age group	Statistics	
	Mean	**Standard Deviation**
MINW[1]	5.173609	0.486258
EMPRB (15-19)	39.93300	9.708780
EMPRM (15-19)	40.78550	10.55225
EMPRF (15-19)	39.07100	9.606199
EMPRB (15-24)	53.19750	8.574137
EMPRM (15-24)	54.98150	9.339719
EMPRF (15-24)	51.32100	8.290278
EMPRB (20-24)	66.03450	7.304742
EMPRM (20-24)	68.93150	8.123863
EMPRF (20-24)	63.02950	7.211958
EMPRB (25-54)	74.88950	6.936926
EMPRM (25-54)	84.42850	6.294788
EMPRF (25-54)	65.33350	9.013576
UNRP	7.953254	2.974576
GDP[2]	22501.32	4908.753
POPBRW (15-19)	0.138295	0.080062
POPMRW (15-19)	0.070934	0.041036
POPFRW (15-19)	0.067375	0.039024
POPBRW (15-24)	0.280617	0.157108
POPMRW (15-24)	0.143341	0.080216
POPFRW (15-24)	0.137283	0.076908
POPBRW (20-24)	0.142318	0.077860
POPMRW (20-24)	0.072410	0.039632
POPFRW (20-24)	0.069911	0.038247
POPBRW (25-54)	0.806984	0.494740
POPMRW (25-54)	0.406110	0.248920
POPFRW (25-54)	0.400876	0.245893
[1]Minimum wage described is the real minimum wage deflated by Consumer Price Index		
[2]Gross Domestic Product is per capita GDP in thousands of dollars		
Variables have been defined in table 1		
Source: Author's compilation from regression data		

A table with the definitions of the acronyms included in this table of descriptive statistics and in all sections of this thesis can be found in Table 1. The mean population

ratios and employment rates for each of the age-sex groups as well as the mean *GDP* and *UNRP* are the simple means of the two hundred pooled provincial time-series for the 1981 to 2000 time period. Notice that the mean employment rates and population ratios for males are higher than that for females for all age groups. Also for employment rates, the means tend to increase with the older age groups.

4.3 Estimation of the Labour Market Participation Equation

This section presents the empirical specification for estimating the relationship between the minimum wage and labour force participation, conditioning on a set of explanatory variables as well as data definitions and sources.

4.3.1 Participation Specification

The empirical specification for the participation equation is expected to be no different from that of employment as the same variables affect both employment and participation rates. Therefore an adjustment of the specification of the employment equation in Equation 4.5 above is used to estimate the effect of the minimum wage on participation rates. This model is also similar to the models employed by Swidinsky (1980) and Schaasfsma and Walsh (1983) with the exception of the fact that Swidinsky used region dummies as opposed to province dummies and Schaasfsma and Walsh excluded the prime aged male unemployment rate as an explanatory variable. The following is the participation equation:

$$(PARTR)_{it} = B_0 + B_1 (MINW)_{it} + B_2(GDP)_{it} + B_3 (UNPR)_{it} + B_4 (POPBRW)_{it} + u_{it} \quad (4.6)$$

$\forall\ i = 1,\ldots\ldots.., 10, \forall\ t = 1,\ldots\ldots.., 20$

Where $(PARTR)_{it}$ is the participation rate of the relevant demographic group in province i and in time t.

The expected sign for the minimum wage coefficient (B_1) in the participation equation remains a puzzle just like in the employment equation because of the results derived in past studies even though textbook evidence showed the participation rate to increase with an increase in wages. The coefficient on Gross Domestic Product (B_2) is expected to be positive as participation rates should increase with the Gross Domestic Product, which indicates how buoyant the economy is at any particular point in time. The coefficient on the unemployment rate of prime aged males (B_3) is expected to be negative as the variable should be a good indicator of how many jobs there are to go round all labour force participants.

It's expected that the coefficient for the population of the relevant age group expressed as a percentage of the total working age population (B_4) will be positive since an increase in the relative supply of any group is likely to increase the rate at which they participate in the labour force.

A big challenge in minimum wage studies is determining which explanatory variables to use during regressions. F-tests for exclusion restrictions were used to identify which variables to include in the regression model for the employment and participation regressions. Results of the F-test showed the Population parameter *(POPRW)* and the real per capita *GDP* variables to have an effect on employment and participation rates after Minimum wage and Unemployment rates of prime aged males had been controlled for. Also F-tests to check the overall significance of the regression showed that the

independent variables help to explain the dependent variables in these regressions. This in addition to the significant t-statistics derived from these additional parameters leads us to conclude that inclusion of these variables were a step in the right direction for obtaining an unbiased minimum wage coefficient. The minimum wage effect on participation rates will be estimated for males, females and both sexes in the 15-19, 15-24, 20-24 and 25-54 demographic groups.

The participation rate persisting in September was obtained from CANSIM. Explanatory variables are the same for the employment equation discussed in the previous section. Table 4.2 below shows the descriptive statistics peculiar to the variables included in the participation equation.

4.3.2 Participation Equation: Descriptive Statistics

Table 4.2 below presents the descriptive statistics (means and standard deviations) peculiar to the participation equation.

Table 4.2: Participation Equation: Descriptive Statistics

Variable/ Age group	Statistics	
	Mean	**Standard Deviation**
PARTRB (15-19)	48.35500	9.550620
PARTRM (15-19)	49.80050	10.09478
PARTRF (15-19)	47.10950	9.186097
PARTRB (15-24)	62.67750	7.397517
PARTRM (15-24)	65.36000	7.971961
PARTRF (15-24)	59.98800	7.411702
PARTRB (20-24)	76.49053	5.316801
PARTRM (20-24)	80.23895	5.809157
PARTRF (20-24)	72.64632	5.633673
PARTRB (25-54)	82.39800	4.584965
PARTRM (25-54)	92.11000	3.289285
PARTRF (25-54)	72.67700	7.432076
Variables have been defined in Table 1		
Source: Author's compilation from regression data		

The mean participation rates for each of the age-sex groups are the simple means of the two hundred pooled provincial time-series for the 1981 to 2000 time period. The

mean participation rates tend to increase with the higher age groups and are higher for males than for females in each category.

4.4 Estimation of the Enrollment Equation

In this section, we present our empirical specification for estimating the relationship between the minimum wage, high school enrolment and high school continuation ratios conditioning on a set of explanatory variables. Also included are data definitions and sources.

4.4.1 Enrollment Specification

To estimate the effect of minimum wages on school enrollment, grade ten, eleven and twelve enrollment rates were used as dependent variables conditioning on a set of explanatory variables. This model included three additional variables to those used in the employment and participation equations. These additional variables were some of the sixteen explanatory variables used by Landon (1997) to estimate the effect of the minimum wage on enrollment rates by age groups. The choice of these additional variables was influenced by necessity as well as the significant results obtained from these variables in Landon's study. The following model will be estimated to determine the direction of the relationship between the minimum wage and school enrollment for high-schoolers:

$$(ENRR)_{it} = B_0 + B_1(MINW)_{it} + B_2(GDP)_{it} + B_3(UNPR)_{it} + B_4(POPBRW)_{it} + B_5(STRATIO)_{it} + B_6(AVAGE)_{it} + B_7(DIV)_{it} + u_{it} \quad (4.7)$$

$\forall\ i = 1,\ldots\ldots, 10, \forall\ t = 1,\ldots\ldots, 20$

Where: $(ENRR)_{it}$ is the enrollment rate for the ith province at time t; $(POPBRW)_{it}$ is the population of teens expressed as a percentage of the total working population; $(STRATIO)_{it}$ is the student teacher ratio for the ith province at time t; $(AVAGE)_{it}$ is the average age of teachers for the ith province at time t; $(DIV)_{it}$ is the divorce rate for the ith province at time t.

The expected sign for the minimum wage coefficient (B_1) is as much a puzzle as it is for the employment equation. For the minimum wage to affect school enrollment, it has to affect labour market variables such as employment and participation rates. Two different rationales exist for explaining the possible impact of the minimum wage on school enrollment. One is the rationale that an increased minimum wage leads to a heightened level of competitiveness in the job market for the few available jobs hence keeping teenagers in school (Ehrenberg and Marcus, 1980). The second rationale for a positive relationship between the minimum wage and school enrollment has to do with requirements for greater human capital investment in the event of a minimum wage hike. Employers may require workers with greater levels of productivity when a minimum wage is increased (Agell and Lommerud, 1995). An increase in the minimum wage can discourage teenagers who mostly are in the minimum wage bracket based on their level of experience from seeking jobs. This is because the textbook description of the impact of the minimum wage on employment rates may give them an incentive to remain in school, as there may only be few options available to them. On the other hand, an increase in the minimum wage may serve to decrease school enrollment rates as the increase in wage

experienced by an increase in minimum wage raises the opportunity cost of education (Neumark and Wascher, 1995b).

The coefficient on Gross Domestic Product *(B_2)* is expected to be negative, as a buoyant economy may be an incentive for teenagers to desire work more than schooling. The unemployment rate of prime aged males in the economy is expected to have a positive coefficient *(B_3)*. In this study, a rise in this variable would encourage students to enroll in school since the probability of their finding jobs is reduced. It's expected that the coefficient for the population of the relevant age group expressed as a percentage of the total working age population *(B_4)* will be negative. This is because as the proportion of teens to the working age population increases, competition for available jobs is less from other demographic groups so enrollment is expected to decrease.

The student teacher ratio *(STRATIO)* was included to capture any effect that education spending may have on school enrollment. This variable is expected to be negatively correlated with school enrollment as one will expect that if the student teacher ratio increases then fewer students would want to be enrolled since the quality and efficiency of the instruction they may receive may decline. The average age of teachers *(AVAGE)* was included as proxy for teacher experience. This same variable was used by Landon (1997) in his work '*High School Enrollment, minimum Wages and Education Spending'*. If the average age of teachers is high, then the teachers are likely to be more experienced and this therefore could create an incentive for students to remain in school. The divorce rate variable *(DIV)* was included in order to capture the impact the social structure of the economy may have on school enrollment. The expectation is that an increase in the divorce rate in the economy will result in a decline in school enrollment as

divorce may have the effect of allowing teenagers with choices that normally would not have existed for them if their parents were together.

F-tests were conducted to prove that the three additional variables to be included in the enrollment equations; Average age of teachers *(AVAGE)*, Divorce rate *(DIV)* and Student teacher ratio *(STRATIO)* were necessary to explain the variation in school enrollment after all the afore mentioned variables had been controlled for. Also F-tests to check the overall significance of these regressions showed that the variables do explain the variations in school enrollment.

4.4.2 Enrollment Data and Sources

Enrollment Data:

Data for high school enrollment of teenagers was obtained from the statistics Canada publications: elementary-secondary enrollment 1981-82 to 91-92 with Catalogue number 81-210 for the 81-82 to 91-92 school years, education in Canada a statistical review with Catalogue No. 81-229-XIB for the 1992-93 to 95-96 school years and from education in -Canada 1996 to 2000 with Cat. No.81-229 for the 96-97 to 98-99 school years. Note the data limitation with enrollment data which is only available from 1981-82 to 1998-1999 school years. This reduces the number of observations for the enrollment and continuation ratio observations by twenty. Also note that data segregation by male and female enrollment is only available until the 1991-92 school year thereby reducing the male and female regressions by seventy more observations. Also, the second specification (first differencing) results in the loss of one observation thereby further reducing the number of observations. These data limitations will greatly affect the results for enrollment and continuation ratios so greater reliance will be placed on results from

the ‘both sexes’ specification with data ranging from the 1981-82 to 1998-99 school years.

Student Teacher Ratio:

Data was obtained from the statistics Canada publication education in Canada: a statistical review 1982 to 1991 for the 1981-82 to 1990-91 school years and from education in Canada 1996 to 2000 Catalogue No. 81-229-XIB for the 1991-92 to 1998-99 school years.

Average Age of Teachers:

Data was obtained from the statistics Canada publications: education in Canada: a statistical review 1982 to 1991 for the 1981-82 to 1990-91 school years and from education in Canada 1996 to 2000 for the 91-92 to 98-99 school years.. Data for Quebec is missing in the 1981-82 and 1982-83 school years. Also, grade twelve enrollment is not available for Quebec in all years.

Divorce Rate:

This is the crude divorce rate per 1000 population. Actual data used was for the present and two previous years. Data was obtained from the statistics Canada publication Vital Statistics marriages and divorces 1985 with Catalogue number 84-205 for 1978 to 1985 and vital statistics compendium 1996 with Catalogue number 81-214-XIE for 1986 to 1996 and from CANSIM for 1997 and 1998.

4.4.3 Enrollment Equation: Descriptive Statistics

Table 4.3 below presents the descriptive statistics (mean and standard deviation) peculiar to the enrollment equation.

Table 4.3: Enrollment Equation: Descriptive Statistics		
Variable/ Grade	**Statistics**	
	Mean	**Standard Deviation**
ENRRB (10)[1]	49.5720	0.033381
ENRRM (10)	47.9062	0.035555
ENRRF (10)	48.8904	0.027873
ENRRB (11)	46.5413	0.043150
ENRRM (11)	44.0522	0.046092
ENRRF (11)	45.8735	0.033834
ENRRB (12)	51.0093	0.252466
ENRRM (12)	43.1127	0.072724
ENRRF (12)	45.2513	0.071908
AVAGE	40.9781	2.058880
DIV	7.43436	1.830250
STRATIO	16.7185	1.180550
[1]The school enrollment percentages are expected to be approximately 50% as population figures for two age groups were used to calculate the percentages for each age-sex group.		
Variables have been defined in table 1		
Source: Author's compilation from regression data		

The mean enrollment rates for each of the grade-sex groups are the simple means of the one hundred and eighty pooled provincial time-series for the 1981-82 to 1998-1999 school years. Notice that the mean enrollment rates reduced with an increase in grade level. These means tend to be higher for females than it is for males.

4.4.4 Continuation Ratio Specification

Grade and overall continuation ratios were also used as measures of school enrollment. These same measures were used by Chaplin, et al, (2003) to estimate the impact of minimum wage on school enrollment. These grade continuation ratios are considered to be good measures as they capture school involvement better than enrollment rates which have been used in most previous studies as a measure for school enrollment.

However, these grade continuation ratios have some drawbacks. One of those is that they are affected by students being held back a grade and by students who dropout of school. Chaplin, et al, (2003) discovered that being held back a grade was more likely to

occur than dropping out. Being held back may bias the results because when students are held back in a specific grade, they increase the continuation ratio for that grade while reducing the continuation ratio for the previous grade. Using overall continuation ratios could combat this problem according to the authors, as they will not be affected as such by grade retention rates. They would only be influenced by dropouts or as the case may be migrants.

We will have to assume that migration is not correlated with the minimum wage variable since we are not including it as an independent variable. Out of province migrations tend to be expensive and will be unlikely to occur just in an attempt to take advantage of a few cents change in the minimum wage. Overall continuation ratio will account for skipped grades but not migration (Chaplin et al, 2003). The following models based on the level estimate will be estimated to determine the impact of the minimum wage on grade and overall continuation ratios.

$$(CONR)_{it} = B_0 + B_1(MINW)_{it} + B_2(GDP)_{it} + B_3(UNPR)_{it} + B_4(POPBRW)_{it} + B_5(STRATIO)_{it} + B_6(AVAGE)_{it} + B_7(DIV)_{it} + u_{it} \quad (4.8)$$

$$(CONBOVER)_{it} = B_0 + B_1(MINW)_{it} + B_2(GDP)_{it} + B_3(UNPR)_{it} + B_4(POPBRW)_{it} + B_5(STRATIO)_{it} + B_6(AVAGE)_{it} + B_7(DIV)_{it} + u_{it} \quad (4.9)$$

$\forall\ i = 1,\ldots\ldots, 10, \forall\ t = 1,\ldots\ldots, 20$

Where $(CONR)_{it}$ is the continuation ratio in the ith province in time t and $(CONBOVER)_{it}$ is the overall continuation ratio in the ith province in time t. Continuation

ratios were calculated from enrollment and graduation data. Data for high school graduation was obtained from the statistics Canada publication Education Indicators in Canada: A Statistical Review for 1981-82 to 1991-92 school years and from education in Canada for the 92-93 to 98-99 school years. These grade continuation ratios have been defined in table 4.4 below:

Table 4.4: Grade Continuation Ratios	
Grade 9 - 10	Grade 10 enrollment in year t/ year t-1 grade 9 enrollment
Grade 10 - 11	Grade 11 enrollment in year t/ year t-1 grade 10 enrollment
Grade 11 - 12	Grade 12 enrollment in year t/ year t-1 grade 11 enrollment
Overall	Graduates in year t-1 + grade 10 – 12 in year t/ grade 9-12 in year t-1
Source: Chaplin, et al, (2003)	

4.4.5 Continuation Ratio Equations: Descriptive Statistics

This section presents some descriptive statistics peculiar to the continuation ratio specifications.

Table 4.5: Continuation Ratio: Descriptive Statistics		
Variable/ Grade	**Statistics**	
	Mean	**Standard Deviation**
CONRB (10-11)	0.950049	0.055599
CONRM (10-11)	0.935583	0.067389
CONRF (10-11)	0.951154	0.049833
CONRB (11-12)	1.072061	0.491906
CONRM (11-12)	0.975337	0.149373
CONRF (11-12)	0.991801	0.142146
CONRB (12-G)	1.253409	0.519075
CONBOVER	0.913333	0.159729
Variables have been defined in table 1		
Source: Author's compilation from regression data		

The mean continuation ratios for each of the grade-sex groups are the simple means of the one hundred and seventy pooled provincial time-series calculated from the 1981-82 to 1998-1999 school years. The continuation ratios tend to increase for the

higher grade levels and female grades 10-11 and 11-12 continuation ratios tend to be higher than that for their male counterparts.

Chapter 5

Econometric Results and Interpretations

This chapter presents and analyses the results derived in the course of this research. Section 5.1 presents the alternative specifications used to conduct this research as well as some econometric problems encountered. Section 5.2 presents the detailed empirical results obtained. Section 5.3 analyses the minimum wage effect on school enrollment, continuation ratios, employment and participation rates.

5.1 Alternative Specifications and Econometric Issues

The different specifications stated in chapter four (see Equation 4.1 to 4.4) have been estimated using the E-views software to determine the effect of the minimum wage on the labour market variables being studied. These specifications are level, first differenced, level with fixed effects without trend terms and level with fixed effects and a quadratic trend. The different specifications in general, are representative of those used by early and recent minimum wage researchers. The complete results (using all the above mentioned specifications) can be found in the appendix.

The fourth specification represented in Equation 4.4 is the preferred specification. This specification is preferred for a number of reasons. Firstly, the use of a fixed effects estimate is appropriate in the given situation as the 10 provinces being studied are under different jurisdictions. Allowing different intercepts for each province will help to capture the effect of the minimum wage while taking the inherent differences in the provinces

into consideration. In essence, conducting a research of this form without putting this fact into consideration can severely bias the results obtained.

Secondly, the first differenced estimates were mostly statistically insignificant for all areas studied. Even though differencing may help reduce the incidence of serial correlation in the residuals, it was not favorable because the differencing greatly reduced the variation in the minimum wage data thereby making it unreliable for this nature of research. Taking longer differences (third, fourth or fifth) would have helped eliminate this problem, but this will greatly reduce the number of observations and the power of the regression.

Thirdly, the choice of the fourth specification was also influenced by the fact that most of the data used in this regression exhibited both upward and downward trends at different points in the data sets. Quadratic trends were included in the fourth specification to help account for the unusual trending nature of the data. Although the results from this specification do not differ markedly from the third specification, the fourth specification is believed to be a better representation of the minimum wage effect. The trend terms *TREND* and *TRENDSQ* were mostly found to have significant t-statistics. F-tests carried out on this specification also show that the variables included were jointly significant. A number of past studies (see Baker and Stanger, 1999) used time dummy variables to account for time effects and found that it made no significant difference in the inference. Using quadratic trends will help account for those time effects as well as help dilute the effect of the trending data.

Lastly, results from the regression showed the adjusted R-squared from the regressions of the fourth specification to be significantly larger than that of other

specifications. The Durbin Watson Statistics from this fourth specification also were significantly larger thereby showing a reduction in the positive serial correlation, which seemed to be present in the residuals.

However, serial correlation was a potential problem in the regressions for the preferred specification causing the estimators to be inefficient. The Durbin-Watson statistics presented in table B.1 in Appendix B show evidence of positive serial correlation in the residuals. This statistic assumes that the regressors are strictly exogenous (not correlated with the error term in any period) so the t-test for serial correlation, shown in table B.2 in the appendix was used to confirm the Durbin-Watson test results. This test was suggested by Wooldridge (2003) to be used for testing for the presence of serial correlation when regressors are not strictly exogenous. The results from this test are also valid if the regressors are strictly exogenous.

A lag of the dependent variable was included as an explanatory variable in the regressions to ascertain if the presence of serial correlation was as a result of the failure to capture the complete dynamics of the model. The inclusion of this variable seemed to greatly minimize the presence of serial correlation in the residuals as the t-test results for the final regression shown in table B.3 in the appendix failed to reject the null of no serial correlation. The final regressions with the lagged term were tested for heteroskedasticity using the Lagrange Multiplier test suggested by Greene (1993). The results from this test are reported in table B.4 in Appendix B and show that the error terms were heteroskedastic. Homoskedasticity assumes that the variance of the error term is constant across different segments of the population and even though heteroskedasticity does not

cause bias or inconsistency in results, it could render the statistics used to test hypotheses invalid by downwardly biasing the standard errors in some cases (Woolridge, 2003).

To account for this problem, the White heteroskedasticity robust statistics are reported for the regressions with a lag of the dependent variable. This statistic is robust to general forms of heteroskedasticity. The regressions with a lagged value of the dependent variable have been reported in the body of the thesis while all the other results for the four specifications in the study are reported in the appendix. Non-robust statistics are reported for the other results in appendix A.

5.2 Empirical Results

In this section, all regression results based on the preferred specification (fixed effects with trend), with a lag of the dependent variable included are presented along with discussions of the results.

5.2.1 Determinants of High School Enrollment Rates

Results and discussions of estimates obtained from the enrollment specification with a lagged term included are presented in this subsection. Different regressions were run for the 'both sexes, male and female demographic groups and for each grade.

Table 5.1: Determinants of Grade 10 enrollment rate			
Explanatory var.	Both sexes	Male	Female
Dependent Variable: Grade 10 Enrollment			
AB--C	25.715**	52.372***	67.722***
BC--C	24.305**	51.000***	68.007***
MB--C	24.921**	53.184***	71.165***
NB--C	24.130**	52.868***	70.444***
NLD--C	23.251**	66.998**	87.189***
NS--C	24.004**	52.062***	70.244***
ONT--C	26.319**	55.184***	72.077***
PEI--C	23.595**	53.140***	70.799***
QUE--C	21.917**	48.364**	68.272***
SK--C	25.054**	52.997***	69.401***
MINWAGE	0.031	1.157*	0.126
UNRP	0.031	0.059	-0.021
AVAGE	-0.021	-0.337	-0.810**
DIV	0.256	0.407	0.258
STRATIO	-0.232	-0.307	0.158
GDP[1]	-0.207***	-0.300**	-0.130
POPBRW[2]	-4.364	-183.509*	-213.350***
TREND	0.033	-0.511	-0.462
TRENDSQ	0.003	0.043*	0.048**
DEP_{t-1}	0.656***	0.513***	0.472***
R-squared	0.850	0.800	0.747
[1] Results for GDP were multiplied by 1000 to remove the scaling factor			
[2] POPBRW, POPMRW and POPFRW for the 'both sexes', male and female groups			
* = 10% level of sig. ** = 5% level of sig. ***=1%level of sig. 2-tailed t tests			
Source: Author's compilation			

Table 5.2: Determinants of Grade 11 enrollment rate			
Explanatory var.	Both sexes	Male	Female
Dependent Variable: Grade 11 Enrollment			
AB--C	39.140***	15.368	66.974***
BC--C	38.056***	12.634	66.762***
MB--C	35.559**	10.921	65.405***
NB--C	35.610**	10.838	65.678***
NLD--C	35.376**	4.1073	70.902**
NS--C	34.395**	8.379	64.253***
ONT--C	38.429***	13.796	68.945***
PEI--C	36.345***	13.264	68.306***
QUE--C	31.560**	4.463	62.755***
SK--C	35.976***	13.153	65.038***
MINWAGE	0.058	0.243	0.346
UNRP	0.019	0.227	0.176**
AVAGE	0.092	0.775	-0.493
DIV	-0.374	0.029	-0.429
STRATIO	-0.604**	-1.435***	-0.648
GDP	-0.218*	-0.230	-0.130
POPBRW[2]	-20.710	44.920	-117.77
TREND	0.188	-0.331	0.127
TRENDSQ	-0.008	0.016	0.008
DEP_{t-1}	0.564***	0.615***	0.449***
R-squared	0.853	0.873	0.833
[1] Results for GDP were multiplied by 1000 to remove the scaling factor			
[2] POPBRW, POPMRW and POPFRW for the 'both sexes', male and female groups			
* = 10% level of sig. ** = 5% level of sig. ***=1%level of sig. 2-tailed t tests			
Source: Author's compilation			

Table 5.3: Determinants of Grade 12 enrollment rate			
Explanatory var.	Both sexes	Male	Female
Dependent Variable: Grade 12 Enrollment			
AB--C	21.492	49.689	32.614
BC--C	3.130	45.275	26.196
MB--C	15.778	56.436	31.779
NB--C	2.069	45.751	26.319
NLD--C	-6.328	58.054	39.052
NS--C	-3.523	44.349	25.160
ONT--C	21.736	47.950	26.214
PEI--C	3.431	46.287	26.352
SK--C	9.155	50.024	29.450
MINWAGE	6.356***	-3.885***	-2.135
UNRP	0.946**	0.183	0.143
AVAGE	-0.177	-0.522	0.433
DIV	1.053	-0.161	-0.417
STRATIO	0.117	1.443**	0.089
GDP[1]	-1.130***	0.007	-0.024
POPBRW[2]	35.373	-120.933	-145.6
TREND	2.853***	1.319	0.867
TRENDSQ	-0.072***	-0.045	-0.079
DEP_{t-1}	0.036	0.279***	0.553**
R-squared	0.647	0.794	0.647
[1] Results for GDP were multiplied by 1000 to remove the scaling factor			
[2] POPBRW, POPMRW and POPFRW for the 'both sexes', male and female groups			
* = 10% level of sig. ** = 5% level of sig. ***=1%level of sig. 2-tailed t tests			
Source: Author's compilation			

The results above show that the minimum wage has a statistically significant positive impact on grade twelve enrollment for the 'both sexes' category and on grade ten enrollment for males. Note that due to the problems encountered in finding enrollment data segregated by male and female after the 1991-92 school year, the male and female groups have shorter data sets than the 'both sexes' group for both the enrollment and continuation ratio specifications. The negative impact recorded for males and females in grade twelve may be an indication that time dummy variables are needed for the 'both sexes' regression which recorded a positive response. *UNRP* was included to determine the effect of cyclical changes in the economy on school enrollment rates. From the table above, we observe that this parameter was mostly found not to be statistically significant with the exception of the grade eleven enrollment regression for females and also in the

case of grade twelve male enrollment regression. The sign on this variable is in agreement with the positive effect predicted in chapter four. The *AVAGE* variable was included to capture the effect of education spending on high school enrollment rates. The coefficient estimates for the *AVAGE* variable were found to have a negative and statistically significant effect on enrollment rates for females in grade ten. No statistically significant result was recorded for the coefficient on this variable for the grade twelve and eleven regressions in all categories. Divorce rates were statistically insignificant for all groups.

Landon (1997) also included divorce rates as an explanatory variable and found divorce to affect the enrollment rates of sixteen-year-old females in a negative way. The *STRATIO*, included as an education spending variable only showed statistically significant results with the expected sign for 'both sexes' in grade eleven. *GDP* did not seem to have any systematic effect on enrollment rates and is negatively and statistically significant for males in grade ten and 'both sexes' in grade eleven and twelve. *POPBRW* was statistically significant for male and female groups in grade ten and with an expected negative sign. The coefficient on the lagged values of the dependent variable (DEP_{t-1}) is statistically significant for all but the grade twelve 'both sexes' category.

5.2.2 Determinants of High School Continuation Ratios

Results and discussions of estimates obtained from the continuation ratio specification are presented in this subsection.

Table 5.4: Determinants of Grade 10-11 Continuation Ratios			
Explanatory var.	Both sexes	Male	Female
Dependent Variable: Grade 10-11 Continuation Ratios			
AB—C	0.353	-0.569	0.044
BC—C	0.345	-0.607	0.012
MB—C	0.279	-0.694	-0.056
NB—C	0.310	-0.668	-0.016
NLD—C	0.296	-1.105	-0.132
NS—C	0.271	-0.719	-0.065
ONT—C	0.309	-0.655	-0.006
PEI—C	0.352	-0.612	0.050
QUE—C	0.242	-0.764	-0.091
SK—C	0.302	-0.639	-0.005
MINWAGE	0.010*	0.016	0.019*
UNRP	-0.002	-4.8 E-03	-0.001
AVAGE	0.009	0.028**	0.018**
DIV	-0.001	0.004	0.005
STRATIO	-0.010**	-0.025**	-0.017**
GDP	-2.02E-03	-1.06E-03	-2.76E-03
POPBRW[1]	0.105	5.229**	1.729
TREND	-0.002	-0.003	-0.009
TRENDSQ	8.26E-06	9.67E-05	0.001
DEP_{t-1}	0.462***	0.530***	0.401***
R-squared	0.731	0.818	0.794
[1] Results for GDP were multiplied by 1000 to remove the scaling factor			
[2] POPBRW, POPMRW and POPFRW for the 'both sexes', male and female groups			
* = 10% level of sig. ** = 5% level of sig. ***=1%level of sig. 2-tailed t tests			
Source: Author's compilation			

Table 5.5: Determinants of Grade 11-12 Continuation Ratios			
Explanatory var.	Both sexes	Male	Female
Dependent Variable: Grade 11-12 Continuation Ratios			
AB—C	-0.522	-0.417	-0.098
BC—C	-0.911	-0.622	-0.222
MB—C	-0.567	-0.503	-0.050
NB—C	-0.870	-0.636	-0.176
NLD—C	-0.836	-0.992	-0.170
NS—C	-0.914	-0.657	-0.200
ONT—C	-0.584	-0.665	-0.271
PEI—C	-0.907	-0.738	-0.216
QUE—C	-0.981	-0.685	-0.201
SK—C	-0.706	-0.558	-0.142
MINWAGE	0.097***	-0.035*	-0.044*
UNRP	0.015***	-0.007**	-0.008
AVAGE?	0.016	0.025*	0.016
DIV	0.027**	0.015	0.012
STRATIO	0.027	0.009	0.022
GDP	-0.001**	-4.04E-03	-5.62E-04
POPBRW[1]	0.665	6.003	2.007
TREND	0.018	-0.013	-0.022
TRENDSQ	-3.8 E-03	0.001	0.002**
DEP_{t-1}	0.035	0.289***	0.304**
R-squared	0.533	0.784	0.584
[1] Results for GDP were multiplied by 1000 to remove the scaling factor			
[2] POPBRW, POPMRW and POPFRW for the 'both sexes', male and female groups			
* = 10% level of sig. ** = 5% level of sig. ***=1%level of sig. 2-tailed t tests			
Source: Author's compilation			

Table 5.6: Determinants of Grade 12-grad Continuation Ratios	
Explanatory variable	Both sexes
Dependent Variable: Grade 12-grad Continuation Ratios	
AB—C	2.266**
BC—C	2.384**
MB—C	2.152**
NB—C	2.423**
NLD—C	2.046**
NS—C	2.327**
ONT—C	2.254**
PEI—C	2.319**
SK—C	2.328**
MINWAGE	-0.055**
UNRP	0.002
AVAGE	0.005
DIV	-0.030**
STRATIO	-0.072**
GDP	2.32E-03
POPBRW[1]	0.111
TREND	-2.21E-02*
TRENDSQ	0.001
DEP_{t-1}	0.001***
R-squared	0.320
[1] Results for GDP were multiplied by 1000 to remove the scaling factor	
[2] POPBRW, POPMRW and POPFRW for the 'both sexes', male and female groups	
* = 10% level of sig. ** = 5% level of sig. ***=1%level of sig. 2-tailed t tests	
Source: Author's compilation	

Table 5.7: Determinants of Overall Continuation Ratios	
Explanatory variable	Both sexes
Dependent Variable: Overall Continuation Ratios	
AB—C	-0.593
BC—C	-0.692
MB—C	-0.616
NB—C	-0.664
NLD—C	-1.031
NS—C	-0.601
ONT—C	-0.689
PEI—C	-0.714
QUE—C	-0.843
SK—C	-0.571
MINWAGE	0.041*
UNRP	0.028
AVAGE	-0.014
DIV	0.037
STRATIO	-0.017
GDP[1]	6.71E-03
POPBRW[2]	1.551
TREND	0.002
TRENDSQ	-0.001
DEP_{t-1}	-0.275***
R-squared	0.071
[1] Results for GDP were multiplied by 1000 to remove the scaling factor	
[2] POPBRW, POPMRW and POPFRW for the 'both sexes', male and female groups	
* = 10% level of sig. ** = 5% level of sig. ***=1%level of sig. 2-tailed t tests	
Source: Author's compilation	

Results show that the minimum wage has a positive impact on grade 10-11 continuation ratios for the 'both sexes' and female groups, and also on the grade 11-12 continuation ratio for the 'both sexes' category. A positive impact was also observed for overall continuation ratios while grade 12 to graduation continuation ratios showed a negative correlation with the minimum wage.

We also observe that *UNRP* has a negative and statistically significant effect on grade 11-12 continuation ratios for males and a positive effect for the 'both sexes' category. The *AVAGE* variable was statistically significant and with the expected positive sign for grade 10-11 continuation ratios in both the male and female categories. The coefficient on this variable was also statistically significant and positive for the male 11-12 continuation ratio regressions. The Divorce rate variable showed a positive statistical significance for 'both sexes' in grade 11-12 and a negative statistical significance for grade 12 to graduation continuation ratio regressions. The *STRATIO* variable showed statistically significant results with the expected sign for all grades 10-11 groups and also for the grade 12 to graduation group. The coefficient on *GDP* was statistically significant for for 'both sexes in the grade 11-12 category. *POPBRW* was positive and statistically significant for grade 10-11 male continuation ratios. Due to the unavailability of graduation data by males and females, 12-grad and overall continuation ratios could not be calculated for the male and female demographic groups.

5.2.3 Determinants of Labour Market Activities

Results and discussions of estimates obtained from the employment and participation specifications are presented in this subsection. Tables 5.8 to 5.11 below show the results obtained from these regressions.

Table 5.8: Determinants of Labour Market Activities (15-19)

Dependent variable	Employment rate			Participation rate		
Explanatory variable	Both Sexes	Male	Female	Both Sexes	Male	Female
Dependent Variable: Age 15-19 Employment and Participation Rates						
AB—C	30.655***	33.319***	32.792***	34.373***	39.393***	34.368***
BC—C	34.903***	35.190***	38.282***	38.619***	43.588***	38.616***
MB—C	38.145***	41.800***	39.825***	41.651***	49.278***	41.648***
NB—C	30.904***	31.833***	33.198***	33.504***	38.202***	33.497***
NLD—C	24.154***	25.481***	25.124***	25.720***	29.113***	25.696***
NS—C	30.481***	31.524***	32.705***	33.644***	38.312***	33.638***
ONT—C	32.482***	32.678***	35.960***	35.839***	39.929***	35.835***
PEI—C	38.025***	43.092***	38.573***	40.050***	48.526***	40.044***
QUE—C	31.027***	34.441***	31.661***	33.360***	39.510***	33.351***
SK—C	36.175***	43.017***	35.805***	38.898***	48.075***	38.893***
MINWAGE	-2.758***	-2.740***	-2.805***	-2.611***	-3.054***	-2.430***
UNRP	-0.604***	-0.726***	-0.515***	-0.305**	-0.276	-0.401**
GDP	0.655***	0.766***	0.597***	0.637***	0.823***	0.392**
POPBRW[1]	-0.124	5.491**	-5.256*	0.668	6.630**	0.372
TREND	0.268	0.471**	0.075	-0.131	-0.019	-0.170
TRENDSQ	-0.024**	-0.044***	-0.009	-0.004	-0.018**	0.003
DEP_{t-1}	0.289***	0.210***	0.263***	0.291***	0.207***	0.208**
R-squared	0.922	0.909	0.846	0.921	0.904	0.921
[1] Results for GDP were multiplied by 1000 to remove the scaling factor						
[2]POPBRW, POPMRW and POPFRW for the 'both sexes', male and female groups						
* = 10% level of sig. ** = 5% level of sig. ***=1%level of sig. 2-tailed t tests						
Source: Author's compilation						

Table 5.9: Determinants of Labour Market Activities (15-24)

Dependent variable	Employment rate			Participation rate		
Explanatory variable	Both Sexes	Male	Female	Both Sexes	Male	Female
Dependent Variable: Age 15-24 Employment and Participation Rates						
AB—C	35.297***	49.128***	30.138***	40.087***	54.348***	37.704***
BC—C	38.603***	51.700***	34.094***	43.030***	57.127***	41.078***
MB—C	41.971***	57.207***	36.365***	45.646***	60.923***	42.851***
NB—C	35.870***	48.280***	31.330***	39.558***	52.459***	37.531***
NLD—C	29.588***	40.641***	24.999***	33.651***	45.572***	31.393***
NS—C	36.894***	49.341***	32.457***	41.092***	55.479***	39.108***
ONT—C	36.506***	49.137***	32.076***	40.979***	54.808***	39.060***
PEI—C	41.819***	56.487***	36.330***	45.260***	59.904***	42.376***
QUE—C	36.717***	50.362***	31.172***	40.337***	55.046***	37.184***
SK—C	39.259***	56.009***	32.140***	42.914***	59.527***	38.479***
MINWAGE	-1.962***	-2.383***	-1.693***	-1.855***	-2.804***	-1.501***
UNRP	-0.578***	-0.809***	-0.447***	-0.201**	-0.201*	-0.231*
GDP	0.614***	0.734***	0.587***	0.481***	0.520***	0.482***
POPBRW[1]	1.861***	5.134***	2.509**	1.314***	3.046**	1.921*
TREND	0.142	0.125	0.101	-0.243**	-0.482**	-0.195
TRENDSQ	-0.018**	-0.025***	-0.012	-0.001	0.007	-4.1E-04
DEP_{t-1}	0.318***	0.107*	0.357***	0.378***	0.266***	0.361***
R-squared	0.949	0.943	0.891	0.943	0.888	0.879
[1] Results for GDP were multiplied by 1000 to remove the scaling factor						
[2]POPBRW, POPMRW and POPFRW for the 'both sexes', male and female groups						
* = 10% level of sig. ** = 5% level of sig. ***=1%level of sig. 2-tailed t tests						
Source: Author's compilation						

Table 5.10: Determinants of Labour Market Activities (20-24)

Dependent variable	Employment rate			Participation rate		
Explanatory variable	Both Sexes	Male	Female	Both Sexes	Male	Female
Dependent Variable: Age 20-24 Employment and Participation Rates						
AB—C	50.299***	68.802***	42.416***	55.825***	76.312***	53.154***
BC—C	51.784***	70.098***	44.354***	56.762***	76.791***	54.838***
MB—C	55.117***	74.401***	47.356***	58.740***	79.275***	56.840***
NB—C	49.327***	67.265***	41.800***	53.820***	72.352***	52.315***
NLD—C	43.820***	60.780***	36.209***	50.089***	67.654***	48.252***
NS—C	51.848***	69.740***	44.769***	56.753***	76.164***	55.407***
ONT—C	50.038***	67.857***	42.621***	55.353***	75.345***	52.987***
PEI—C	55.073***	73.189***	47.962***	59.608***	78.735***	59.370***
QUE—C	51.107***	69.336***	43.414***	55.593***	75.361***	53.335***
SK—C	51.917***	72.747***	42.478***	56.207***	78.097***	52.126***
MINWAGE	-1.246**	-1.658***	-0.999***	-1.280***	-1.972***	-0.930*
UNRP	-0.718***	-1.046***	-0.527***	-0.229**	-0.237	-0.269**
GDP	0.424***	0.458***	0.481**	0.210*	0.123	0.366**
POPBRW[1]	6.727***	13.992***	13.975***	4.318***	8.415***	10.794***
TREND	0.174	-0.059	0.331*	-0.207*	-0.490***	0.082
TRENDSQ	-0.016**	-0.010	-0.022**	-0.002	0.008	-0.016**
DEP_{t-1}	0.252***	0.092	0.263***	0.338***	0.213***	0.246***
R-squared	0.895	0.866	0.796	0.847	0.793	0.730
[1] Results for GDP were multiplied by 1000 to remove the scaling factor						
[2]POPBRW, POPMRW and POPFRW for the 'both sexes', male and female groups						
* = 10% level of sig. ** = 5% level of sig. ***=1%level of sig. 2-tailed t tests						
Source: Author's compilation						

Table 5.11: Determinants of Labour Market Activities (25-54)

Dependent variable	Employment rate			Participation rate		
Explanatory variable	Both Sexes	Male	Female	Both Sexes	Male	Female
Dependent Variable: Age 25-54 Employment and Participation Rates						
AB—C	56.051***	77.751***	31.211***	38.025***	51.162***	29.914***
BC—C	56.222***	78.250***	31.561***	38.525***	51.603***	30.525***
MB—C	57.398***	78.331***	33.274***	39.511***	51.928***	32.227***
NB—C	51.709***	75.258***	27.414***	37.096***	50.021***	29.049***
NB—C	51.709***	75.258***	27.414***	35.722***	48.921***	27.202***
NS—C	54.362***	76.838***	30.225***	37.538***	50.632***	29.552***
ONT—C	56.321***	77.883***	31.855***	38.395***	51.406***	30.607***
PEI—C	57.854***	78.999***	33.886***	40.585***	52.360***	34.016***
QUE—C	54.751***	77.661***	29.984***	37.591***	51.143***	29.029***
SK—C	57.380***	78.251***	33.233***	39.417***	51.902***	32.016***
MINWAGE	-0.619***	-0.474***	-0.611**	-0.494***	-0.423**	-0.613***
UNRP	-0.713***	-1.078***	-0.388***	-0.141***	-0.170***	-0.127**
GDP[1]	0.161***	0.109**	0.203***	0.179***	0.107***	0.251***
POPBRW[2]	0.130**	-0.052	0.341**	0.116**	-0.025	0.519***
TREND	0.477***	-0.130**	0.783***	0.365***	-0.124**	0.889***
TRENDSQ	-0.015***	-0.002	-0.021***	-0.014***	-8.40E-05	-0.029***
DEP_{t-1}	0.312***	0.204***	0.483***	0.511***	0.469***	0.498***
R-squared	0.984	0.974	0.980	0.957	0.910	0.967
[1] Results for GDP were multiplied by 1000 to remove the scaling factor						
[2]POPBRW, POPMRW and POPFRW for the 'both sexes', male and female groups						
* = 10% level of sig. ** = 5% level of sig. ***=1%level of sig. 2-tailed t tests						
Source: Author's compilation						

The parameter estimates for most of the variables were statistically significant in both the employment and participation specifications. The minimum wage variable was found to be negatively correlated with both employment and participation rates for all but the female regression in the 20-24 age group. Results for employment supports textbook evidence of a competitive market but participation results are contrary to textbook predictions. *UNRP* and *GDP* followed the expected negative and positive signs while *POPBRW* was positive as expected and also statistically significant for most groups.

5.3 Minimum Wage Effects

In this section, the regression estimates for the minimum wage effects on the labour market variables being studied are presented along with the elasticity estimates.

Table 5.12: Minimum Wage Effects

	($1 Minimum Wage Increase)			**(1% Minimum Wage Increase)**		
Effect on:	Both sexes	Male	Female	Both sexes	Male	Female
Dependent Variable: Grade Enrollment Rates						
Grade 10	0.031	1.157*	0.126	0.003	0.038*	0.013
Grade 11	0.058	0.243	0.346	0.006	0.029	0.039
Grade 12	6.356***	-3.885***	-2.135	0.649***	-0.466***	-0.244
Dependent Variable: Grade Continuation Ratios						
Grade 10-11	0.010*	0.016	0.019*	0.054*	0.088	0.102*
Grade 11-12	0.097***	-0.035*	-0.044*	0.463***	-0.182*	-0.225*
Grade 12-grad	-0.055**	-	-	-0.395**	-	-
Overall	0.041*	-	-	0.232*	-	-
Dependent Variable: Employment Rates by Age Group						
Age 15-19	-2.758***	-2.740***	-2.805***	-0.363***	-0.354***	-0.376***
Age 15-24	-1.962***	-2.383***	-1.693***	-0.193***	-0.228***	-0.172***
Age 20-24	-1.246**	-1.658***	-0.999	-0.099***	-0.126***	-0.083
Age 25-54	-0.619***	-0.474***	-0.611**	-0.043***	-0.029***	-0.048**
Dependent Variable: Participation Rates by Age Group						
Age 15-19	-2.611***	-3.054***	-2.430***	-0.283***	-0.322***	-0.131***
Age 15-24	-1.855***	-2.804***	-1.501***	-0.155***	-0.225***	-0.131***
Age 20-24	-1.280***	-1.972***	-0.930*	-0.087***	-0.128***	-0.067*
Age 25-54	-0.494***	-0.423**	-0.613***	-0.031***	-0.024**	-0.044***
* = 10% level of sig. ** = 5% level of sig. ***=1%level of sig. 2-tailed t tests						
Source: Author's compilation						

Table 5.12 above presents the minimum wage effects on the enrollment, continuation ratio, employment and participation equations. Elasticity estimates are based on sample means for the different demographic groups and are intended to show how responsive the labour market variables are to a marginal change in the minimum wage. The results show an inelastic minimum wage effect. An increase in the minimum wage is followed by a lower decrease or increase for each of the dependent variables. Discussions in this section do not only include that for the final regression with the lagged dependent variable but also for the minimum wage effect on the labour market variables of interest for all the specifications discussed in chapter four. Results for these other specifications can be found in the tables in Appendix A.

5.3.1 Effect on Enrollment Rates

The estimates presented in the tables of results in the appendix and in Table 5.12 above, show the results derived from the study of the impact of the minimum wage on school enrollment of grade ten, eleven and twelve students for the three gender groups under study. The first column of Table A.1 in the appendix contains the results obtained for the enrollment specification using a level estimate. The results show the minimum wage variable to have a statistically significant negative effect on school enrollment rates for the three grade-gender groups in the study with the exception of grade twelve in the 'both sexes' group. This result is in conformity with results obtained both in the United States (Neumark and Wascher, 1995b) and in Canada (Landon, 1997). These results were significant at the ten, five and one percent levels of significance using two-tailed tests. There also seems to be some economic significance in the results obtained as on average, a dollar increase in the minimum wage would result in a 2 to 9 percent decrease in

enrollment rates depending on the group being studied. For males in grade twelve, this would mean that a whole dollar increase in the minimum wage would result in enrollment decreasing on average by 2,267 students. This estimate was obtained by multiplying the level parameter estimate for this group by the average of the grade twelve male populations for all the provinces in the twenty years under study.

In the second column of Tables A.1, A.2 and A.3 in the appendix, we report first difference estimates of the enrollment specification. In this specification, the intercept is the change in the intercept from one period to the other. The rationale behind using first differences is to eliminate the unobserved province effects peculiar to each province in the study. Results obtained using this estimate show that the minimum wage variable exhibits no significance for any of the grade-sex groups under study. Investigations as to why the results from this estimation show a marked difference from the level estimate revealed that first differences reduced the variability in the minimum wage variable. Even though the minimum wage variable across the provinces over the years under study show enough variability to allow for a minimum wage study, differencing reduces this variability so much that it renders it unusable for inference, hence the large standard errors and low t-statistics.

In the last two columns of Tables A.1, A.2 and A.3 in the appendix, we report the fixed effects estimates of the level specification with and without trend terms. The results were similar in every respect. The adjusted R-squared were observed to be significantly larger than that obtained in the level and differenced estimates. The adjusted R-squared, according to Woolridge (2003) adjusts the fit by including a penalty for the addition of variables in a regression model.

The intercepts for these regressions are the intercepts for the ten provinces under study. Overall, these fixed effects regressions provide a better fit than the previous ones and show both positive and negative minimum wage effects on school enrollment. For the final regression with the lagged value of the dependent variable, statistical significance was observed for males in grade ten and for 'both sexes' and males in grade twelve. For these groups, a dollar increase in the minimum wage would increase school enrollment by 1.16% and 6.36%. These results are both statistically and economically significant. It is no surprise though that a negative and statistically significant result was observed for the male and female groups as due to limitations, a shorter range of data was used to estimate the parameters for those groups. Elasticity estimates show that a percentage increase in the minimum wage leads to a .65 percent and .04 percent increase in enrollment rates for both sexes in grade twelve and males in grade ten.

5.3.2 Effect on Continuation Ratios

In tables A.4, A.5 and A.6 in the appendix and also in table 5.12 above, we see the results derived from the study of the impact of the minimum wage on high school grade 10-11, 11-12, 12-graduation and overall continuation ratios for the three gender groups under study. Level, first difference, and fixed effects estimates (with and without trend terms) are presented in the various columns. Note that no results for 12-graduation and overall continuation ratios were reported for the male and female groups, as graduation data required to calculate those ratios was unavailable for those groups.

The level estimates show that the minimum wage has no statistical relationship to the grade continuation ratio for the 'both sexes' group. For the male and female groups, the minimum wage is shown to be negatively correlated with grades 10-11 and 11-12

continuation ratios and to be statistically significant with the exception of grade 10-11 for females. This is somewhat consistent with results from the level estimates in the enrollment equation. The differenced estimates show no statistical significance as the variability in the minimum wage variable was reduced greatly by first differencing.

The fixed effects estimates presented in tables A.4, A.5 and A.6 show that the minimum wage variable has a statistically significant positive relationship with grade 10-11 continuation ratios for all three groups under study. The results from the final regression with a lag of the dependent variable show that a dollar increase in the minimum wage will result in a 0.01 to 0.19 increase in grade continuation ratios for the 'both sexes' and female groups in grade 10-11, grade 11-12 and overall continuation ratios. A statistically significant negative impact was observed for grade 12-graduation continuation ratios. Elasticity estimates show that a percentage increase in the minimum wage leads to a .05 to .46 percent increase in grade continuation ratios. One can then conclude that the minimum wage effect on continuation ratios is mostly positive. This result is contrary to results obtained by some United States authors. Chaplin, et al, (2003) also used grade continuation ratios as a measure of school effort to estimate the impact of the minimum wage and found that minimum wage had a negative impact on grade 9-10 continuation ratios in states with compulsory schooling age below eighteen.

5.3.3 Effect on Employment Rates

The estimates presented in tables A.7, A.8 and A.9 in appendix A, show the results derived from the study of the impact of the minimum wage on employment for the twelve age-sex groups under study. The first column of results in the tables in the appendix presents the level estimates. The results using this estimate, show that the

minimum wage has a statistically significant negative effect on the employment rate of all but two (males 20-24 and 25-54) of the age-sex groups under study.

The first differenced estimates reported in the second column of tables A.7, A.8 and A.9 in the appendix show that none of the minimum wage coefficients was statistically significant for all the groups under study just like in the enrollment equation. These results are in conformity with minimum wage studies where positive or non-significant minimum wage effects were derived (Baker and Stanger 1999; Neumark and Wascher, 1992 and Card 1992, 1994). Second or longer differences could be useful in eliminating this problem but this will greatly reduce the number of observations and the power of the regression. Baker and Stanger (1999) eliminated this problem by the fourth difference but with a greatly reduced number of observations.

The third and fourth columns of the tables in the appendix show fixed effects estimation, with and without trend terms of the impact of the minimum wage on employment rates. For the fixed effects estimation, we assume that the unobserved effects are correlated with some of the explanatory variables thereby resulting in inefficient estimators. Trend terms were included in order to account for time factors. Intercepts were reported for this specification for the different cross-sectional units (the 10 provinces). Results show the fixed effects estimation to result in relatively larger and more statistically significant minimum wage coefficients. The adjusted R-squared also get significantly larger. In general, the results were in conformity with the level estimates. Several past studies (Baker and Stanger 1999 and Landon, 1997) correct for heteroskedasticity and serial correlation but this makes no difference in their inference.

The results from the final regression with a lag of the dependent variable included as an explanatory variable have been reported in table 5.12 above. All groups studied, with the exception of females in the 20-24 age group, are observed to have statistically significant parameters. Males in the 20-24 and 25-54 age groups now report statistically significant coefficients when compared to the level estimates. Note that the minimum wage coefficients generally get smaller with the older age groups. The elasticity estimates also show that the older age groups are less responsive than the younger groups. The results for teenagers is in the upper range of estimates achieved over the years by economists who mostly observe an average of a two percent increase in employment rates for a 10% increase in the minimum wage.

Overall, the minimum wage was found to have a statistically significant negative impact on employment rates for eleven of the twelve groups studied. The differences between the different estimates were not marked. Economically and using the 15-19 group as reference, the results can be translated to mean that a dollar increase in the minimum wage results in an average loss in employment for about 2,810 males. For females, the loss in employment is for about 2,768 females. These results were obtained by multiplying the parameter estimates by the average of the 15-19 male and female populations for all the provinces in the twenty years under study. These results are both economically and statistically significant. The elasticity estimates, show that the employment rates for women are more responsive to a minimum wage hike than that of men.

5.3.4 Effect on Participation Rates

The estimates presented in tables A.10, A.11 and A.12 in appendix A, show the results derived from the study of the impact of the minimum wage on participation rates for the twelve age-sex groups under study. In the first column of results in the tables in the appendix, we show the level estimates from this regression. The results show that the minimum wage has a statistically significant negative effect on the participation rate of all groups studied. The first differenced estimates reported in the second column show that none of the minimum wage coefficients was statistically significant for all the groups under study with the exception of males in the 25-54 age group.

The third and fourth columns show fixed effects estimation, with and without trend terms of the impact of the minimum wage on participation rates. Results show the fixed effects estimation to result in relatively larger and more statistically significant minimum wage coefficients just like it did in the enrollment and employment equations. In the fixed effects estimation without trend terms the result for males in the 25-54 age groups show no statistically significant results.

For the final regression with the lag of the dependent variable, the minimum wage was found to have a statistically significant negative impact on participation rates for the twelve groups studied. The differences between the different estimates were not marked. For all the estimates, the minimum wage coefficient decreased with the older age groups. Also notice that the coefficients were always larger for the males groups with the exception of the 25-54 age group where a larger coefficient was reported for the female group. Economically, using the 15-19 group as reference, the results can be translated to mean that a dollar increase in the minimum wage results in an average reduction in

labour force participation for about 3,178 males. For females, the reduction in participation levels is by about 2,398 females. These results were obtained by multiplying the parameter estimates by the average of the 15-19 male and female populations for all the provinces in the twenty years under study. These results are economically and statistically significant and imply that females in this group are less likely than males to react to a minimum wage hike by dropping out of the labour force.

Chapter 6

Conclusion

This thesis studies and analyses the effects of the minimum wage on schooling, employment and participation rates. It seeks to provide valuable and up to date information on minimum wage effects, which can be helpful for decision-making in both the public and private sectors of the economy. In addition, it attempts to reconcile some of the previous contradictory results in minimum wage research.

Findings point to statistically significant and positive minimum wage effects on schooling with both the enrollment rate and continuation ratio specifications. However, a statistically significant and negative minimum wage effect was found in the case of the grade 12 to graduation continuation ratios. For the continuation ratio specification, the statistically significant positive effects found were for the 'both sexes' and female groups transitioning from grade 10-11, for 'both sexes' in the grade 11-12 transition and for overall continuation ratios. For the enrollment specification, the results indicate an approximate 0.04% to 0.65% increase in enrollment rates for a percentage minimum wage increase while for the continuation ratio specifications, the results indicate that a percentage minimum wage increase results in about a 0.05% to a 0.46% increase in continuation ratios. While these conform to results obtained by Card (1992) and Mattila (1978) who found zero or positive minimum wage effects on schooling, it contradicts the

results obtained by Neumark and Wascher (1995b), Chaplin, et al, (2003) and Landon (1997) who found negative minimum wage effects.

The positive minimum wage effects is indicative of the fact that a dollar increase in the minimum wage is not enough incentive to quit high school considering all the benefits that could accrue from education. This positive correlation can also be explained by the fact that teenagers may choose to remain in school or enroll when an increase in minimum wage is introduced as a result of expectations of falling employment levels with minimum wage hikes. Another possible explanation for a positive minimum wage effect as suggested by Ehrenberg and Marcus (1980) is that an increased minimum wage leads to a heightened level of competitiveness in the job market for the few available jobs hence keeping teenagers in school. Requirements for greater human capital investment in the event of a minimum wage hike for employers requiring workers with greater levels of productivity is another reason suggested by Agell and Lommerud (1995) for a positive minimum wage effect on enrollment rates. Therefore, the results obtained show that minimum wage hikes do not reduce schooling using both specifications.

The minimum wage was also found to have a highly statistically significant negative correlation with both employment and participation rates. The results indicate a 0.5 to 2.8 percent reduction in employment and participation rates for a dollar increase in the minimum wage, which is toward the upper end of the estimates found in the literature. These results are in conformity with past and present minimum wage research in Canada, United States and internationally where negative minimum wage effects were found as in the case of Mincer (1976), Solon (1985), Wellington (1991), Swidinsky (1980) and Yuen (1998) just to mention a few. However, the employment and

participation regressions contradict results obtained by some early Canadian works (Zaidi, 1970; Fantl and Wittingham, 1970; Rhodes, 1973; Dhruvaragan, 1974 and Maphangoh, 1976) and research done in the United States by Card and Krueger (1995).

Differentials exist in the results for 'both sexes', males and females in the employment and participation rate specifications. For the employment specification, the negative effect is greater for females in the 15-19 and 25-54 age groups. For the participation specification, the differences between the different estimates were not marked but were larger for the male groups with the exception of the 25-54 age group where a larger negative coefficient was reported for the female group. This means that the female participation rates are less sensitive to the minimum wage than that for their male counterparts. One explanation for this difference as suggested by Swidinsky (1980) may be that females are less likely than men to consider additional human capital investment necessary because of their primary responsibility at home. For both specifications, the minimum wage coefficients decreased with the older age groups.

Reconciling the evidence obtained in this research with that obtained from previous research in both the United States and in Canada may require us to argue that any apparent differences obtained by the different researchers may be due to the differences in techniques, data sets, equation specifications and the reference groups being studied. Focusing on the Canadian labour market, more recent studies of the impact of the minimum wage on employment and participation rates tend to arrive at similar results notwithstanding the technique, data set or reference group used for the studies. Given these recent results, we can conclusively argue that the effect of the minimum wage on the Canadian labour market is a negative one. The fact that the results obtained

for the schooling effects are mostly contradictory to some studies in the United States as well as to those in Canada that found negative correlations between the minimum wage and schooling implies that further research needs to be done in this area to arrive at a conclusion on the impact of the minimum wage on schooling. In the Canadian setting, even though much research has not been done in this area, the enrollment measure used is very important to arrive at a reliable conclusion. A certain amount of confidence is associated with the results obtained in this study given the fact that two different measures of schooling –enrollment rates and continuation ratios were employed to arrive at the same conclusion.

A major drawback encountered during the course of this research was the limitation created by the fact that segregation by male and female enrollment was not available beyond the 1991-92 school year. The implication being that the data sets for the enrollment and continuation ratio specifications by gender were shorter than the other specifications by as much as seventy observations.

Even though minimum wage legislation remains popular in politics, in economics it is not always the case. Proponents of the minimum wage argue that it helps towards better allocation of wealth while opponents debate the inefficiency caused by the minimum wage in the labour market. From the results obtained in this research, one cannot be forced to take a stand for or against the minimum wage. The reason being that the minimum wage does not adversely affect schooling on one hand and even though it affects the labour market variables of employment and labour force participation rates, it still improves the wage situation for individuals who remain employed. The afore mentioned not withstanding, a step in the right direction would be a carefully targeted

minimum wage policy that takes into account the goings on in the economy at any point in time in order to achieve optimal allocation efficiency.

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APPENDIX A

Regression Results

Table A.1: Regression Results (Both Sexes): Effects on Enrollment Rate (ENRRB)				
Variable	**Level**	**Difference**	**Fixed Effects**	**Fixed Effects/Tr**
Dependent Variable: Grade 10 Enrollment Rates				
AB—C			60.037***	81.710***
BC—C			56.888***	81.139***
MB—C			57.754***	83.039***
NB—C			55.905***	79.924***
NLD—C			57.702***	82.128***
NS—C			56.113***	80.868***
ONT—C			60.874***	85.976***
PEI—C			53.697***	78.437***
QUE—C			48.778***	76.493***
SK-C			58.533***	81.002***
C	69.717***	4.3 E-04	Province	Province
MINWAGE	-1.888***	-7.5 E-04	-0.785*	-0.507
UNRP	-0.066	0.001*	0.125	0.153*
AVAGE	0.151	0.001	0.607***	-0.524*
DIV	-0.801***	7.1E-06	-0.383	-0.322
STRATIO	-0.641***	-0.7.07 E-04	-0.880***	-0.033
GDP	0.213***	6.41E-04	-0.250**	-0.180
POPBRW	-31.780***	-1.023***	-43.109**	-51.032**
TREND				0.886***
TRENDSQ				-0.027***
R-squared	0.332	0.105	0.736	0.773
Dependent Variable: Grade 11 Enrollment Rates				
AB--C			51.107***	64.000***
BC--C			48.345***	63.730***
MB--C			44.753***	61.039***
NB--C			44.747***	59.780***
NLD--C			45.901***	61.562***
NS--C			41.779***	57.893***
ONT--C			50.047***	65.606***
PEI--C			46.509***	61.992***
QUE--C			34.354***	52.563***
SK--C			46.798***	60.258***
C	43.026***	0.002	Province	Province
MINWAGE	-2.258***	-0.001	-0.281	0.160
UNRP	0.149	4.54 E-04	0.107	0.144
AVAGE	0.506**	0.001***	0.998***	0.081
DIV	-1.457***	-0.003	-0.616**	-0.835***
STRATIO	-0.055	-0.003	-1.318***	-0.471
GDP	0.417***	-3.46E-03**	-0.331**	-0.181
POPBRW	-33.516***	-0.958**	-38.986	-47.559***
TREND				1.011***
TRENDSQ				-0.040***
R-squared	0.358	0.124	0.781	0.807
Dependent Variable: Grade 12 Enrollment Rates				
AB--C			-72.478*	30.929
BC--C			-100.413**	12.395
MB--C			-90.988**	25.163
NB--C			-99.970**	12.347
NLD--C			-105.342**	9.740

Table A.1: Regression Results (Both Sexes): Effects on Enrollment Rate (ENRRB)				
Variable	**Level**	**Difference**	**Fixed Effects**	**Fixed Effects/Tr**
NS--C			-107.442***	6.779
ONT--C			-85.540**	30.895
PEI—C			-101.017**	14.303
SK--C			-87.721**	18.804
C	-6.692	-2.590	Province	Province
MINWAGE	4.587	10.127	6.100***	6.887***
UNRP	2.260***	5.577***	0.698**	0.791**
AVAGE	1.882	10.279*	4.159***	-0.300
DIV	-1.890*	1.114	0.681	1.209
STRATIO	-2.949*	-10.579*	-2.583***	0.126
GDP	0.834	3.404	-0.133***	-0.118***
POPBRW	-109.718	529.613	44.000	0.741
TREND				2.634
TRENDSQ				-0.05979
R-squared	0.174	0.099	0.652	0.699038
Source: Author's compilation				
* = 10% level of sig. ** = 5% level of sig. ***=1%level of sig. . 2-tailed t tests				

Table A.2: Regression Results (Males): Effects on Enrollment rate (ENRRM)				
Variable	**Level**	**Difference**	**Fixed Effects**	**Fixed Effects/Tr**
Dependent Variable: Grade 10 Enrollment Rates				
AB--C			88.143***	83.203***
BC—C			86.531***	82.914***
MB--C			90.792***	87.033***
NB--C			89.326***	84.626***
NLD--C			111.336***	98.179***
NS--C			88.274***	84.377***
ONT--C			93.403***	89.858***
PEI—C			88.994***	84.359***
QUE--C			81.515***	79.068***
SK--C			89.944***	84.958***
C	97.668***	0.001	Province	Province
MINWAGE	-2.382***	0.004	0.791	1.192
UNRP	-0.201	0.003**	0.229*	0.283**
AVAGE	-0.189	6.34 E-04	-0.283	-0.628
DIV	-0.531*	1.51E-05	0.165	0.159
STRATIO	-1.184***	-0.004	-0.5871	-0.208
GDP	5.66E-02	2.02E-03	-0.299*	-0.239
POPMRW	-79.437***	-1.771	-306.969***	-223.900*
TREND				0.615
TRENDSQ				-0.020
R-squared	0.443	0.117	0.759	0.762
Dependent Variable: Grade 11 Enrollment Rates				
AB--C			49.228***	31.290
BC—C			47.219**	30.084
MB--C			46.880**	28.859
NB--C			45.224**	26.125
NLD--C			44.093*	9.716
NS--C			40.652**	22.359
ONT--C			50.779***	33.379
PEI--C			50.579***	31.276
QUE--C			34.198*	17.360
SK--C			48.792***	29.840
C	88.358***	0.003	Province	Province
MINWAGE	-5.425***	-0.008	-0.540	0.142
UNRP	-0.074	4.3 E-04	0.434***	0.490***
AVAGE	0.144	0.001**	0.949**	0.856*
DIV	-1.898***	-0.005	-0.187	-0.151
STRATIO	-0.643*	-0.005	-1.868***	-1.641***
GDP	0.495***	-1.69E-03	-0.172	-0.156
POPMRW	-98.783***	-1.783	-46.068	113.414
TREND				1.002*
TRENDSQ				-0.053
R-squared	0.407	0.146	0.819	0.823
Dependent Variable: Grade 12 Enrollment Rates				
AB--C			79.255***	74.448**
BC--C			69.134**	65.901*
MB--C			83.995***	80.710**
NB--C			74.996***	70.658*
NLD--C			128.303**	114.900**
NS--C			69.427**	65.995*
ONT--C			73.376**	70.313**
PEI--C			75.557***	71.355*
SK--C			79.891***	75.166**
C	107.405***	0.006	Province	Province
MINWAGE	-5.421***	0.942	-4.586***	-4.085***
UNRP	0.232	0.120	-0.135	-0.070
AVAGE	0.242	-0.004	0.325	-0.106
DIV	-1.742***	0.524	0.184	0.197

Table A.2: Regression Results (Males): Effects on Enrollment rate (ENRRM)				
Variable	**Level**	**Difference**	**Fixed Effects**	**Fixed Effects/Tr**
STRATIO	-2.333***	-0.323	1.030	1.489*
GDP	0.713***	-3.74E-02	-0.022	-0.015
POPMRW	-145.004***	-731.849**	-545.443***	-456.919**
TREND				0.690
TRENDSQ				-0.021
R-squared	0.437	0.084	0.814	0.818
Source: Author's compilation				
* = 10% level of sig. ** = 5% level of sig. ***=1%level of sig. . 2-tailed t tests				

Table A.3: Regression Results (Females): Effects on Enrollment Rate (ENRRF)				
Variable	**Level**	**Difference**	**Fixed Effects**	**Fixed Effects/Tr**
Dependent Variable: Grade 10 Enrollment Rates				
AB--C			110.603***	121.536***
BC--C			109.387***	122.741***
MB--C			112.558***	126.699***
NB--C			111.686***	124.719***
NLD--C			131.172***	142.734***
NS--C			111.038***	125.233***
ONT--C			115.028***	128.965***
PEI--C			110.919***	124.378***
QUE--C			106.767***	122.880***
SK--C			110.734***	122.684***
C	104.457***	-2.39E-05	Province	Province
MINWAGE	-2.796***	-0.007	-0.418	-0.093
UNRP	-0.136	0.001	0.090	0.151
AVAGE	-0.332	4.32 E-04	-0.690**	-1.526***
DIV	-0.534**	-0.002	-0.162	-0.239
STRATIO	-1.151***	-0.001	-0.536*	0.236
GDP	4.70E-02	2.43E-03	-0.230	-0.105
POPFRW	-65.371***	-1.965	-286.147***	-285.093***
TREND				0.437
TRENDSQ				0.006
R-squared	0.418	0.102	0.752	0.733
Dependent Variable: Grade 11 Enrollment Rates				
AB--C			73.307***	65.094***
BC--C			71.834***	64.788***
MB--C			70.266***	62.940***
NB--C			71.340***	63.068***
NLD--C			77.427***	60.577***
NS--C			67.924***	60.600***
ONT--C			74.885***	67.983***
PEI--C			74.770***	66.499***
QUE--C			63.857***	57.843***
SK--C			71.453***	62.708***
C	78.069***	0.002	-0.314	Province
MINWAGE	-4.354***	0.005	0.198	0.469
UNRP	0.003	0.001	0.369*	0.248**
AVAGE	0.249	0.001***	-0.493	0.022
DIV	-1.584***	-0.006**	-1.444	-0.498*
STRATIO	-0.617***	-0.006**	-1.66 E-04***	-0.987**
GDP	0.356***	-7.60E-05	-125.3941	-0.132
POPFRW	-73.918***	-1.738	-0.314*	-36.543
TREND				0.929***
TRENDSQ				-0.045*
R-squared	0.473	0.166	0.781	0.795
Dependent Variable: Grade 12 Enrollment Rates				
AB--C			106.4138***	98.504**
BC--C			100.9577***	93.095**
MB--C			116.1331***	107.908**
NB--C			109.4779***	100.995**
NLD--C			167.4265***	154.304***
NS--C			105.003***	96.767**
ONT--C			103.6853***	95.755**
PEI--C			111.8824***	103.292**
SK--C			110.327***	101.852**
C	119.802***	-0.004	Province	Province
MINWAGE	-6.265***	0.007	-5.448***	-5.073***
UNRP	0.106	-1.67E-05	-0.363	-0.350
AVAGE	0.175	0.006	-0.499	-0.479
DIV	-1.854***	0.008	-0.134	-0.112
STRATIO	-1.936***	-0.008	1.736**	1.802*

Table A.3: Regression Results (Females): Effects on Enrollment Rate (ENRRF)				
Variable	**Level**	**Difference**	**Fixed Effects**	**Fixed Effects/Tr**
GDP	0.383	1.10E-03	-7.58E-03	-8.87E-03
POPFRW	-167.067***	-0.004	-644.084***	-592.029***
TREND				0.429
TRENDSQ				-0.0278
R-squared	0.359	0.068	0.684	0.685
Source: Author's compilation				
* = 10% level of sig. ** = 5% level of sig. ***=1%level of sig. . 2-tailed t tests				

Table A.4: Regression Results (Both Sexes): Effects on Continuation Ratios (CONRB)				
Variable	**Level**	**Difference**	**Fixed Effects**	**Fixed Effects/Tr**
Dependent Variable: Grade 10-11 Continuation Ratios				
AB--C			0.887***	0.742***
BC--C			0.890***	0.742***
MB--C			0.792***	0.643***
NB--C			0.828***	0.681***
NLD--C			0.816***	0.674***
NS--C			0.763***	0.619***
ONT--C			0.845***	0.687***
PEI--C			0.919***	0.768***
QUE--C			0.741***	0.583**
SK--C			0.812***	0.666***
C	0.424*	0.005	Province	Province
MINWAGE	-0.001	-4.63E-05	0.021***	0.022***
UNRP	0.004*	5.50E-05	-0.001	-0.001
AVAGE	0.006	0.002***	0.006*	0.010*
DIV	-0.009*	0.009	0.001	-0.003
STRATIO	0.015***	-0.001	-0.010**	-0.011*
GDP	3.90E-03***	-7.83E-03***	-3.07E-03	-1.87E-03
POPBRW	-0.022	0.311	0.041	0.029
TREND				2.27 E-04
TRENDSQ				-1.31 E-04
R-squared	0.150	0.106	0.671	0.672
Dependent Variable: Grade 11-12 Continuation Ratios				
AB--C			-0.641	0.569
BC--C			-1.106	0.191
MB--C			-0.836	0.484
NB--C			-1.068	0.205
NLD--C			-0.994	0.284
NS--C			-1.118	0.174
ONT--C			-0.842	0.498
PEI—C			-1.129	0.173
QUE--C			-1.309	0.112
SK--C			-0.884	0.344
C	1.083	-0.032	Province	Province
MINWAGE	-0.015	0.154	0.093***	0.093***
UNRP	0.034*	0.128***	0.011*	0.013**
AVAGE	0.001	0.188	0.045***	-9.4E-04
DIV	-0.032	0.067	0.016	0.020
STRATIO	-0.011	-0.200	-0.008	0.017
GDP	1.83E-02	5.82E-02	-1.73E-03**	-0.177**
POPBRW	-1.596	6.179	0.275	-0.120
TREND				0.027**
TRENDSQ				-6.7E-04
R-squared	0.037	0.102	0.540	0.561
Dependent Variable: Grade 12-grad. Continuation Ratios				
AB--C			-25.653	60.644
BC—C			-24.408	67.115
MB--C			-28.054	64.192
NB--C			-28.159	61.860
NLD--C			-53.410	36.102
NS--C			-26.855	63.902
ONT--C			-26.816	67.169
PEI—C			-29.828	62.015
SK--C			-28.965	58.044
C	-17.412	0.935	Province	Province
MINWAGE	1.024	5.044	0.321	0.350
UNRP	-0.173	-0.611	0.081	0.193
AVAGE	-0.099	0.550	0.345	-2.580*
DIV	0.050	-1.903	-0.622	-0.254
STRATIO	0.720	-1.155	-0.460	0.776
GDP	-8.60E-03	-0.95	0.016	8.30E-03

Table A.4: Regression Results (Both Sexes): Effects on Continuation Ratios (CONRB)				
Variable	**Level**	**Difference**	**Fixed Effects**	**Fixed Effects/Tr**
POPBRW	47.791**	49.507	175.387**	151.870**
TREND				1.344
TRENDSQ				-0.018
R-squared	0.126	0.038	0.167	0.208
Dependent Variable: Overall Continuation Ratios				
AB--C			-0.013	-0.688
BC--C			-0.091	-0.785
MB--C			-0.042	-0.740
NB--C			-0.090	-0.778
NLD--C			-0.535	-1.203
NS--C			-0.056	-0.735
ONT--C			-0.059	-0.792
PEI--C			-0.121	-0.826
QUE--C			-0.204	-0.950
SK--C			-4.1E-04	-0.679
C	1.274*	0.004	Province	Province
MINWAGE	0.006	0.013	0.020	0.027
UNRP	0.016***	0.055**	0.026	0.027***
DIV	-0.014	0.016	-3.4E-04	-0.014
AVAGE	-0.008	0.004	0.019	0.038
STRATIO	-0.003	-0.047	-0.019	-0.024
GDP	3.10E-03	2.47E-02	1.08E-04	5.64E-04
POPBRW	-0.898*	2.136	1.854	1.848
TREND				-0.002
TRENDSQ				-4.3E-04
R-squared	0.049	0.100	0.096	0.106
* = 10% level of sig. ** = 5% level of sig. ***=1%level of sig. . 2-tailed t tests				

Table A.5: Regression Results (Males): Effects on Continuation Ratios (CONRM)				
Variable	**Level**	**Difference**	**Fixed Effects**	**Fixed Effects/Tr**
Dependent Variable: Grade 10-11 Continuation Ratios				
AB--C			0.054	0.163
BC--C			0.015	0.133
MB--C			-0.106	0.017
NB--C			-0.088	0.036
NLD--C			-0.572	-0.398
NS--C			-0.174	-0.049
ONT--C			-0.032	0.087
PEI--C			0.045	0.171
QUE--C			-0.217	-0.089
SK--C			-0.042	0.076
C	0.719*	-0.004	Province	Province
MINWAGE	-0.043**	0.007	0.030*	0.028
UNRP	0.002	-0.001	0.004*	0.004
AVAGE	0.005	0.002***	0.026***	0.023**
DIV	-0.023***	0.002	0.004	0.004
STRATIO	0.014**	-0.004	-0.033***	-0.031***
GDP	8.79E-03***	-4.08E-03	-2.06E-03	-1.48E-03
POPMRW	-0.347	-1.399	5.522***	4.955**
TREND				-0.002
TRENDSQ				3.07 E-04
R-squared	0.192	0.094	0.760	0.755
Dependent Variable: Grade 11-12 Continuation Ratios				
AB--C			1.551	1.614**
BC--C			1.253	1.266
MB--C			1.453	1.469*
NB--C			1.298	1.351
NLD--C			1.803	2.150*
NS--C			1.243	1.267
ONT--C			1.270	1.277
PEI--C			1.187	1.235
QUE--C			1.182	1.148
SK--C			1.373	1.435*
C	3.262***	0.022	Province	Province
MINWAGE	-0.105**	0.019	-0.036	-0.049
UNRP	-0.008	0.005	-0.005	-0.007
AVAGE	-0.034***	0.015	0.002	0.017
DIV	0.008	0.039	0.012	0.013
STRATIO	-0.024	-0.035	0.013	-7.2E-04
GDP	3.83E-03	-2.82E-03	-1.16E-03*	-1.40E-03**
POPMRW	-0.953	4.455	-4.427	-7.221
TREND				-0.023
TRENDSQ				8.77E-04
R-squared	0.202	0.055	0.731	0.741
Source: Author's compilation				
* = 10% level of sig. ** = 5% level of sig. ***=1%level of sig. . 2-tailed t tests				

Table A.6: Regression Results (Females): Effects on Continuation Ratios (CONRF)				
Variable	**Level**	**Difference**	**Fixed Effects**	**Fixed Effects/Tr**
Dependent Variable: Grade 10-11 Continuation Ratios				
AB--C			0.537**	0.592**
BC--C			0.521**	0.577**
MB--C			0.423*	0.480*
NB--C			0.469*	0.532*
NLD--C			0.321	0.428
NS--C			0.407	0.467*
ONT--C			0.499**	0.553*
PEI--C			0.584**	0.647**
QUE--C			0.402	0.457
SK--C			0.471*	0.531*
C	0.441	0.013	Province	Province
MINWAGE	-0.024	0.001	0.031***	0.028**
UNRP	0.001	0.001	0.001	-8.93E-05
AVAGE	0.010**	0.002***	0.013***	0.013*
DIV	-0.018***	0.014***	0.002	0.002
STRATIO	0.013***	-0.002	-0.018***	-0.018***
GDP	6.37E-03***	-3.19E-03	-1.69E-03	-1.56E-03
POPFRW	-0.156	2.785	1.869	1.395
TREND				-0.005
TRENDSQ				3.37 E-04
R-squared	0.247	0.2357	0.779	0.776
Dependent Variable: Grade 11-12 Continuation Ratios				
AB--C			1.834**	1.705**
BC--C			1.636**	1.463
MB--C			1.875**	1.693
NB--C			1.711**	1.559*
NLD--C			2.353**	2.319**
NS--C			1.671**	1.493
ONT--C			1.635**	1.448
PEI--C			1.670**	1.510
QUE--C			1.674**	1.451
SK--C			1.747**	1.610*
C	3.160***	-0.025	Province	Province
MINWAGE	-0.094**	0.015	-0.052	-0.065
UNRP	-0.005	0.006	-0.006	-0.009
AVAGE	-0.028**	0.009	-0.009	0.008
DIV	-3.67 E-04	0.033	0.007	0.009
STRATIO	-0.025	-0.033	0.027	0.012
GDP	3.07E-04	-3.29E-03	-8.00E-04	-1.01E-03
POPFRW	-1.842	-7.400	-6.557*	-7.491*
TREND				-0.019
TRENDSQ				7.55E-04
R-squared	0.117	0.058	0.564	0.573
Source: Author's compilation				
* = 10% level of sig. ** = 5% level of sig. ***=1%level of sig. . 2-tailed t tests				

Table A.7: Results (Both Sexes): Effects on Employment Rates (EMPRB)				
Variable	**Level**	**Difference**	**Fixed Effects**	**Fixed Effects/ Tr**
Dependent Variable: Age 15-19 Employment Rates				
C	65.112***	-0.455*	Province	Province
AB			69.190***	45.805***
BC			68.705***	50.097***
MB			70.501***	54.183***
NB			57.801***	43.662***
NLD			46.882***	34.106***
NS			57.829***	43.582***
ONT			67.522***	46.869***
PEI			66.275***	53.228***
QUE			61.055***	43.649***
SK			68.658***	51.785***
MINWAGE	-2.519***	-0.661	-3.412***	-3.022***
UNRP	-2.112***	-0.439***	-0.934***	-0.857***
GDP	0.331***	1.121***	5.87E-02	0.763***
POPBRW	-24.761***	-1.280	0.863	0.576*
TREND				0.077
TRENDSQ				-0.021***
R-squared	0.704	0.188	0.894	0.914
Dependent Variable: Age 15-24 Employment Rates				
C	70.994***	-0.333*	Province	Province
AB			77.161***	52.174***
BC			75.662***	55.802***
MB			78.023***	60.635***
NB			66.387***	51.361***
NLD			55.592***	42.245***
NS			68.202***	53.056***
ONT			75.029***	52.964***
PEI			73.415***	59.571***
QUE			70.851***	52.346***
SK			74.876***	56.891***
MINWAGE	-1.684***	-0.430	-2.635***	-2.205***
UNRP	-1.889***	-0.446***	-0.871***	-0.791***
GDP	0.349***	0.79***	5.70E-02	0.815***
POPBRW	-8.952***	1.469	2.854	2.060*
TREND				0.074
TRENDSQ				-0.023***
R-squared	0.722	0.255	0.913	0.943
Dependent Variable: Age 20-24 Employment Rates				
C	80.585***	-0.187	Province	Province
AB			82.935***	66.584***
BC			81.151***	67.990***
MB			84.185***	72.573***
NB			74.853***	64.820***
NLD			66.634***	57.806***
NS			78.120***	68.013***
ONT			80.493***	65.885***
PEI			81.263***	71.988***
QUE			79.161***	66.872***
SK			80.343***	68.325***
MINWAGE	-1.102*	0.112	-1.612***	-1.229***
UNRP	-1.705***	-0.539***	-0.947***	-0.914***
GDP	0.244***	0.414*	7.13E-02***	0.549***
POPBRW	-9.215***	6.164*	8.124	6.661
TREND				0.116
TRENDSQ				-0.019***
R-squared	0.694	0.157	0.876	0.893
Dependent Variable: Age 25-54 Employment Rates				
C	83.792***	0.330***	Province	Province
AB			68.439***	79.207***

Table A.7: Results (Both Sexes): Effects on Employment Rates (EMPRB)				
Variable	**Level**	**Difference**	**Fixed Effects**	**Fixed Effects/ Tr**
BC			71.842***	78.772***
MB			75.676***	80.747***
NB			66.554***	71.113***
NLD			66.554***	71.113***
NS			71.302***	75.787***
ONT			71.637***	79.472***
PEI			76.681***	80.439***
QUE			70.173***	76.248***
SK			75.653***	80.872***
MINWAGE	-1.176***	-0.447	-1.630***	-0.808***
UNRP	-1.357***	-0.660***	-0.607***	-0.850***
GDP	0.403***	0.145*	0.729***	0.204***
POPBRW	-1.112***	-0.046	0.476*	0.256
TREND				0.666***
TRENDSQ				-0.021***
R-squared	0.821	0.590	0.947	0.980
Source: Author's compilation				
* = 10% level of sig. ** = 5% level of sig. ***=1%level of sig. . 2-tailed t tests				

Table A.8: Regression Results (Males): Effects on Employment Rates (EMPRM)				
Variable	**Level**	**Difference**	**Fixed Effects**	**Fixed Effects/Tr**
Dependent Variable: Age 15-19 Employment Rates				
C	71.649***	-0.787***	Province	Province
AB			80.331***	46.004***
BC			75.686***	48.237***
MB			78.742***	54.590***
NB			63.906***	42.964***
NLD			53.686***	34.749***
NS			63.978***	42.883***
ONT			75.481***	45.034***
PEI			74.807***	55.455***
QUE			70.716***	44.988***
SK			79.956***	54.980***
MINWAGE	-2.677***	-1.842	-3.463***	-2.815***
UNRP	-2.445***	-0.570***	-1.110***	-1.009***
GDP	0.205*	1.359***	-0.211	0.807***
POPMRW	-40.212***	0.804	5.994	5.576
TREND				0.170
TRENDSQ				-0.034***
R-squared	0.648	0.191	0.868	0.904
Dependent Variable: Age 15-24Employment Rates				
C	77.704***	-0.640***	Province	Province
AB			87.636***	55.316***
BC			83.332***	57.994***
MB			86.076***	64.106***
NB			73.335***	54.381***
NLD			63.083***	46.284***
NS			74.680***	55.561***
ONT			82.956***	54.757***
PEI			81.067***	63.678***
QUE			79.685***	56.212***
SK			85.673***	62.949***
MINWAGE	-1.703**	-1.091	-2.505***	-2.145***
UNRP	-2.275***	-0.563***	-1.144***	-1.003***
GDP	0.240***	1.068***	-0.177*	0.847***
POPMRW	-13.272***	2.592	7.564**	5.006*
TREND				-0.051
TRENDSQ				-0.023***
R-squared	0.711	0.259	0.899	0.943
Dependent Variable: Age 20-24 Employment Rates				
C	88.277***	-0.465	Province	Province
AB			92.793***	72.926***
BC			89.728***	74.576***
MB			92.106***	79.248***
NB			83.125***	72.084***
NLD			75.313***	65.687***
NS			85.573***	74.421***
ONT			88.564***	71.633***
PEI			88.459***	78.423***
QUE			87.454***	73.636***
SK			90.834***	77.521***
MINWAGE	-1.008	-0.104	-1.304**	-1.310**
UNRP	-2.142***	-0.665***	-1.335***	-1.204***
GDP	0.132	0.695**	-0.125	0.561***
POPMRW	-9.778	8.575	19.461***	13.226**
TREND				-0.212
TRENDSQ				-0.006
R-squared	0.722	0.147	0.853	0.878
Dependent Variable: Age 25-54 Employment Rates				
C	97.538***	-0.221***	Province	Province

Table A.8: Regression Results (Males): Effects on Employment Rates (EMPRM)				
Variable	**Level**	**Difference**	**Fixed Effects**	**Fixed Effects/Tr**
AB			110.321***	96.686***
BC			107.182***	96.872***
MB			106.029***	97.347***
NB			99.769***	92.521***
NLD			99.769***	92.521***
NS			102.689***	95.033***
ONT			108.193***	96.746***
PEI			104.430***	97.521***
QUE			105.515***	95.941***
SK			106.389***	97.433***
MINWAGE	0.017	-0.234	-0.317***	-0.463***
UNRP	-1.604***	-0.996***	-1.342	-1.214***
GDP	3.88E-02	0.182***	-0.350***	0.127***
POPMRW	-2.699***	-0.061	-0.478	0.013
TREND				-0.184***
TRENDSQ				-0.003***
R-squared	0.906	0.766	0.951	0.972
Source: Author's compilation				
* = 10% level of sig. ** = 5% level of sig. ***=1%level of sig. . 2-tailed t tests				

Table A.9: Regression Results (Females): Effects on Employment Rates (EMPRF)				
Variable	**Level**	**Difference**	**Fixed Effects**	**Fixed Effects/Tr**
Dependent Variable: Age 15-19 Employment Rates				
C	58.495***	-0.099	Province	Province
AB			57.705***	46.029***
BC			61.617***	52.486***
MB			62.036***	54.125***
NB			51.603***	44.764***
NLD			39.914***	33.758***
NS			51.505***	44.608***
ONT			59.376***	49.219***
PEI			57.661***	51.385***
QUE			51.107***	42.627***
SK			56.962***	48.782***
MINWAGE	-2.366***	0.477	-3.368***	-3.261***
UNRP	-1.766***	-0.324	-0.756***	-0.701***
GDP	0.459***	0.828**	0.337**	0.708***
POPFRW	-59.700***	-5.839	-2.553	-3.403
TREND				-0.028
TRENDSQ				-0.008
R-squared	0.667	0.066	0.841	0.847
Dependent Variable: Age 15-24 Employment Rates				
C	64.026***	-0.0163	Province	Province
AB			66.942***	49.701***
BC			68.260***	54.229***
MB			70.140***	57.657***
NB			59.638***	48.820***
NLD			48.368***	38.713***
NS			61.929***	51.038***
ONT			67.350***	51.808***
PEI			65.783***	55.746***
QUE			62.213***	49.011***
SK			64.054***	51.143***
MINWAGE	-1.642***	0.167	-2.747***	-2.270***
UNRP	-1.497***	-0.363***	-0.609***	-0.589***
GDP	0.458***	0.490	0.279***	0.761***
POPFRW	-22.744***	3.182	3.642	3.096
TREND				0.188
TRENDSQ				-0.022***
R-squared	0.667	0.087	0.868	0.883
Dependent Variable: Age 20-24 Employment Rates				
C	72.451***	0.114	Province	Province
AB			72.951***	60.723***
BC			72.691***	62.066***
MB			76.226***	66.381***
NB			66.668***	58.090***
NLD			58.108***	50.454***
NS			70.895***	62.281***
ONT			72.461***	60.779***
PEI			73.759***	65.667***
QUE			70.980***	60.750***
SK			69.786***	59.602***
MINWAGE	-1.181*	-0.011	-1.975***	-1.253*
UNRP	-1.259***	-0.488***	-0.566***	-0.625***
GDP	0.363***	7.52E-02	0.277**	0.536***
POPFRW	-27.151***	16.717*	12.940	13.536*
TREND				0.415**
TRENDSQ				-0.028***
R-squared	0.554	0.064	0.782	0.795
Dependent Variable: Age 25-54 Employment Rates				
C	70.457***	0.897***	Province	Province
AB			26.075***	62.173***
BC			36.450***	61.267***

Table A.9: Regression Results (Females): Effects on Employment Rates (EMPRF)				
Variable	**Level**	**Difference**	**Fixed Effects**	**Fixed Effects/Tr**
MB			45.453***	64.781***
NB			33.233***	50.090***
NLD			33.233***	50.090***
NS			40.419***	57.503***
ONT			35.290***	63.137***
PEI			49.147***	63.970***
QUE			34.902***	57.230***
SK			44.880***	64.787***
MINWAGE	-2.362***	-0.652	-3.04***	-1.203***
UNRP	-1.114***	-0.314***	0.147	-0.484***
GDP	0.747***	9.72E-02	1.821***	0.253**
POPFRW	-1.686	-0.158	2.509*	0.968*
TREND				1.558***
TRENDSQ				-0.040***
R-squared	0.576	0.137	0.830	0.975
Source: Author's compilation				
* = 10% level of sig. ** = 5% level of sig. ***=1%level of sig. . 2-tailed t tests				

Table A.10: Regression Results (Both Sexes): Effects on Participation Rates (PARTRB)				
Variable	**Level**	**Difference**	**Fixed Effects**	**Fixed Effects/Tr**
Dependent Variable: Age 15-19 Participation Rates				
AB--C			75.078***	55.414***
BC--C			74.502***	59.946***
MB--C			75.859***	63.748***
NB--C			61.529***	51.142***
NLD--C			49.096***	39.855***
NS--C			62.274***	51.762***
ONT--C			72.390***	56.078***
PEI--C			69.523***	60.176***
QUE--C			64.301***	51.101***
SK--C			72.350***	59.834***
C	68.846***	-0.418	Province	Province
MINWAGE	-2.032***	-1.189	-2.749***	-3.021***
UNRP	-1.917***	-0.213	-0.651***	-0.471***
GDP	0.363***	0.909***	-2.31E-02	0.704***
POPBRW	-25.271***	-0.075	3.804	1.775***
TREND				-0.389
TRENDSQ				0.001995
R-squared	0.660	0.102	0.885	0.907
Dependent Variable: Age 15-24 Participation Rates				
AB--C			91.421***	66.049***
BC--C			88.907***	69.593***
MB--C			89.754***	73.359***
NB--C			77.253***	63.169***
NLD--C			66.169***	53.778***
NS--C			79.968***	65.738***
ONT--C			88.227***	66.647***
PEI--C			84.509***	71.716***
QUE--C			82.236***	64.574***
SK--C			86.071***	69.116***
C	79.188***	-0.303*	Province	Province
MINWAGE	-1.683***	-1.091	-2.504***	-2.539***
UNRP	-1.448***	-0.123	-0.454***	-0.283***
GDP	0.257***	0.498***	-0.229***	0.646***
POPBRW	-8.880***	0.859	3.561***	2.0258*
TREND				-0.281***
TRENDSQ				-0.007
R-squared	0.590	0.087	0.876	0.929
Dependent Variable: Age 20-24 Participation Rates				
AB--C			107.263***	84.093***
BC--C			103.565***	85.057***
MB--C			104.066***	87.863***
NB--C			94.358***	80.465***
NLD--C			86.752***	74.864***
NS--C			98.819***	84.597***
ONT--C			103.897***	83.341***
PEI--C			101.798***	88.772***
QUE--C			100.229***	83.128***
SK--C			100.730***	84.088***
C	93.847***	-0.186	Province	Province
MINWAGE	-1.586***	-0.684	-2.240***	-1.742***
UNRP	-1.040***	-0.098	-0.379***	-0.324***
GDP	2.41E-03	6.64E-02	-0.450***	0.295***
POPBRW	-7.551*	3.014	8.631***	5.412**
TREND				-0.195
TRENDSQ				-0.008
R-squared	0.379	0.017	0.765	0.818
Dependent Variable: Age 25-54 Participation Rates				
AB--C			69.946***	79.362***
BC--C			73.928***	79.453***

Table A.10: Regression Results (Both Sexes): Effects on Participation Rates (PARTRB)				
Variable	**Level**	**Difference**	**Fixed Effects**	**Fixed Effects/Tr**
MB--C			77.620***	81.308***
NB--C			72.469***	75.616***
NLD--C			68.807***	72.185***
NS--C			73.450***	76.682***
ONT--C			73.512***	79.854***
PEI--C			79.892***	82.424***
QUE--C			72.436***	77.067***
SK--C			77.472***	81.269***
C	86.067***	0.320***	Province	Province
MINWAGE	-1.411***	-0.611*	-1.944***	-0.926***
UNRP	-0.627***	-0.102**	0.063	-0.198***
GDP	0.396***	0.113	0.782***	0.260***
POPBRW	-0.719	-0.028	0.394	0.241
TREND				0.800***
TRENDSQ				-0.028***
R-squared	0.551	0.062	0.855	0.944
Source: Author's compilation				
* = 10% level of sig. ** = 5% level of sig. ***=1%level of sig. . 2-tailed t tests				

Table A.11: Regression Results (Male): Effects on Participation Rates				
Variable	**Level**	**Difference**	**Fixed Effects**	**Fixed Effects/Tr**
Dependent Variable: Age 15-19 Participation Rates				
AB--C			85.470***	55.679***
BC--C			81.571***	59.096***
MB--C			84.012***	65.037***
NB--C			67.781***	51.459***
NLD--C			55.852***	41.256***
NS--C			68.374***	51.877***
ONT--C			80.025***	54.904***
PEI--C			78.482***	63.688***
QUE--C			73.953***	53.394***
SK--C			83.375***	63.764***
C	75.864***	-0.7354**	Province	Province
MINWAGE	-2.2694***	-1.587	-2.979***	-3.159***
UNRP	-2.151***	-0.226	-0.736***	-0.508***
GDP	0.228***	1.127***	-0.255*	0.794***
POPMRW	-41.640***	1.678	12.675	8.139
TREND				-0.412**
TRENDSQ				-0.005
R-squared	0.593	0.098	0.848	0.888
Dependent Variable: Age 15-24 Participation Rates				
AB--C			100.951***	72.419***
BC--C			96.497***	75.605***
MB--C			97.665***	80.454***
NB--C			83.974***	69.269***
NLD--C			73.443***	60.605***
NS--C			87.722***	72.830***
ONT--C			95.722***	72.258***
PEI--C			92.314***	79.147***
QUE--C			91.038***	72.267***
SK--C			96.582***	78.784***
C	87.220***	-0.457*	Province	Province
MINWAGE	-1.833**	-1.356	-2.566***	-3.067***
UNRP	-1.702***	-0.121	-0.590***	-0.309***
GDP	0.124	0.614***	-0.420***	0.668***
POPMRW	-14.670***	1.003	8.726**	4.065
TREND				-0.661***
TRENDSQ				0.006994
R-squared	0.538	0.057	0.808	0.881
Dependent Variable: Age 20-24 Participation Rates				
AB--C			119.618***	93.065***
BC--C			114.521***	94.005***
MB--C			114.821***	96.949***
NB--C			103.842***	88.908***
NLD--C			95.721***	83.587***
NS--C			108.666***	93.291***
ONT--C			115.057***	91.765***
PEI--C			110.584***	96.853***
QUE--C			110.856***	92.094***
SK--C			113.893***	95.695***
C	102.364***	-0.386	Province	Province
MINWAGE	-1.704***	-0.858	-2.488***	-2.302***
UNRP	-1.244***	-0.115	-0.401***	-0.302***
GDP	-0.122	4.20E-02	-0.695***	0.171
POPMRW	-11.130	1.606	19.980***	10.390*
TREND				-0.596**
TRENDSQ				0.008
R-squared	0.363	0.008	0.705	0.778
Dependent Variable: Age 25-54 Participation Rates				
AB--C			110.260***	96.540***
BC--C			107.170***	96.792***

Table A.11: Regression Results (Male): Effects on Participation Rates				
Variable	**Level**	**Difference**	**Fixed Effects**	**Fixed Effects/Tr**
MB--C			106.157***	97.382***
NB--C			101.146***	93.526***
NLD--C			98.586***	91.381***
NS--C			102.451***	94.759***
ONT--C			108.217***	96.666***
PEI--C			104.514***	97.581***
QUE--C			105.355***	95.729***
SK--C			106.562***	97.500***
C	96.040***	-0.227***	Province	Province
MINWAGE	0.052	-0.321	-0.438	-0.553***
UNRP	-0.665***	-0.107**	-0.383***	-0.268***
GDP	7.97E-02**	0.165*	-0.332***	0.146***
POPMRW	-2.478***	-0.051	-0.444	0.0129
TREND				-0.191***
TRENDSQ				-0.002
R-squared	0.565	0.067	0.799	0.879
Source: Author's compilation				
* = 10% level of sig. ** = 5% level of sig. ***=1%level of sig. . 2-tailed t tests				

Table A.12: Regression Results (Female): Effects on Participation Rate				
Variable	**Level**	**Difference**	**Fixed Effects**	**Fixed Effects/Tr**
Dependent Variable: Age 15-19 Participation Rates				
AB--C			68.608***	58.765***
BC--C			70.533***	63.458***
MB--C			70.079***	64.330***
NB--C			57.603***	52.697***
NLD--C			47.388***	43.066***
NS--C			58.557***	53.583***
ONT--C			68.065***	60.101***
PEI--C			62.432***	58.072***
QUE--C			57.351***	51.023***
SK--C			63.627***	57.687***
C	61.259***	-0.125	Province	Province
MINWAGE	-1.844**	-0.686	-2.350***	-2.601***
UNRP	-1.616***	-0.294	-0.658***	-0.547***
GDP	0.479***	0.548	7.00E-02	0.460**
POPFRW	-45.624***	-1.545	5.879	2.990
TREND				-0.283
TRENDSQ				0.005
R-squared	0.619	0.035	0.816	0.821
Dependent Variable: Age 15-24 Participation Rates				
AB--C			80.241***	61.711***
BC--C			80.271***	65.777***
MB--C			80.830***	68.281***
NB--C			69.918***	59.099***
NLD--C			58.602***	49.032***
NS--C			72.708***	61.794***
ONT--C			79.441***	63.304***
PEI--C			75.807***	65.891***
QUE--C			72.567***	59.154***
SK--C			74.376***	61.397***
C	71.813***	-0.042	Province	Province
MINWAGE	-1.634**	-0.875	-2.487***	-2.296***
UNRP	-1.194***	-0.124	-0.349***	-0.266**
GDP	0.388***	0.384	2.26E-02	0.614***
POPFRW	-21.774***	2.534	4.764	3.122
TREND				-0.043
TRENDSQ				-0.012
R-squared	0.575	0.033	0.839	0.862
Dependent Variable: Age 20-24 Participation Rates				
AB--C			94.407***	74.610***
BC--C			92.281***	75.747***
MB--C			92.935***	78.352***
NB--C			84.493***	71.618***
NLD--C			77.254***	65.590***
NS--C			88.761***	75.654***
ONT--C			92.363***	74.513***
PEI--C			92.653***	80.212***
QUE--C			89.198***	73.720***
SK--C			87.116***	71.973***
C	85.051***	0.026	Province	Province
MINWAGE	-1.483**	-0.782	-2.040***	-1.213*
UNRP	-0.820***	-0.111	-0.332**	-0.322**
GDP	0.134	4.87E-02	-0.188	0.435***
POPFRW	-19.978***	11.152	14.430*	11.565*
TREND				0.224
TRENDSQ				-0.026***
R-squared	0.308	0.016	0.672	0.700
Dependent Variable: Age 25-54 Participation Rates				
AB--C			29.717	79.362
BC--C			41.062	79.453

Table A.12: Regression Results (Female): Effects on Participation Rate				
Variable	**Level**	**Difference**	**Fixed Effects**	**Fixed Effects/Tr**
MB--C			49.590***	81.308***
NB--C			44.339***	75.616***
NLD--C			39.361***	72.185***
NS--C			45.317***	76.682***
ONT--C			39.485***	79.854***
PEI--C			55.896***	82.424***
QUE--C			40.034***	77.067***
SK--C			48.709***	81.269***
C	76.778***	0.881***	Province	Province
MINWAGE	-2.891***	-0.947	-3.548***	-1.366***
UNRP	-0.600***	-0.109	0.509***	-0.141**
GDP	0.687***	4.56E-02	1.894***	0.332***
POPFRW	-0.216	-0.064	2.206	0.985*
TREND				1.822***
TRENDSQ				-0.055***
R-squared	0.377	0.035	0.721	0.944
Source: Author's compilation				
* = 10% level of sig. ** = 5% level of sig. ***=1%level of sig. . 2-tailed t tests				

APPENDIX B

Summary of Tests

Durbin Watson Test for Serial Correlation

The Durbin Watson test for first order serial correlation $(u_t = pu_{t-1} + e_t)$, in the residuals is given by the following:

$$DW = \Sigma(u_t - u_{t-1})^2 / \Sigma u_t^2 \qquad \text{(B.1)}$$

Σu_t^2 is the sum of squares of all residuals and *DW* is the Durbin Watson Statistic, which depends on the number of explanatory variables and the number of observations. For a particular number of explanatory variables and observations there is an upper limit d_u and a lower limit d_l. The decision rule for the null hypotheses *Ho: p = 0*, where *p* is the correlation coefficient is as follows.

Reject Ho If DW < dl,

Do not reject null If DW > du

Inconclusive test If dl ≤ DW ≤du

Table B.1: Durbin Watson Test Results for the Initial Regressions				
Dependent Variables	**DW**	**Obs.**	**Var.**	**Decision**
EMPRB(15-19)	1.452	200	14	1.452<dl so reject null at
EMPRM(15-19)	1.629	200	14	dl < 1.629< du so test is inconclusive
EMPRF(15-19)	1. 543	200	14	dl < 1.543< du so test is inconclusive
EMPRB(15-24)	1.384	200	14	1.384<dl so reject null
EMPRM(15-24)	1.850	200	14	1.850>du so fail to reject null hypothesis
EMPRF(15-24)	1.348	200	14	1.348<dl so reject null
EMPRB(20-24)	1.588	200	14	dl < 1.588< du so test is inconclusive
EMPRM(20-24)	1.978	200	14	1.978>du so fail to reject null hypothesis
EMPRF(20-24)	1.524	200	14	1.524<dl so reject null
EMPRB(25-54)	1.197	200	14	1.197<dl so reject null
EMPRM(25-54)	1.044	200	14	1.044<dl so reject null
EMPRF(25-54)	1.122	200	14	1.122<dl so reject null
PARTRB(15-19)	1.436	200	14	1.436<dl so reject null
PARTRM(15-19)	1.619	200	14	dl < 1.619< du so test is inconclusive
PARTRF(15-19)	1.559	200	14	dl < 1.559< du so test is inconclusive
PARTRB(15-24)	1.290	200	14	1.290<dl so reject null
PARTRM(15-24)	1.409	200	14	1.409<dl so reject null
PARTRF(15-24)	1.338	200	14	1.338<dl so reject null
PARTRB(20-24)	1.370	200	14	1.370<dl so reject null
PARTRM(20-24)	1.602	200	14	dl < 1.602< du so test is inconclusive
PARTRF(20-24)	1.520	200	14	1.520<dl so reject null
PARTRB(25-54)	1.019	200	14	1.019<dl so reject null
PARTRM(25-54)	1.067	200	14	1.067<dl so reject null
PARTRF(25-54)	1.030	200	14	1.030<dl so reject null
ENRRB(10)	.780	178	17	.780<dl so reject null
ENRRM(10)	1.218	108	17	dl < 1.218< du so test is inconclusive
ENRRF(10)	1.501	108	17	dl < 1.501< du so test is inconclusive
ENRRB(11)	0.875	178	17	0.875 <dl so reject null
ENRRM(11)	1.001	108	17	1.001<dl so reject null
ENRRF(11)	1.125	108	17	1.125< dl so reject null
ENRRB(12)	2.197	162	17	2.197>du so fail to reject null hypothesis
ENRRM(12)	0.975	99	17	0.975 <dl so reject null
ENRRF(12)	1.004	99	17	1.004 <dl so reject null
CONRB(10-11)	1.108	169	17	1.108 <dl so reject null
CONRM(10-11)	1.093	99	17	1.093<dl so reject null
CONRF(10-11)	1.236	99	17	dl <1.236< du so test is inconclusive
CONRB(11-12)	2.184	169	17	2.184>du so fail to reject null hypothesis
CONRM(11-12)	1.059	99	17	1.059 <dl so reject null
CONRF(11-12)	1.126	99	17	1.126 <dl so reject null
CONRB(12-g)	1.298	152	17	1.298< dl so reject null
CONBOVER	2.691	169	17	2.691>du so fail to reject null hypothesis
These are test results from the regression with fixed effects and trend terms and no lag values				
The null hypotheses was tested at the 1% level of significance				

t-Test for Serial Correlation

The t-test for serial correlation is carried out by regressing the residuals from the regression on all the explanatory variables and a lag of the residual to test for first order serial correlation or an AR (1) process. This method was suggested by Wooldridge (2003) to be used when regressors are not strictly exogenous. The results from this test

are also valid if the regressors are strictly exogenous. The decision rule for the null hypotheses of no serial correlation *Ho: p = 0,* tested at the 5%level of significance with n-k-1 degrees of freedom is as follows.

Reject null If $t_{calculated} > t_{table}$

Do not reject null If $t_{calculated} < t_{table}$

Table B.2: initial t-test Results

Dependent Variables	Correlation Coefficient	t-statistic	Decision
EMPRB(15-19)	0.201084	2.104688	Fail to reject null
EMPRM(15-19)	0.201182	2.106097	Fail to reject null
EMPRF(15-19)	0.201002	2.103530	Fail to reject null
EMPRB(15-24)	0.315563	3.823878	Reject null
EMPRM(15-24)	0.315596	3.824736	Reject null
EMPRF(15-24)	0.315534	3.823055	Reject null
EMPRB(20-24)	0.236385	3.045632	Reject null
EMPRM(20-24)	0.236317	3.044380	Reject null
EMPRF(20-24)	0.236439	3.046977	Reject null
EMPRB(25-54)	0.452725	6.135834	Reject null
EMPRM(25-54)	0.452632	6.134301	Reject null
EMPRF(25-54)	0.452811	6.137241	Reject null
PARTRB(15-19)	0.179458	1.893382	Fail to reject null
PARTRM(15-19)	0.179544	1.894784	Fail to reject null
PARTRF(15-19)	0.179386	1.892094	Fail to reject null
PARTRB(15-24)	0.332673	4.066614	Reject null
PARTRM(15-24)	0.332684	4.067877	Reject null
PARTRF(15-24)	0.332679	4.065550	Reject null
PARTRB(20-24)	0.228920	2.973911	Reject null
PARTRM(20-24)	0.228905	2.973133	Reject null
PARTRF(20-24)	0.228914	2.974538	Reject null
PARTRB(25-54)	0.483756	6.780757	Reject null
PARTRM(25-54)	0.483690	6.781285	Reject null
PARTRF(25-54)	0.483817	6.780177	Reject null
ENRRB(10)	0.291445	2.064575	Reject null
ENRRM(10)	0.293422	2.086520	Fail to reject null
ENRRF(10)	0.289625	2.049196	Fail to reject null
ENRRB(11)	0.355086	2.220260	Fail to reject null
ENRRM(11)	0.358774	2.228538	Fail to reject null
ENRRF(11)	0.351738	2.210966	Fail to reject null
ENRRB(12)	0.357086	2.210260	Fail to reject null
ENRRM(12)	0.328774	2.258538	Fail to reject null
ENRRF(12)	0.311738	2.200966	Fail to reject null
CONRB(10-11)	0.377281	3.104124	Reject null
CONRM(10-11)	0.376953	3.085023	Reject null
CONRF(10-11)	0.377825	3.119550	Reject null
CONRB(11-12)	0.249115	2.038818	Fail to reject null
CONRM(11-12)	0.235259	1.916847	Fail to reject null
CONRF(11-12)	0.257483	2.093241	Fail to reject null
CONRB(12-g)	-0.289795	-2.988094	Reject null
CONBOVER	-0.289795	-2.988094	Reject null
Tested at the 1% level of significance for two-tailed tests			

Table B.3: Final t-test Results for serial correlation			
Dependent Variables	**Correlation Coefficient**	**t-statistic**	**Decision**
EMPRB(15-19)[1]	0.043734	0.419404	Fail to reject null
EMPRM(15-19)	0.098693	0.880334	Fail to reject null
PARTRB(15-19)	0.179458	1.893382	Fail to reject null
PARTRM(15-19)	0.179544	1.894784	Fail to reject null
PARTRF(15-19)	0.179386	1.892094	Fail to reject null
PARTRB(20-24)	0.057325	0.485186	Fail to reject null
ENRRB(10)	0.291445	2.064575	Fail to reject null
ENRRM(10)	-0.141879	-0.887576	Fail to reject null
ENRRF(10)	0.289625	2.049196	Fail to reject null
ENRRB(11)	0.355086	2.220260	Fail to reject null
ENRRM(11)	0.358774	2.228538	Fail to reject null
ENRRF(11)	0.351738	2.210966	Fail to reject null
ENRRB(12)	0.475729	1.757349	Fail to reject null
ENRRM(12)	0.103074	1.299734	Fail to reject null
ENRRF(12)	0.038594	0.501869	Fail to reject null
CONRB(11-12)	0.249115	2.038818	Fail to reject null
CONRM(11-12)	0.235259	1.916847	Fail to reject null
CONRM(11-12)	0.257483	2.093241	Fail to reject null
[1] Randomly selected from the regression with a lagged value of the dependent variables.			
Tested at the 1%level of significance for two-tailed tests			

Lagrange Multiplier Test for Heteroskedasticity

The Lagrange multiplier test suggested by Greene, W. H (1993) was used to test for the presence of heteroskedasticity. A formulation of this test is shown below.

$$LM = T/2 \sum^{i} \{s_i^2/s^2 - 1\}^2 \quad \text{(B.2)}$$

$$LM = T/2 \left[\{s_i^2/s^2 - 1\}^2 + \ldots \{s_n^2/s^2 - 1\}^2\right] \quad \text{(B.3)}$$

$$s^2 = \sum^{nT} e_i^2/nT \quad \text{(B.4)}$$

$$s_i^2 = \sum^{T} e_i^2/T \quad \text{(B.5)}$$

Where s^2 is the sum of all squared residuals and s_i^2 is the sum of squared residuals for province i and LM is the Lagrange Multiplier statistic. The e_i^2 is the squared residual for province i in each period. T is the number of times-series observations, n is the number of

cross-sectional observations and Σ is the summation term. Tested all the regressions for the preferred specification at the 5% critical value in a chi-square distribution with n degrees of freedom and arrived at the conclusion to reject the null hypotheses for most. In other words, heteroskedasticity could be a problem for the inference. The decision rule for testing the null hypotheses, $H_{O:}$ Homoskedastic errors with the LM test is as follows:

Reject Ho If LM > chi-square critical value,

Do not reject null If LM < chi-square critical value

Table B.4: Lagrange Multiplier Test Results

Dependent Variables	L.M. Statistic	Decision
EMPRB(15-19)	31.344	Reject null[1]
EMPRM(15-19)	62.632	Reject null
EMPRF(15-19)	29.147	Reject null
EMPRB(15-24)	14.546	Fail to reject null
EMPRM(15-24)	18.811	Reject null
EMPRF(15-24)	23.912	Reject null
EMPRB(20-24)	15.172	Fail to reject null
EMPRM(20-24)	14.444	Fail to reject null
EMPRF(20-24)	20.519	Reject null
EMPRB(25-54)	33.906	Reject null
EMPRM(25-54)	56.02	Reject null
EMPRF(25-54)	29.802	Reject null
PARTRB(15-19)	25.371	Reject null
PARTRM(15-19)	49.162	Reject null
PARTRF(15-19)	25.366	Reject null
PARTRB(15-24)	10.741	Fail to reject null
PARTRM(15-24)	128.72	Reject null
PARTRF(15-24)	25.156	Reject null
PARTRB(20-24)	19.304	Reject null
PARTRM(20-24)	26.116	Reject null
PARTRF(20-24)	25.762	Reject null
PARTRB(25-54)	60.855	Reject null
PARTRM(25-54)	81.413	Reject null
PARTRF(25-54)	23.899	Reject null
ENRRB(10)	26.11	Reject null
ENRRM(10)	21.197	Reject null
ENRRF(10)	16.509	Fail to reject null
ENRRB(11)	56.429	Reject null
ENRRM(10)	29.95	Reject null
ENRRF(10)	29.566	Reject null
ENRRB(12)	438.32	Reject null
ENRRM(12)	130.14	Reject null
ENRRF(12)	130.14	Reject null
CONRB(10-11)	118.01	Reject null
CONRM(10-11)	53.794	Reject null
CONRF(10-11)	56.042	Reject null
CONRB(11-12)	52.37	Reject null
CONRM(11-12)	132.2	Reject null
CONRF(11-12)	184.27	Reject null
CONRB(12-g)	169.51	Reject null
CONBOVER	524.39	Reject null

[1] Heteroskedasticity robust test statistics were reported to account for the rejections

F-Tests

F-tests for exclusion restrictions were used to identify which variables to include in the regression model for the employment, enrollment and participation regressions. To test the null hypotheses Ho: B_5, B_6, $B_7 = 0$, the following formula is employed:

$$F = [(R^2_{ur} - R^2_r)/q] \,/\, [(1-R^2_{ur})/(n-k-1)] \qquad \text{(B.6)}$$

Where q is the number of restrictions representing the number of additional variables to be included in the already existing model, n is the number of observations and k is the number of explanatory variables in the regression model. This critical value for this test depends on q as the numerator degree of freedom and on $n-k-1$ as the denominator degree of freedom. The decision rule is as follows:

Reject null if $F_{calculated} > F_{critical\ value\ from\ table}$

Do not reject if $F_{calculated} < F_{critical\ value\ from\ table}$

F-tests were also carried out to check the overall significance of the regressions. To test the null hypotheses H_O: $B_0 = B_1 = B_K$, we used the following formula which is also reported by the regression package used:

$$F = [(R^2/k)]/[(1-R^2)/(n-k-1)] \qquad \text{(B.7)}$$

The results of these tests are not reported here, but they show that the independent variables help to explain the dependent variables in these regressions. The decision rules are same as is given in the F test for testing exclusion restrictions.

APPENDIX C

CANSIM Data

The tables in this appendix present the details of the CANSIM data by series and table numbers. Population estimates are from CNSIM 2 Table 510001.

Table C.1: Employment Rate Sources (Series Numbers)

Province	B15 - 19	M15 - 19	F15 - 19	B15 - 24	M15 - 24	F15 – 24
NLD	D981077	D981086	D981095	D981076	D981085	D981094
PEI	D981315	D981324	D981333	D981314	D981323	D981332
NS	D981632	D981641	D981650	D981631	D981640	D981649
NB	D982005	D982014	D982023	D982004	D982013	D982022
QUE	D982378	D982387	D982396	D982377	D982386	D982395
ONT	D982751	D982760	D982769	D982750	D982759	D982768
MB	D983124	D983133	D983142	D983123	D983132	D983141
SK	D983497	D983506	D983515	D983496	D983505	D983514
AB	D983870	D983879	D983888	D983869	D983878	D983887
BC	D984299	D984308	D984317	D984298	D984307	D984316
Province	**B20 – 24**	**M20 – 24**	**F20 - 24**	**B25 – 54**	**M25 - 54**	**F25 – 54**
NLD	D981078	D981087	D981096	D981080	D981089	D981098
PEI	D981316	D981325	D981334	D981318	D981327	D981336
NS	D981633	D981642	D981651	D981635	D981644	D981653
NB	D982006	D982015	D982024	D982008	D982017	D982026
QUE	D982379	D982388	D982397	D982381	D982390	D982399
ONT	D982752	D982761	D982770	D982754	D982763	D982772
MB	D983125	D983134	D983143	D983127	D983136	D983145
SK	D983498	D983507	D983516	D983500	D983509	D983518
AB	D983871	D983880	D983889	D983873	D983882	D983891
BC	D984300	D984309	D984318	D984302	D984311	D984320

Table C.2: Participation Rate Sources (Series Numbers)

Province	B15 – 19	M15 – 19	F15 - 19	B15 - 24	M15 - 24	F15 – 24
NLD	D981050	D981059	D981068	D981049	D981058	D981067
PEI	D981423	D981432	D981441	D981422	D981431	D981440
NS	D981796	D981805	D981814	D981795	D981804	D981813
NB	D982169	D982178	D982187	D982168	D982177	D982186
QUE	D982542	D982551	D982560	D982541	D982550	D982559
ONT	D982915	D982924	D982933	D982914	D982923	D982932
MB	D983288	D983297	D983306	D983287	D983296	D983305
SK	D983661	D983670	D983679	D983660	D983669	D983678
AB	D984034	D984043	D984052	D984033	D984042	D984051
BC	D984407	D984416	D984425	D984406	D984415	D984424
Province	**B20 – 24**	**M20 – 24**	**F20 - 24**	**B25 - 54**	**M25 - 54**	**F25 – 54**
NLD	D981051	D981060	D981069	D981053	D981062	D981071
PEI	D981424	D981433	D981442	D981426	D981435	D981444
NS	D981797	D981806	D981815	D981799	D981808	D981817
NB	D982170	D982179	D982188	D182172	D182181	D182190
QUE	D982543	D982552	D982561	D982545	D982554	D982563
ONT	D982916	D982925	D982934	D982918	D982927	D982936
MB	D983289	D983298	D983307	D983291	D983300	D983309
SK	D983662	D983671	D983680	D983665	D983673	D983682
AB	D984035	D984044	D984053	D984037	D984046	D984055
BC	D984408	D984417	D984426	D984410	984419D	D984428

Table C.3: Other Sources (Series Numbers)

Province	GDP	CPI	UNPR
NLD	D24022	D28627	D981008
PEI	D24034	D28648	D981381
NS	D24046	D28669	D981754
NB	D24058	D28690	D982127
QUE	D24070	D28711	D982500
ONT	D24082	D28732	D982873
MB	D24094	D28753	D983246
SK	D24106	D28774	D983646
AB	D24118	D28795	D984019
BC	D24130	D28816	D984365