THE EFFECTS OF THE MINIMUM WAGE: A REEXAMINATION OF THE EVIDENCE FROM CANADA

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ABSTRACT

Several recent studies have challenged the conventional notion that raising the minimum wage has negative labour market consequences. In particular, most recent minimum wage research has considered teen employment, with virtually no examination of teen *part-time* employment rates, even though theory suggests larger percentage changes on *part-timers* than all employed. Given the conflicting findings in the recent literature, especially in the US, this study reinvestigates the evidence on the impact of minimum wage on employment and *part-time* employment on Canadian youth (15 to 19 and 20 to 24 year olds). This paper will follow a similar format as Baker, Benjamin and Stanger (1999). The empirical analysis considers provincial data which includes observations from late 1990s, a period when many provinces raised their minimum wage above inflation. The study finds that, for teenagers-15 to 19, a 10% increase in the minimum wage is associated with roughly 3.1% decrease in employment and for teenagers-20 to 24, the elasticity drops to 1.7%. Another finding is that, minimum wage hikes diminish *part-time* employment in greater values (in average: 3.2% for 15-19 year olds and 3.5% for 20-24 year olds). This finding is in line with the neo-classical labour market predictions. Another major finding of the study is that minimum wage hikes have long term effects, in fact it is the long-term effects of the minimum wage increases that drive the above findings. The long-term effects are attributed to the substitution and expectation effects.

INTRODUCTION

The effect of minimum wages in labour markets is a controversial issue in both policy making and academic circles. The neo-classical model makes clear predictions about the impact of a binding minimum wage on employment. Sectors that are forced to raise wages in response to a minimum wage will reduce employment because of both substitution and scale effects. On the other hand, many policy makers view minimum wage hikes as a useful tool to reduce poverty (Freeman, 1996) as well as to provide a "living wage" for the working poor (Kuttner, 1997).

Although the neo-classical labour market model and the social aims of minimum wage continue to dominate most introductory economics textbook, recent research ("The New Minimum Wage Research") challenges these predictions. For example, time-series regression models that have traditionally been used to measure the impact of the minimum wage on teenage employment no longer find a statistically significant effect of the minimum wage when data from the 1980s are added (see Wellington (1991), Klerman (1991) and Grenier and Seguin (1991)). Also, case studies of the fast food industry in New Jersey and Pennsylvania find that employment did not decline at establishments that were forced to raise their minimum wage rates (Katz and Krueger (1990), Card and Krueger (1994)).

In spite of these unusual findings in the US, there are two main arguments against the findings of these "revisionists". First, it is argued that when the minimum wage really "bites" into the wage distribution –when it exceeds the equilibrium wage- then the effects of the minimum wage hike predicted by the textbook model will surface. The natural question becomes: by how much can the province increase its minimum wage rate

before causing significant disemployment effects? A second argument is the following: even if short-run minimum wage elasticity on employment is negligible, in the long-run employers will have time to adjust the composition of their labour input.

Accordingly, this paper will reexamine the evidence in Canada by updating the sample data of the paper by Benjamin Baker and Stanger (BBS, 1999) who use Canadian provincial data from 1975-1993. I will also be using Canadian provincial data with a time period between 1980-1998. The sample will allow us to capture minimum wage elasticity better, since data on minimum wage rate from the late 1990's are high in real terms compared to data used in previous studies. BBS used teen employment as their dependent variable, even though theory suggests that effect of minimum wage hikes will be more apparent on *part-timers* (Ressler et al, 1996). Hence, one would expect to see larger percentage changes in employment of *part-timers* than all employment. Nevertheless, I will use both teen employment and teen *part-time* employment as the dependent variable for sensitivity analysis.

The first section of this paper starts with the theoretical considerations on the effect of minimum wage hike on youth employment. Next, I will survey the North American literature on minimum wage. The third part will analyze minimum wages in Canada. In the fourth part I will review the methodologies used by previous authors and present the methodology used in this paper. The last section of the paper will present the findings of my primary research with some policy implications.

SECTION ONE

THEORETICAL CONSIDERATIONS

There are several plausible economic models for analysing the net employment effect of minimum wages. The two most commonly referred to models within the labour markets are perfect competition and monopsony. As long as the minimum wage is set above the market-clearing wage, the competitive model predicts that the effect is a decline in employment. In contrast, in the monopsony model, the net employment effects are less clear since they depend on the level of the legislated minimum wage (even if it is above the market-clearing wage). Before we review the available empirical research on the topic and present our model, it is useful to summarize the two models mentioned above.

The academic and policy debate of minimum wages is not limited to the employment changes affecting low-paid workers, but it also includes the distribution of employment, poverty reduction, and school enrolment rates, among others. These effects go in line with the employment effects of minimum wages. And since the minimum wage debate is a political issue as well as a serious economic issue, policy makers are concerned with all aspects of minimum wage legislation. Keeping this in mind, it is also useful to discuss other theoretical aspects of the effects of minimum wages than just the employment effects.

Accordingly, the plan of this section is as follows. First, I start with a summary of the neoclassical labour market to explain the employment effects of minimum wages. This is followed by a discussion of the theoretical predictions on the distribution of employment resulting from an increase in minimum wages. In the final part, I will analyze the much ignored but recently modified monopsony model. By analyzing the

different theoretical predictions of minimum wage hikes, I hope to clarify some of the controversial empirical findings in the academic and political circles.

Effects of the Minimum Wage Increase on Employment: The Neoclassical Perspective

In the neoclassical model, there are two major theories regarding the analysis of the minimum wage. First, Stigler (1946) treated the minimum wage as applying to a market for homogeneous labour that was coincident with an entire labour market. Second, Welch (1976) proposed a two-sector model in which the minimum wage applies only to the covered sector. The other sector provides job opportunities for workers displaced by a higher minimum wage. These two models have become the basic "textbook version" of minimum wages.

The neoclassical (competitive) model predicts that an increase in minimum wages will generate costs to the society exceeding its benefits. This prediction is based on the simple supply and demand model, where in perfectly competitive models market-clearing wages will be achieved when the quantity demanded of labour is exactly equal to the quantity supplied of labour. At this intersection, an equilibrium wage exists where workers maximize utility and firms maximize profits. The equilibrium wage will be exactly equal to the volume of employees marginal product-the contribution that the worker makes to the firm's revenue. Hence if the government forces the wages to rise, it would result in two outcomes: an increase in unemployment rate (and/or a decline in employment) and an increase in the productivity among marginal workers. Consequently, the minimum wage ends up hurting some low-wage workers as they are

laid-off, and it benefits other low-wage workers, as they will be paid more. Overall, a policy that helps some at the expense of others is not Pareto efficient.

However, the neoclassical model has been criticized for its assumptions based on oversimplification of the real world labour market. These assumptions ignore the complexities of the labour market, leaving the predictions of the neoclassical model invalid.

Firstly, there is the issue of the minimum wage coverage; the minimum wage legislation covers only certain industries. Uncovered industries are free to pay their employees less than the legislated minimum wage rate. Hence if we assume that the coverage is incomplete, a greater minimum wage may induce workers from the uncovered sector to queue for jobs in the covered sector, while previously employed workers from the covered sector may seek jobs in the uncovered sector. In Welch's (1976) model where, as mentioned above, the minimum wage applies only to a covered sector, an increase in minimum wage will increase the supply of low-paid workers in the uncovered sector, increasing employment, but decreasing wages further. Welch predicts that the net impact of minimum wage legislation is an economy-wide reduction in employment. Only if the elasticity of labour supply to the market is zero is there no net loss of employment (see Welch 1976 for more details of the model). Welch's model has been accepted as a practical way of dealing with the backdrop of the competitive model where the uncovered sector provides a substantial outlet for workers (lower-productivity-mostly teenagers) laid off[1].

A second criticism of the neoclassical labour model is the assumption that the labour market is totally homogeneous, and all workers are equally likely to share in the

minimum wage generated employment losses. Economists generally agree that workers are not identical, and hence low-wage employers may be substituting workers they prefer for more disadvantaged workers. This would suggest that minimum wage laws not only affect the number of low-wage jobs, but also who gets them. Hence from a policy perspective, one has to also consider the distributional consequences of minimum wages. In conclusion, a heterogeneous labour market introduces two new aspects of minimum wages, namely the employment and distribution of employment effects of minimum wages. Several theoretical studies have been done on the distribution of employment as a result of an increase in minimum wages. In the next part I review these studies and in section three I give a brief summary of the available empirical evidence.

The Effect of Minimum Wage Increase on the Distribution of Employment

One way for the minimum wage to affect the distribution of low-wage jobs is through shifts in demand away from unskilled and toward more skilled workers. Several studies emphasize substitution among worker types. According to Teulings (1996), workers with various skill levels are assigned to jobs, which vary in the level of complexity. He shows that in the case of an increase in minimum wage level, employers will lay off people with wages most affected by the increase, those with wages closest to the minimum wage. The result will be a shift in the distribution of workers. Thus, while the net employment effects are zero, it is conceivable that the composition of the employed have changed.

Lang and Dickens (1992) develop a simple model incorporating both bilateral search and heterogeneous workers. In a later paper (1998), the same authors adopt this model and show that "...a minimum wage law increases employment by attracting more

and better applicants to low-wage jobs with high vacancy rates." This finding though is based on several assumptions. The most important assumption is that there are N workers, type 1 and type 2, and mN potential firms, where m and N are large. This assumption implies that there is always an excess quantity of demanded labour. Given this assumption and others (see Lang et al, 1998), in the first half of their paper the authors show that if the minimum wage rate is raised, there will be higher quantity supply of labour to low-wage employers which will fill more vacancies. The result will likely to increase employment in low-wage jobs and perhaps cause overall employment to increase. However, Lang and Kahn emphasize that the increase in employment is not the most desirable. This is because minimum wage laws have important effect on who gets low-wage jobs if not on the total number of jobs available.

> "...the equilibrium with minimum wage is strictly Pareto inferior to the equilibrium without a minimum wage. The increased competition from higher productivity workers makes lower productivity workers worse off without making higher productivity workers better off."

In the second part of their paper, Lang and Kahn examine the impact of 1991 minimum wage raise on patterns of employment in low-wage occupations. They analyze the food service industry using data from the NBER current Population Survey. They find that "there is a pattern of jobs shifting away from adults towards students including high school students." This finding is in line with Card and Krueger (1994) who find that, following the minimum wage increase in New Jersey, relative to Pennsylvania, teenage employment rose by 2 percentage points and adult employment fell by 2.9 percentage points (pp. 789-90 and Footnote 31). But both of these findings, by Card et al and Lang et al, examine only the restaurant industry. In a sample not limited to a specific industry, Neumark and Wascher (1996) find compositional effects of increasing minimum wages

within the teenage population. They find that increasing the minimum wage induces teenagers who had been simultaneously employed and in school to leave school, while teenagers who had been employed but not in school were displaced.

Effects of the Minimum Wage Increase on Employment: The Monopsony Perspective

Although criticism of the neoclassical model has led to the development of several new arguments of the way the labour market operates, the claim that statutory minimum wages could add to unemployment remained, until recently, unchallenged[2]. The new challenge has come from the research by Card and Krueger (1995), who argue that the labour market can carry the characteristics of a monopsony in less orthodox ways. Before I discuss Card and Krueger's "reinterpretation" of the monopsony model, below I summarize the more traditional "textbook version" of the monopsony model.

In the textbook version of the monopsony model, firms are price takers in the product market but have some degree of market power in the labour market. Because of this power firms are in a position to pay sub-competitive wages and they face an upward sloping labour supply schedule. Accordingly, a K percent rise in the minimum wage will *potentially* increase net employment by $K\varsigma$ percent along the supply curve of labour, where ς is the elasticity of labour supply. I use the word *potentially* since, in monopsony, employment effects of a minimum wage hike depend on the level of the legislated minimum wage. In other words, the increase in employment is valid only for "small" increase in the minimum wage. Indeed, the employment response to higher wages is inversely-U shaped, i.e. a reduction in number of employed (Refer to figure A1 in the Appendix for a simple graphic illustration of the "textbook" monopsony model).

Textbook discussions of monopsony usually dismiss it as an intellectual curiosity. The reasoning behind this judgement is the belief that the elasticity of supply to a particular firm is close to infinity unless the firm actually employs a significant fraction of the total pool of potential workers (ex. a mining firm in a small town). In order to understand Card and Krueger's (1995) "reinterpretation" of the monopsony model, we first have to analyze the assumptions made in their model.

Firstly, Card and Krueger argue that the low-wage market has excess quantity demand of labour. They observe that "...vacancies are a pervasive phenomenon in the low-wage labour market." Secondly, Card and Krueger argue that low-wage employers are willing to pay wages higher than the equilibrium rate (or bonuses etc.) in order to attract more workers and reduce the turnover rate of existing workers. A third assumption is that the elasticity of quit rate with respect to wage is not infinite: that is the argument by the neo-classical model of perfect job information is wrong. With these assumptions, Card and Krueger, like Lang and Khan (1998), create a labour market where a "small" rise in minimum wage can increase net employment.

A different source of monopsony like behaviour suggested by Card and Krueger[3] arises in a model in which workers have some discretion over the level of effort exerted on the job, and firms use a combination of direct monitoring and efficiency wage premiums to induce a higher level of effort. The firm's optimal policy is to pay a "no-shirking" wage sufficiently high so that the cost of losing the job, multiplied by the probability of detection, just equals the monetized disutility of exerting effort on the job. If we assume that the probability of detection is a strictly decreasing function of the number of nonsupervisory workers by the firm, then it follows directly that the no-

shirking wage increases with the level of employment. Hence, if the no-shirking wage is an increasing function of employment, then marginal cost is higher than the offered wage, and a gap emerges between marginal productivity and the wage. Accordingly, a firm that is forced to increase its offered wage as a result of hike in the minimum wage will increase employment.

Conclusion

To sum up, the theoretical predictions of minimum wage increases are slightly contradictory. This is best summed up by Osterman's (1995) observation:

> ...When asked about the effect of the minimum wage, economists must reply that we have no generally applicable model of the labour market. The best that can be said is that different firms will respond in different ways. Some will move up the demand curve and cut employment, others will experience a shock effect and maintain or expand employment, others will shift to a low turnover/low vacancy regime, hence maintaining employment, and still other firms will continue doing business as before but simply pay the new minimum because it is fair. We have no systematic explanations of why some firms choose one course over another, we cannot explain the relative proportions, and hence we cannot really make reliable predictions.

SECTION TWO

THE REVIEW OF THE LITERATURE

The evolution of the minimum wage literature can be divided into three time periods: studies that appeared before 1983, those done during 1983 and 1992, and those which appeared after 1992. Studies that appeared before 1983 relied mainly on aggregated time-series analysis to detect the effects of minimum wages on youth employment. There are many such studies. Between 1983 and 1992 the number of studies diminished significantly owing to the lack of new methodologies of experimenting the available data. It is only after the appearance of the much-referenced "natural experiment" methodology by Card et al in 1992 that economists in the US, Canada and other countries started again to publish extensively on the subject.

The Pre-1983 Studies

Many of the studies on the effects of minimum wages on employment estimate some form of the following basic formula:

$$E_i/E=f(W_M/W, t, U) \qquad (1^*)$$

where E_i is the employment of i^{th} group of workers, E is the population of that group, W_M is the minimum wage and W is a market clearing wage, t is a time trend and U is some measure of cyclical activity, which generally includes real GDP and the unemployment rate of some larger group.

Below is a brief summary of the U.S. findings during 1970 and 1983.

Table 1. Estimated Impact of a 10 Percent Increase in the Minimum Wage on Employment of 16- to 19-year-olds

Study	*Percent Change in Employment (1)*	*Period (2)*
1. Kaitz (1970)	-0.98*	1954-1968
2. Kosters and Welch (1972)	-2.96[a]	1954-1968
3. Kelly (1975)	-1.20[a]	1954-1968
4. Kelly (1976)	-0.66[a]	1954-1974
5. Gramlich (1976)	-0.94[a]	1948-1975
6. Hashimoto and Mincer (1970) and Mincer (1976)	-2.31[a]	1954-1969
7. Welch (1976)	-1.78*	1954-1968
8. Ragan (1977)	-0.65*	1963-1972
9. Mattila (1978)	-0.84[a]	1947-1976
10. Freeman (1979)	-2.46[a]	1948-1977
11. Wachter and Kim (1979)	-2.52[a]	1962-1978
12. Iden (1980)	-2.26[a]	1954-1979
13. Ragan (1981)	-0.52[a]	1963-1978
14. Abowd and Killingsworth (1981)	-2.13	1954-1979
15. Betsey and Dunson (1981)	-1.39[a]	1954-1979
16. Boschen and Grossman (1981)	-1.50	1948-1979
17. Brown, Gilroy, and Kohen (1983)	-0.96	1954-1979
18. Hamermesh (1981)	-1.21	1954-1978
19. Average	**-1.52**	

Source: Brown, Gilroy, and Kohen (1982), Tables1 and 3.
** Statistically significant at the 0.10 level*
[a] No Significance tests are available because reported coefficients were derived from disaggregated data.

On balance, the time-series studies have found that a 10% increase in the minimum wage rate led to a decline in employment of young workers by 1-3%. The elasticity of minimum wages on employment of adult workers was believed to be less than that of teenagers. Indeed, some studies even concluded that a higher minimum wage could increase the employment of adult workers (Hamermesh, 1982).

1982 – 1992 Studies

Between 1982 and 1992, only a few studies were done on minimum wages. This is because the federal minimum in the US did not increase during that time and the methodology of evaluating the problem also stayed relatively unchanged. I refer to the table from Hamermesh (1993) and Card and Krueger (1995) with some additions to analyse the few papers that appeared between 1982 and 1992.

Table 2. Studies (U.S.) of the Employment Effect of a Minimum Wage

Study	*Economy and Data*	*Elasticity with Respect to* W_M
US		
Solon (1985)	US teens, 1954 –79	[-0.06, -0.11]
Alpert (1986)	US employment, 1966-78	[-0.04, -0.10]
Wellington (1991)	US teens, 1954-86	[-0.05, -0.09]
Klerman (1992)		[-0.052]
International		
Santiago (1989)	Puerto Rico, all workers, 1973-82	[-0.12]
Castillo-Freeman	Puerto Rico, all workers, 1951-87	[-0.15]
Bazen and Martin (1991)	France, 1963-86	[-0.09, -0.23]
Kaufman (1989)	UK, 1963-79	[-0.02, -0.14]

Note: Data is adopted from Card and Krueger (1995) and Hamermesh (1993)

Solon (1985) used the basic time-series methodology to measure minimum wage effects on employment, paying more attention to serial correlation and seasonality. His results are similar to previous studies; a rise in the minimum wage has a negative significant effect on employment. Alpert (1986) studied the restaurant industry in the US when minimum wage coverage was extended to this industry. His conclusions are also very similar to that of previous literature. Santiago (1989) studied the effect of minimum wages on all employment in Puerto Rico, paying attention to account for cyclical changes in employment demand. His conclusions are also in line with the previous research, but when Castillo et al (1990) uses industry panel for 1956-75 for Puerto Rico, as we see in table 2, the impact of minimum wages increase considerably. This is because during

1970`s minimum wage rate in Puerto Rico rose rapidly to a level where minimum wages really had a "bite".

Wellington (1991) re-estimated the time-series equation (i.e. equation *(1*)* above) using data from the late 1980s when the minimum wage levels were relatively low. She found that an increase of 10% in minimum wages would reduce teen employment by less than 1%-which is at the lower end of the range of previous estimates- and no employment effect at all for the young adults aged 20-24. Hamermesh 1993 attributes her findings to the fact that the data Wellington used in her study had no "bite", that is real minimum wages were at very low levels-i.e. market clearing wage was close to the minimum wage. But Card et al (1995) does not agree with Hamermesh, arguing that most time-series studies (including Wellington) uses the Kaitz index. He observes that the Kaitz index had actually increased during the 1980`s compared to the 1960`s due to the increased coverage. Thus he argues that minimum wages now has even much smaller effect on employment than what earlier studies have found (given that one believes Kaitz index to be a valid measure).

The findings from Canada, except from Grenier and Seguin (1991), are very similar to that of the US studies (see table 8 in section 5). Grenier et al found quantitatively similar estimates for minimum wage elasticity for the 1956-1975 period as in previous studies, but for the 1976-1988 period, they found that the minimum wage had a statistically insignificant effect on the employment of teenagers.

In conclusion, the studies undertaken between 1982 and 1992 were just a mere update of the previous time-series studies. Overall, they found that an increase in

minimum wages had a smaller effect on youth employment compared to the findings reported before 1983.

The Post 1992 Studies

The most influential study done during this period is by Card and Krueger (1992, 1994). Their first study was based on data from New Jersey and Pennsylvania. In April 1992, New Jersey's minimum wage rose to $5.05 per hour from $4.25, while neighboring Pennsylvania's remained at $4.25. This gave them a unique opportunity to compare the change in employment at the firm level. Hence prior to the effective date to the new law, the authors surveyed over 400 fast-food restaurants in New Jersey and eastern Pennsylvania. As a result of this "natural experiment", they found that increases in minimum wage in New Jersey did not significantly affect employment levels in the fast food restaurants they surveyed. This result came as a revelation to many.

Not surprisingly, their research has been subject to counterattacks ever since. A summary of the criticisms of Card and Krueger`s "natural experiments" is contained in a series of articles that appeared in *Industrial and Labour Relations Review* (1995). This section will summarize the criticisms of the Card and Krueger (1995) study, while section one has the summary of the theory, which the authors use.

Perhaps the harshest criticism came from Professor Welch, who dismissed the Card and Krueger`s methodology as being "poor". Welch (1992) argues that the nature of the questions used in interviewing the restaurants was confusing, and the control groups were "questionable and misleading" (in other words, the restaurants interviewed

do not represent the whole restaurant industry). On the other hand Brown (1995) and Hamermesh (1995) criticize Card and Krueger on the following grounds:

1. The restaurants previously knew that minimum wages would go up, hence there is a chance that these restaurants had already laid off some of their employees.
2. The duration of the survey did not allow sufficient time to elapse before these restaurants could adjust their hiring plans. In other words, Card and Krueger did not wait enough so that the minimum wage effects are fully felt.
3. If we assume that large firms (the restaurants Card and Krueger use in their natural experiment are all multinationals) have smaller expenditure shares compared to smaller firms, then an *exogenous* increase in the cost of low-wage labour will force small firms out of business. In this case large firms will claim the business of the bankrupt small firms and further increase their size. Hence the positive employment effect found by Card and Krueger is valid only for the specific restaurants interviewed, not the whole low-wage labour market.
4. Even the best natural experiment does not have the power to control for all the different factors that are in effect in both states.

Card and Krueger argue that "natural experiments" applied at the firm level will "...give us a fundamental insight of the (neoclassical) theory" since, it is the micro level prediction that is transformed to a prediction of the labour market as a whole. Welch (1995) does not agree with the authors arguing that "...nothing, in ordinary competition theory predicts that employment in any given industry or in any given restaurant will decline in response to an increase in the minimum wage."

Another set of criticisms of the Card and Krueger paper series came from Neumark and Wascher (1995). Neumark and Wascher used establishment-level payroll data to analyze the same New Jersey-Pennsylvania episode. After pointing out

inconsistencies in the Card and Krueger data, Neumark and Wascher go on to calculate the employment effects of minimum wages using the payroll data. Their results show that a rise in the minimum wage yields a small but statistically significant disemployment effect. Nevertheless Neumark and Wascher's findings point at such a small disemployment effect that it is safe to say that "...the results from both sides are remarkably similar in one respect. Neither generates disemployment effects large enough to make the teenage employees of these restaurants worse off (as a group) from increases in the minimum wage." (Benjamin, 1996)

In conclusion of the Card and Krueger vs. the neoclassical labour theory episode, it is safe to conclude that economists have to reconsider their beliefs regarding: a) their use of methodology to measure the labour market impacts of minimum wages and b) their beliefs regarding the short run effects of minimum wages. Regarding the long run effects of minimum wages, it is still not as easy to agree on a common conclusion. Card and Krueger also do not analyze long run effects in as much detail as they analyze short run effects.

Card, Krueger and Kartz's findings encouraged other authors to write more extensively about the effects of minimum wages. After 1992, the evidence regarding the effects of minimum wages started to emerge from other European countries. Below I analyze the aftermath of Card and Krueger's much discussed book.

After the influential book of Card and Krueger in 1995, Neumark and Wascher published an article in NBER, arguing that "although increases in minimum wages have small (short run) net effects on overall teen employment rates, such increases raise the probability that more skilled teenagers leave school and displace lower-skilled workers

from their jobs." This finding is still in line with the predictions of the neoclassical labour market model. Their findings also found support in Canada, where Landon (1997) concluded that increases in minimum wages have a significant negative effect (0.7 percentage point fall) on enrolment rates of 16 and 17-year-old males and 17-year-old females.

The prediction that minimum wages may affect school enrolment rates is not a new concept. Previously Cunningham (1981) finds that an increase in minimum wages has significant negative effect on school enrolment. By comparison, Ehrenberg and Marcus (1980, 82) and Mattila (1981) find evidence of positive effects on enrolment rates, whereas Agell et al (1995) and Card (1992) find no effect at all.

SECTION THREE

MINIMUM WAGES IN CANADA: DESCRIPTIVE ANALYSIS

In Canada, the provinces hold the legislative authority over employment standards, and consequently minimum wages have followed different time paths over the sample period. Data for the provincial legislated changes in the nominal minimum wages over the sample period is from the Human Resources Development Canada web page and BBS (1999). In most provinces almost all the workers are now covered by the minimum wage legislation; the coverage rate is close to 100%. For this reason I assume perfect coverage and do not include the variable in the regression analysis.

Figure 1 plots the real annual (weighted-average) adult minimum wage (in 1992 dollars). Prince Edward Island and the Yukon and Northwest Territories are excluded due to data limitations. In both of the charts in figure 1, we observe that the real minimum wages have a downward trend over much of the 1980s and an upward trend during the 1990s. Still, we observe some variation in both the timing and the severity of the decline/rise. For example, during the 1980s, Quebec and Alberta had a more severe decline than Ontario (20% versus 9% - between 1981 and 1989). Similarly, between 1990 and 1998, Ontario's real minimum wage rate increased by only 4% whereas Quebec experienced an increase of 13%.

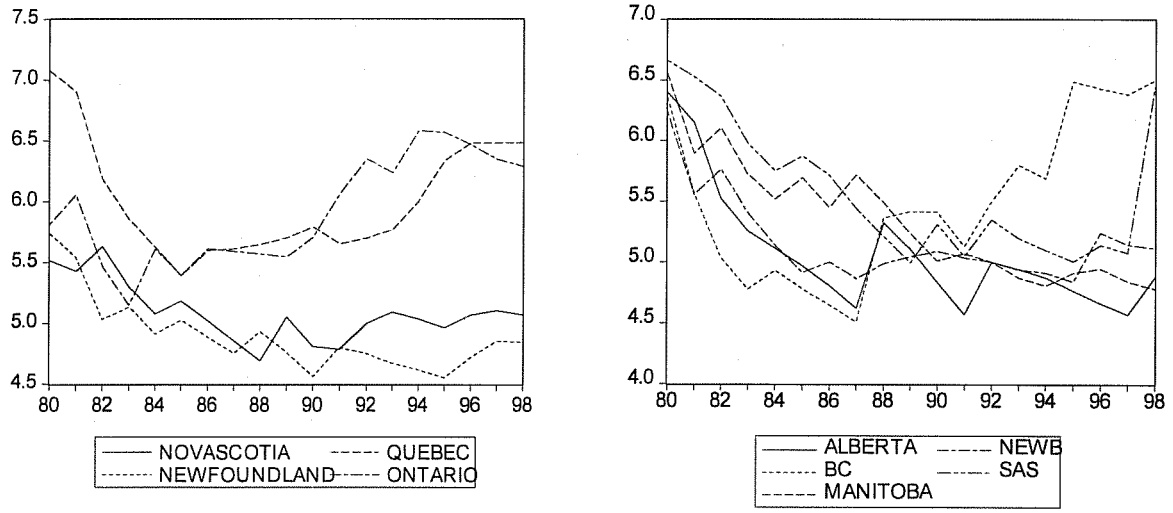


Fig. 1. Real minimum wages by province, 1980-1998. Minimum wages are in 1992 dollars. Data sources are reported in the appendix.

Figure 2 shows the movement in the minimum/average wage ratio. The ratio exhibits less dramatic declines through the 1980s and smaller recoveries in some provinces in the early to mid 1990s. Nevertheless, Figure 1 and 2 tell much of the same story, that is, real minimum wages were higher during the 1990s compared to the 1980s. Hence, if there is an increase in minimum wages in the 1990s, we would expect it to have a larger marginal effect on employment during the 1990s compared to the 1980s, ceteris paribus.

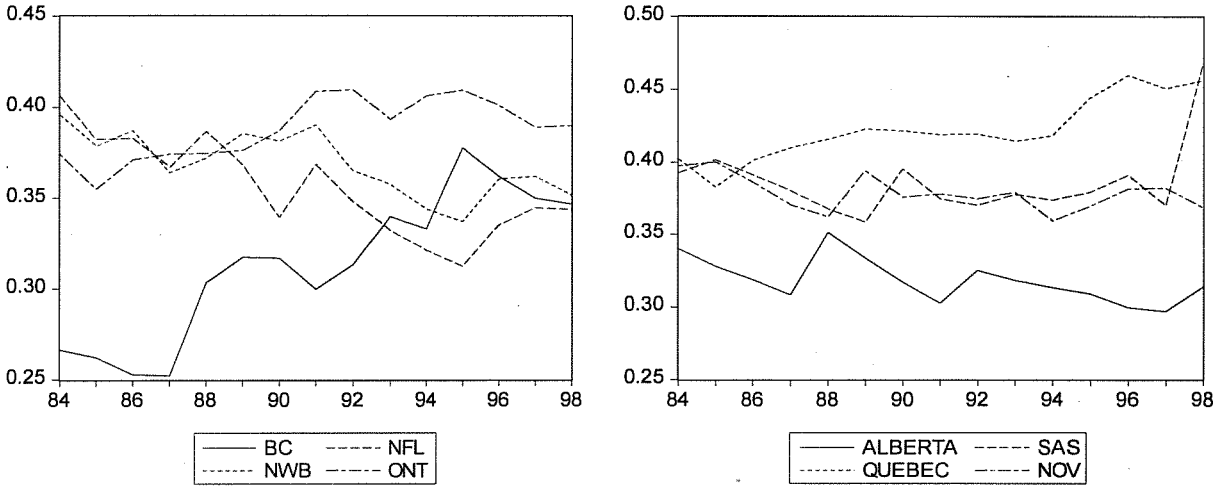


Fig. 2. Ratio of provincial minimum wage to the manufacturing wage (overtime inc.). Data sources are reported in the appendix.

Before I analyze the methodology used in this study, it is necessary to know who earns minimum wages in Canada. This will allow us to better interpret our conclusions and will explain the reason why I choose youth employment as our dependent variable.

Who Earns Minimum Wages in Canada: The Matter of the Choice for Dependent Variable

The neoclassical model predicts that an increase in minimum wages will have a negative employment effect on the labour market (with several assumptions analyzed in section 2). But since almost all of the studies (including this study) pertain to the effects of minimum wages on the youth labour market, the natural question to ask is whether this is an unbiased estimator of the low-wage labour market. There are basically two reasons why economists use youth employment/unemployment to study minimum wage effects; the characteristics of youths and the characteristics of the low-wage labour market. I analyze them in turn.

There has been a particular emphasis on youth employment/unemployment because this group is characterized by low skill levels, low productivity, and relatively low levels of experience-attributes which suggest that this cohort is most likely to be adversely affected by a statutory minimum.

On similar lines, young workers constitute the largest low-wage paid labour market. Statistics Canada (summer 1998) published data on minimum wage earners. As shown in figure 3, more than half of the minimum wage earners were teenagers between the age of 15 to 24 years. Of these, the large majority is students attending school on a full-time basis. This observation has two implications to the study of minimum wages.

First youth employment is a good proxy for the low-wage labour market, and second, policy makers are interested in the effects of minimum wages on school enrolment rates.

Figure 3. Who is working for minimum wage?

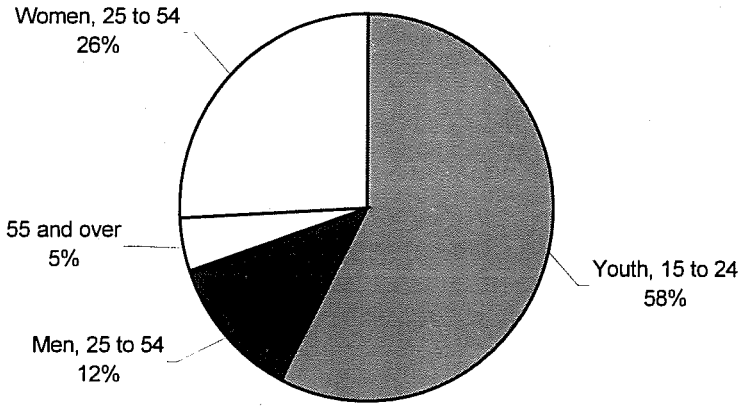


Figure is for the year 1998-first quarter. Source: Statistics Canada 71-005-XPB

SECTION FOUR

METHODOLOGY

This study deals with the effects of changes in minimum wage on youth employment. The critical question we wish to address is: what would the employment level be if the minimum wage were different, all other factors being equal? The literature suggested three approaches to this issue: time-series analysis, natural experiments and pooled time-series cross-section analysis.

I begin with a review of the time-series methodology and natural experiments methodologies. This is followed by a discussion of pooled data analysis, which is the approach used in this study. The choice of this methodology was made for the following reasons. Firstly, time-series methodology has come under severe criticism in the past decade or so (which I explain in the next part). Secondly, even though I would prefer to use the much controversial "natural experiment" methodology, this is not possible due to budget constraints. Thirdly, pooled data enables us to capture the heterogeneity across the provinces.

Time Series Methodology

For the last 30 years, time-series analysis was the most used methodology to measure minimum wage effects on employment. Especially in the US, where minimum wages are legislated by the federal government, variation in minimum wages was limited. Hence time-series analysis was the most feasible methodology for empirical studies.

A typical study relates the employment-population ratio of teenagers to a variable indicating the importance of the minimum wage. In its basic form, the estimating equation in the time-series literature is of the following form:

$$Y_t = g\,(MW_t, X_{t1}, \ldots, X_{tk}) + \epsilon_t\,,$$

Where Y represents the measure of employment or unemployment in year t and g (·) is a function of a set of explanatory variables. Most studies have focused on teenage employment. The reason for this is that most adult workers earn substantially more than the minimum wage, whereas most teenage workers earn the minimum wage[4].

A key issue concerns the other explanatory variables (denoted $X_1,\ldots,X_k$) to be included in the equation. Most studies included some measure of aggregate demand (such as adult unemployment rate, real GDP etc.) and supply side variables (such as school-enrolment rate, population of teens expressed as a proportion of the total working-age population). The model typically is estimated with the dependent variable in logarithms, although some studies use a linear specification.

In the US, where coverage rate was less then 100%, researchers often used the Kaitz index to specify the minimum wage variable (see this section part 3 for more detailed explanation of the Kaitz index).

Time-series approach has been subject to criticisms. One major disadvantage faced in time-series analysis is the identification problem. That is because most of the variables in the regression equation are co-trended, it is problematic to calculate the sole effect of minimum wages on employment. The aggregate time-series approach implicitly compares employment in years during which the minimum wage is relatively high to employment in years during which it is relatively low. The problem is that so many factors affect firms' employment decision that time-series analysis can not separate the impact of minimum wages. Time-series studies have always assumed that, controlling for the other explanatory variables, employment would be the same over time if the minimum wage were constant. Unfortunately, solely interplay variation is not sufficient to identify the ceteris paribus impact of minimum wage on employment.

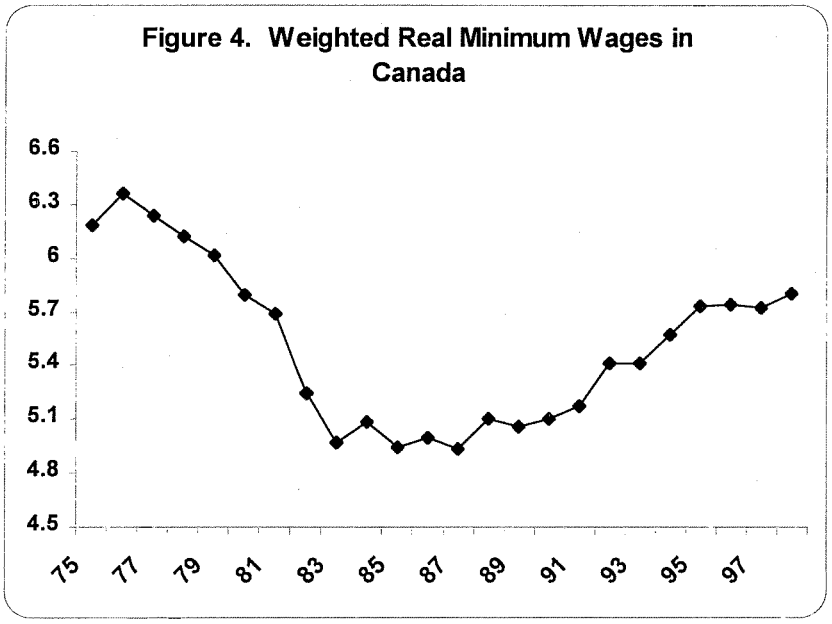
Natural Experiment Methodology

Until the rise in 1991, minimum wage level in the US remained at it nominal level through the 1980s. This caused the real value of minimum wage rate to diminish to the level of 1970s (see Card 1995). Due to the record low levels, some states raised minimum wages on their own, before the federal government did so in 1990 and 1991. This new data was used by Card and Krueger (1992) to take into account the interstate variation in minimum wage levels. The essence methodology is the following[5]. If the minimum wage rose in one state, but not in another, than a comparison of employment in the two states would enable us to attribute the change to the minimum wage hike. Note, however, that it is difficult to hold all other factors constant, unlike a laboratory experiment.

Methodology Based on Pooled Data

This is evidently the methodology used in Baker, Benjamin and Stanger (BBS, 1999). In this paper, I essentially adopt part of their methodology and update the data sample time. However, our own approach is different from the BBS study in the following respects. First, this study includes minimum wage data for the late 1990s. This is period during which the *real* minimum wage levels are higher than during the 1980s (see figure 4). Given the prevailing high real levels, further increases are likely to have a greater impact or a relatively bigger "bite", ceteris paribus on youth employment.

Figure 4. Weighted Real Minimum Wages in Canada



Note: The figure shows real minimum wages averaged by weighting across province. Weights are the population in each province of 15-64 year olds. Real minimum wage is provincial min wage deflated by provincial CPI. Source: CANSIM matrix no. 7440 – 7460.

A second difference of this paper from the BBS paper is that, I analyze the effects of minimum wages on two different dependent variables, namely the ratio of youth employment to the youth population and youth *part-time* employment to youth population. I do this because statistics Canada (1998) reports that "...the minimum wage

workers were more likely than other employees to be working part-time (62% of minimum wage earners are part-time)." Hence, there is a rise in the minimum wage level, we would expect a higher percentage of decrease in the employment of *part-timers* compared to all youth employed. A second reason for using *part-time* youth employment as our dependent variable is the argument presented by Ressler et al (1998): "...firms respond to increase in the minimum wage by altering the level of part-time employment". Hence, we should pick up a bit more of the impact on employment on *part-time* employees than from all youth employed[6].

The sample in this study covers nine provinces over the 1980-1998 period. As mentioned earlier, the data from the late 1990s has key advantages in sorting out the impact of minimum wage hikes. For instance, Wellington (1991) finds small minimum wage elasticity because her sample included data from much of the late 1980s where federal minimum wage was at relatively low levels. The Canadian minimum wage data have a similar trend, during the 1980s the real value of minimum wages was lower compared to the late 1990s.

The specific data sources used in this study are given in table 3 (next page). Data used are in annual averages, which is an advantage over some previous studies, such as Neumark and Wascher (1992, 1994). The latter use data based on Current Population Survey (CPS) estimates, which has been criticized by Card on the grounds that it is small in size and represents only the month it was conducted. This could lead to significant measurement errors, which in turn may affect the findings (Card et al 1994).

The basic specification for province i in year t is:

$$(EMP/POP)_{it} = \alpha_o + \alpha_1(MinW/AveW)_{it} + \Sigma \lambda_i P_i + \alpha_3 t + \alpha_4 t^2 + \alpha_5(MinW(-1)/AveW(-1))_{it} + \alpha_6 X_{it} \qquad (1)$$

where *EMP/POP* is the employment population ratio for youths[7].

The measure of the minimum wage *MinW/AveW*, is the ratio of adult minimum wage to the average manufacturing wage[8]. The *Min/AveW* is close to the Kaitz index, which is the regressor used in most previous studies. The Kaitz index is the product of the province's nonsupervisoral workforce covered by the provincial minimum wage (or the federal if greater) divided by the average hourly wage. This measure has the advantage of adjusting for variation in provincial minimum coverage, however, as Patridge (1998)

Table 3. 1980-1998 Descriptive Statistics for the 9 Provinces[a]

	Mean (Std Dev.) (15-19 years old)	***Mean (Std Dev.) (20-24 years old)***
Teen Unemployment Rate (Stat. Can. Matrix no. 3472-3482)	19.78 (5.66)	13.98 (7.93)
Teen Employment/Pop (Stat Can Matrix no. 3472-3482)	41.36 (10)	59.8 (12.7)
Teen part time Emp/Pop (Stat Can Matrix no. 3472-3482)	25.1 (7.2)	11.3 (4.7)
Minimum Wage[b] (Dept of Labour web page)	5.44 (0.62)	5.44 (0.62)
Manufacturing Sector Av. Wage (Stat Can Matrix no. 4285-4466)	13.47 (2.4)	13.47 (2.4)
Unemployment Rate (25-54) (Stat Can Matrix no. 3472-3482)	14.36 (9.6)	14.36 (9.6)
N	**171**	**171**

[a] *Alberta, BC, Manitoba, New Brunswick, Newfoundland, Nova Scotia, Ontario, Quebec, Saskatchewan*
[b] *Real Minimum Wage = Nominal Provincial Min. Wage / Provincial CPI*

argues, the Kaitz index is based on the questionable assumption that a 10 percent increase in minimum wage coverage has the same effect as 10 percent increase in the nominal

minimum wage rate. Card et al (1994) also suggests that instead of a Kaitz index, it is better to use the minimum wage rate itself. Following this suggestion and Baker et al (1999), I assume that minimum wages cover all employment.

The P_i's are 8 provincial dummy variables with Ontario representing the reference group. The dummy variables (also referred to as fixed effects) are introduced to control for provincial differences in employment and labour force levels not accounted for by the other explanatory variables. One key factor reflected in the provincial fixed effects is that provinces which raised the minimum wage are systematically different than other provinces. It is very important to control for the provincial fixed effects, since not accounting for the provincial differences may underestimate the minimum wage effects (even though we can't really interpret them). For example, Deere et al (1995) criticised Card's (1992) cross-state analysis for not accounting for low-wage sun-belt states (where the federal minimum wage was most binding), which were growing faster than the national average in 1990 and 1991. This kind of mistake can mislead the researcher. The variable t and t^2 are the year effects, which I enter in a variety of configurations. The year effects account for national economic and demographic factors that have a common effect across all provinces.

In the empirical methodology of minimum wage studies, there has been some controversy over the inclusion of lagged minimum wage effects and school enrolment rates. Brown (1995) and Hamermesh (1995) argue that the effects of minimum wages may well be felt some time after the legislation is passed, i.e. minimum wage increases will have negative lagged effects as well as a negative current effect on employment. With the passage of time, the affected employers will adjust to a minimum wage hike by

substituting more-skilled workers or capital for low-skilled workers. With this logic, Neumark and Wascher (1992) and Patridge (1998) use lagged minimum wage effects. Baker et al (1999) also analyses the lagged minimum wage effects by testing whether minimum wage elasticity varies across different frequencies (see section five for further discussion of BBS paper on this subject). On the other hand, Brown et al (1982) and Card et al (1995) argue that minimum wage jobs have high turnover rates, that is in the low-wage market, employers can costlessly adjust to a change in the price of labour. Hence these authors do not find it necessary to include a lagged minimum wage variable. Nevertheless, since this paper follows Baker's et al methodology, I will analyse regressions with and without the lagged effect for sensitivity analysis.

Another important concern is the inclusion of school enrolment rates in the regression. Some authors prefer to include this variable while others do not. Note, however, that those who have included school enrolment rates have generally arrived at different conclusions. This is not surprising giving the fact that the existing literature uses very different data sets and specifications to study the impact of minimum wage changes on school enrolment. Given the number of part-time and full-time students who also work for minimum wages in Canada (9.7% of all minimum wage earners), I chose not to include this variable in our regression analysis[9].

Finally, in the set of controlled variables X_{it}, I include real provincial gross domestic product (GDP), the unemployment rate of males between the ages of 25 and 54, and the population of teenagers expressed as a proportion of the total working-age population. The first two variables are designed to capture the overall labour demand, and the population of teen's ratio is to account for supply side effects.

SECTION FIVE

EMPIRICAL ANALYSIS

The labour market model outlined in the preceding section is estimated with annual data over the period 1980 to 1998[10]. The estimates are shown in Tables 1A through 8A in the appendix. The model appears to perform well. The estimated coefficients generally have the expected sign and are statistically significant. In table 1A I present a set of estimates using a linear specification of equation *(1)*. The first column contains the results using a quadratic trend to control for time effects. The minimum wage is not statistically significant, i.e. it has no effect on the employment to population ratio (See also the summary given in table 4a). The minimum wage effects on *part-time* employment are found in tables 4b and 3A. Here the elasticity of minimum wage is significantly negative. The implied elasticity of –0.013 is below the range of estimates reported in many US studies (mainly the findings of time-series research). But again these time series studies have been subject to much criticism, and most economists are now willing to accept that the short-run minimum wage effects are lower than those previously thought to be the case. As Freeman (1995) puts it "Yes, Virginia, the employment effects of minimum wage were overrated."

The second column of all the tables in the text report WLS estimates of equation *(1)*, weighting the observations for each province according to population (the weighting technique that BBS uses). As BBS report, the manner in which the observations are weighted has little impact on the minimum wage.

In the third column, I include the lagged minimum wage effect (Tables 1A through 8A, and summarized in table 5). This time, we find that the current minimum

wage elasticity turns out to be insignificant, whereas the lagged minimum wage elasticity is significant for the 15 to 19 year olds. This finding is in line with BBS's findings. They find that in the short run, minimum wage effects are insignificant and positive, whereas the long-run effects are significantly negative.

In the fourth and fifth columns of Table 4 I summarize the WLS estimates from specifications without provincial effects and the trend terms. For all employed of both age groups, deleting these variables does not change my results. Minimum wages still have no effect on employment. For the *part-timers*, deleting these variables results in minimum wage elasticity that is significantly negative.

Table 4a. Summary of the Elasticities of the Effects of Minimum Wage Rates on Employment Selected Provinces (1980-1998): Dependent Variable: <u>All</u> youth employed

Linear	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*
15 – 19 year old	-0.077	-0.059*	-0.0154	-0.017	-0.0758*
20 – 24 year old	-0.025	-0.018*	0.0102	-0.18*	-0.008
Logarithmic	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*
15 – 19 year old	-0.31*	-0.15**	-0.18	-0.2	-0.19
20 – 24 year old	-0.165*	-0.14*	-0.06	0.08	-0.08

Where columns represents (1): basic specification (2): weighted (WLS) basic specification (3): WLS with lagged effect (4): WLS with no province effect (5): WLS with no time effects. These specifications are held constant through out the text.

Table 4b. Summary of the Elasticities of the Effects of Minimum Wage Rates on Employment Selected Provinces (1980-1998): Dependent Variable: <u>Part-time</u> employed

Linear	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*
15 – 19 year old	-0.013*	-0.016	-0.00036	-0.029**	-0.022
20 – 24 year old	-0.30**	0.011*	0.003	-0.017*	0.016*
Logarithmic	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*
15 – 19 year old	-0.37*	-0.26*	-0.2	-0.21	-0.022***
20 – 24 year old	-0.03	-0.474*	-0.26	-0.32*	-0.2

Table 5a. Summary of the Effects of Lagged Minimum Wage Rates on Employment (1980-1998):

Dependent Variable All youth employed

Linear *15 – 19 year old*	*Linear* *20 – 24 year old*	*Logarithmic* *15 – 19 year old*	*Logarithmic* *20 – 24 year old*
-0.057*	0.09	0.0008	0.11

Table 5b. Summary of the Effects of Lagged Minimum Wage Rates on Employment (1980-1998):

Dependent Variable: Part-time youth employed

Linear *15 – 19 year old*	*Linear* *20 – 24 year old*	*Logarithmic* *15 – 19 year old*	*Logarithmic* *20 – 24 year old*
-0.024	-0.1	0.011***	-0.27**

Note: Stars refer to the level of significance at which the test is conducted. *- 1 percent level; **- 5 percent level; ***- 10 percent level

In tables 2A, 4A, 6A, and 8A (*"Logarithmic")*, I present a comparable set of results when the variables are entered in logs. BBS find different estimates as a result of this functional change. Our results are also different for the two different functional forms. This is surprising to us since the log-linear specification typically leads to very similar results in time series studies of aggregate U.S. data (Brown et al 1983). But this is not always the case; some studies find sensitivity to the choice of functional form (for example, Castillo-Freeman and Freeman1992, Krueger 1995).

One of the differences between this paper and BBS paper is that, when we use the log form in our analysis we find large-significant minimum wage elasticity compared to BBS who find small-minimum wage elasticity. BBS say that they are "surprised" by their results and that "it is not immediately apparent why this change in functional form should have such a large impact." I am also surprised with their finding, since usually equations pertaining to labour demand are in log form.

In order to determine which of the two functional forms provide the more appropriate summary of our data, I follow the procedure suggested by BBS. I enter each of the control variables both linearly and log-linearly in each specification. Here I confront the two functional forms, within a common framework. The results are recorded in table 6. The elasticity estimates from the two functional forms are quite similar and in agreement with those from the log form. Hence this analysis indicates that it is the linear form of the control variables that leads to the inconsistencies in the results. Including logarithmic versions of these variables in the linear specification leads to a negative and significant estimate of the minimum wage elasticity.

Table 6. Reconciling Linear and Logarithmic Specifications

	Linear and Logs Together	
	Linear	Logs
Minimum Wage	-0.31	-0.25
Elasticity	(-3.07)	(-2.81)

Note-t statistics are in parenthesis. Sample covers 1980-1998 for the 15-19 year olds.

Our interpretation of this evidence is that the log transformation of our base equation *(1)*, provides the more appropriate summary of these data. Our experiment lead to a significant estimate of the elasticity for teens in the range of -0.25 through -0.31. I proceed, therefore, adopting the logarithmic form of our base equation.

Before I analyze the long-run effects of minimum wage on youth employment, I turn to Table 4b. Here the dependent variable is *part-time* employed youth (ages 15-19 and 20-24), and all variables are in the natural log form (except for the dummies and trend). The specifications of the equations for columns 1 through 5 are the same as in the

rest of the tables. The results indicate that a 10% increase in minimum wage reduces *part-time* youth employment by 2.6 % to 3.7 % for the 15 to 19 years old and 3.2 % to 4.7% for 20 to 24 years old. We observe that elder *part-time* teens are effected in greater percentages form an increase of minimum wage while younger teens are less employed overall (all employment decreases 3.1 % for 15 to 19 years old compared to 1.6 % decrease for 20 to 24 year olds).

What Did Baker Benjamin and Stanger Find?

BBS's work on the effect of minimum wages on employment is the latest and most complete work available for Canadian teenagers. BBS provide two important findings. First, they find a negative, significant minimum wage elasticity of approximately -0.25 for teenagers (for the years 1975-1993), which is toward the upper end of the range of estimates found in the literature. Second, they suggest that there are important employment dynamics at work in the teen labour market and argue that their finding of negative significant employment effect is driven by long-run variation in the minimum wage: variation of cycles of 6 years or more. In order to cast this observation, they provide additional estimates of the employment equation using lags of the minimum wage ratio as explanatory variables. I follow their approach and apply this procedure to our sample data. The results are reported in table 7. The contemporaneous elasticity, which is reported in column 1, is similar to the results for longer samples.

Table 7. Varying the Lagged minimum Wage Effects, Base Specification

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*
Contemporaneous	-.22	-.21	-.25	-.15	-.13	-.14	-.21
Elasticity	(-1.83)	(-1.78)	(-1.78)	(-1.27)	(-1.01)	(-1.04)	(-1.27)
First lagged		-0.15	-.003	-.04	-.038	-.12	-.21
Minimum wage		(-1.36)	(-.025)	(-.3)	(-.3)	(-.9)	(-1.26)
Second lagged			-.28	-.164	-.15	-.14	-.18
Minimum wage			(-2.5)	(-1.22)	(-1.26)	(-1.14)	(-1.27)
Third lagged				-.18	-.05	-.02	.009
Minimum wage				(-1.45)	(-.38)	(-.17)	(.067)
Fourth lagged					-.23	-.16	-.14
Minimum wage					(-1.89)	(-1.26)	(-.97)
Fifth lagged						-.17	-.11
Minimum wage						(-1.34)	(-.77)
Sixth lagged							-.04
Minimum wage							(-.29)
Sum (long-run elasticity)	**-22**	**-.36**	**-.53**	**-.53**	**-.598**	**-.75**	**-.881**

Note-t statistics in parenthesis. The sample covers 1980-1998 for 15-19 year olds. Each column represents estimates from the logarithmic base specification with the additional lagged minimum wages included.

In column 2, I compare specifications with one lag of the minimum wage. Consistent with the results of BBS, the long-run elasticities of column 1 and 2 are close to each other. In columns 3-7, I consider still longer lags of the minimum wage. In contrast, these longer lags do have a substantive effect on the long-run elasticity. Once the fourth and fifth lags are introduced, the elasticity estimates are greater than -0.6. These results are also anticipated in the works of Neumark and Wascher (1992, 1994) along with the BBS study.

What is the explanation of these findings in the dynamic labour-demand model? One explanation is adjustment costs. BBS explains "The employment variation could result from the substitution of alternative factors of production with longer planning horizons. Capital is an obvious candidate that is thought to have a much longer adjustment period. The higher cost of substitution may rationalize the importance of low, rather than high, frequency changes" (BBS 1999, also Brown 1995 and Hamermesh 1995).

A second explanation is expectations. The firms expect that due to inflation, minimum wage will rise with high volatility. These minor changes do not lead firms to substantially revise their expectations of wage costs. However, there can be also long-run expectations in changes in real minimum wage rate. It is plausible that it is these long-run-permanent movements in the minimum wage that firms will focus on in choosing the capital/labour mix.

Finally, what follows is a comparison of our results with previous Canadian minimum wage literature. Below is a summary table of the employment effect of a minimum wage at various time intervals. Firstly, as with other Canadian studies, I also find that minimum wage increase has a significant negative effect on youth employment. I observe that my findings are somewhat higher than those reported by previous Canadian studies. I attribute this to the fact that the data set I use include the late 1990's when real minimum wage level was higher compared to the previous covered by BBS (1975-93) and Grenier and Seguin (1975-88). The economic theories suggest that the effect of minimum wage rise to be more effective at higher real minimum wage levels than at lower real minimum wage levels, ceteris paribus.

Secondly, as BBS have found, the effect of minimum wage rise is felt larger in the long run compared to the short run. This is in line with the neo-classical prediction that in the long run, employers will have replacement time (i.e. there will be larger employment variation from the substitution of alternative factors of production).

A third finding of this paper is, minimum wage elasticity is larger for *part-time* employed youth compared to all youth employment. This finding can be explained in two mechanisms. One mechanism is that, in the short run, employers are able to cut *part-*

time employment more easily than they could cut full-time employment. Hence, we will observe greater percentage movement in the employment of *part-timers* than all employed. A second mechanism is a substitution effect. In the long run, employers will prefer to employ full-timers than *part-timers*, hence if they substitute capital for labour, they will first reduce the number of *part-time* employed. This again would result in larger employment changes for the *part-time* employed youth.

Table 8. Studies of the Employment Effect of a Minimum Wage, Canada, 1980-1999

Study	*Data*	*Elasticity With Respect to* W_M	
Swidinsky (1980)	1965 – 75	Male Teens	-0.10
		Female Teens	-0.27
Schaafsma and Walsh (1983)	Provincial data, 1975 – 79	Males, 15-19	-0.17
		Males, 20-24	-0.20
		Females, 15-19	-0.28
		Females, 20-24	-0.21
McKee and West (1984)	1975 – 81[a]	Male Teens	-0.55
		Female Teens	-0.56
Grenier and Seguin (1991)	1976 – 88	Male Teens	-0.232
		Female Teens	0.118
Shannon and Beach (1995)	Ontario, micro data – 1989	All employed	-0.12 to - 0.15
Baker, Benjamin, Stanger (1999)	1975 – 93	All Youth	-0.25

[a] *Average of estimates for eight provinces only*

SECTION SIX

POLICY IMPLICATIONS

The findings in this study suggest that minimum wage rates in Canada have a significant negative effect on the employment rate of the youth (i.e. those in the 15-24 age bracket). In fact, the disemployment effect is even larger if we look only at *part-time* employment. Does this finding reply that the minimum wage legislation is totally undesirable or is it the best alternative to "reduce poverty and inequality"? In this section, I will address some of the issues surrounding minimum wage legislation.

Minimum Wages and Politics

During the 1980s, minimum wages were decreasing in real terms because the provinces were not allowing the nominal value of minimum wages to exceed the inflation rate. For the mainstream economist, the fact that the real minimum wage was not increasing was a testament to the soundness of orthodox economic analysis and many empirical findings (such as this one). But this perspective is problematic because, as many economists well know, minimum wage legislation has a political dimension in addition to the economic dimension. It is not hard to guess why policy makers have always been attracted to minimum wage legislation. Minimum wage laws are much less complicated; rather than designing sophisticated tax-transfer schemes, governments can raise the incomes of the working poor by ordering firms to pay a higher wage plus, the minimum wage legislation does not explicitly cost anything-at least on paper-for the government. The only matter of controversy is the level of wage itself.

Should the Working Poor be Really Cheering for Minimum Wages?

The finding of this paper would suggest otherwise. This is not only because some low-wage workers would lose their jobs (in general), but also because firms will scale back hiring rather than adding more employees. In other words, there will be firms who will not expand their hiring because of the rising cost of labour. Economists cannot accurately calculate how many businesses are unwilling to expand or how many entrepreneurs will delay new openings (perhaps forever). Hence the consequences of jobs may include not only the loss of existing low paid jobs, but also the loss of possible job openings in the future.

Social Objective of Minimum Wage Legislation

Politicians and the general public often favor minimum wages as the means of reducing poverty and inequality. Many studies have found that minimum wages compress the earnings distribution and also tend to reduce wage disparities between age groups and sexes (Fortin and Lemieux, 1997). Even if, in the unlikely event, that minimum wages do not reduce employment among the poor, they will be effective at reducing poverty only if large number of poor families contain low wage workers. This is not the case. In the first quarter of 1998, 4.8% of the total work force worked for the minimum wage or less. Of this amount, more than half (58%) were youths in the 15 to 24 old age group who lived with their parents. Only about 1% of the total work force in Canada (58,000 workers) that earn a minimum wage or less and is the sole earner for the family[11]. Clearly, minimum wages help some poor families. But they also hurt many, especially

those with a teenager trying to enter the labour market, while channeling income mainly to households that are not poor.

How does Minimum Wage Legislation Compare to Other Policies?

The effect of the minimum wage or of any other policy must be judged in the context of numerous other policies and institutions. But economists have provided relatively little evidence on such matters. One policy that the minimum wage is compared is the Earned Income Tax Credit (EITC) program in the US. In effect, the EITC cuts the marginal tax rate on low incomes, putting more money in workers' pockets. Opponents of EITC argue that, by increasing incentives of the workers, it might also turn some non-working poor into workers. On the other hand, critics of the program argue that, EITCs subsidize low-wage employers while minimum wages "tax" those employers. Hence even the two policies complement one another, minimum wage "looks better in the second-best world in which we live than it does in most textbooks." (Ehrenberg, 1995). Still, it is not possible to compare the two programs, since no one has yet analyzed the quantitative interactions between these and other policies. This is also true in the Canadian context, where no research has yet been done on a comparative analysis of the effectiveness and distributional factors of minimum wages with other policies. Clearly, this is one aspect of research that could shed more light on the effectiveness of the minimum wage.

CONCLUSION

I reexamined the effect of minimum wages on employment and *part-time* employment of teenagers (15 to 19 and 20 to 24) in Canada. The minimum wage data covers late 1990, which are high in real terms, compared to 1980s (data used by the most recent Canadian study). The methodology of the paper is adopted from Baker, Benjamin and Stanger (1999). The findings of this paper are as follows.

First, I find that weighting the observations diminishes the effect of minimum wage hikes on employment. Secondly, I find that the functional form of the regression equation make a difference in our findings. Our calculations favour the log form. Thirdly, I find that the *part-time* employed teenagers are the most affected group from a rise in minimum wage rate. Lastly, long-term effects of minimum wage hikes drive the negative effects of minimum wages outlined above. In conclusion, these findings have important implications for the interpretations of employment adjustment in the minimum wage sector and shed light to the controversy of the effect of minimum wages from the Canadian perspective.

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Appendix A

Data Definitions and Sources

All dollar figures in this article refer to Canadian dollars.

Minimum Wages: the adult minimum wage. Data are from Labour Canada web page, and BBS (1999)

Average manufacturing wage: average hourly earnings (including overtime) for manufacturing establishments. Data are from CANSIM matrix no. 4285 – 4466

Provincial consumer price index: data is from CANSIM matrix no 7440 – 7480

Employment/Population ratio: the ratio of employment to population for the relevant rage group. Data are from CANSIM matrix no. 3472 – 3482

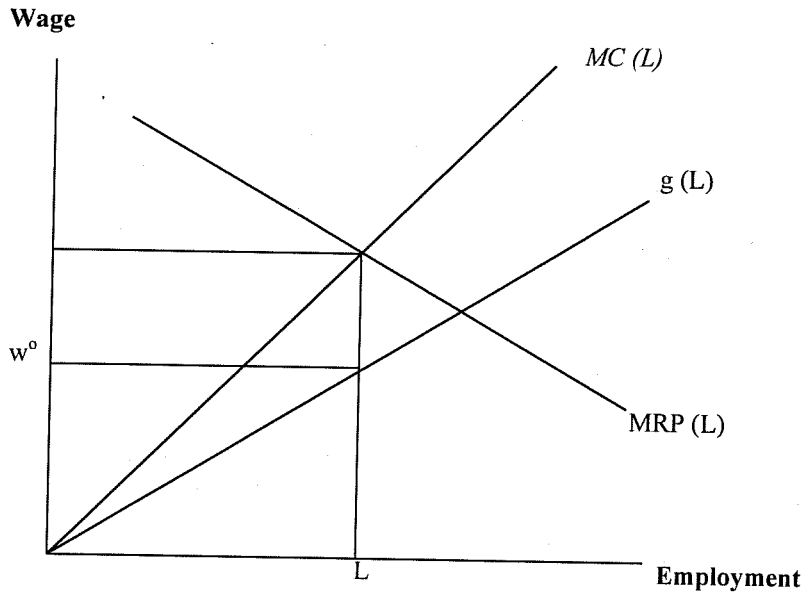
Part-time employment/Population ratio: the ratio of employment to population for the relevant rage group. Data are from CANSIM matrix no. 3472 – 3482

Population ratio: the ratios of the population of the relevant age group to the working age (15 – 64) population. Data are from CANSIM matrix no. 3472 – 3482.

Percent of minimum wage earners for province: Data from Statistics Canada catalog no 72-005-XPB

Real Gross Domestic Product: Provincial GDP deflated by the provincial consumer price index. Data are from CANSIM matrix no. 7880 – 7898.

Figure 1A. Illustration of Monopsony Equilibrium



In the monopsonistic equilibrium, the employer is "supply constraint." Such and equilibrium is illustrated in Figure A1. Here *MC (L)* represents the marginal cost of hiring an additional worker (*MC(L)* < *w*). Starting from a situation in which the wage is monopsonistically determined at a level w^o, a *K* percent increase in the wage caused by an increase in the minimum wage will lead to a $K\varsigma$ percent increase in employment along the supply curve of labour. Where ς is the elasticity of supply. If ς is infinite, then this expression reduces to the standard case of setting (*MRP(L)* = *w*).

Table 1A: *Linear* Specifications of the Teen Employment (15-19 year olds) Equations with varying Time and Province Effects

	(1)	*(2)*	*(3)*	*(4)*	*(5)*
Minimum wage ratio	-0.14	-0.07	-0.018	-0.02	-0.09
	(-1.5)	(-2.58)	(-0.5)	(-0.95)	(-3.03)
Minimum wage ratio lagged	.....	.....	–0.068	.....	.....
			(-1.94)		
Unemployment rate	-0.0055	-0.033	-0.032	-0.008	-0.038
	(-6.3)	(-9.11)	(-8.61)	(-4.52)	(-9.65)
Population ratio (x 1,000)	-1.65	4.212	6.69	5.75	4.21
	(-3.4)	(4.39)	(-3.84)	(13.6)	(4.92)
Real gross domestic product	0.0207	-0.0706	-0.0225	0.0001	-0.0252
	(6.3)	(-3.22)	(-3.84)	(0.4)	(-3.96)
Trend	0.028	0.005	0.0056	0.007	.....
	(8.04)	(4.92)	(5.08)	(5.81)	
Trend squared	-0.0014	-000021	-0.00024	-0.000318	.....
	(-10.6)	(-5.36)	(-5.4)	(-5.702)	
Minimum wage elasticity	-0.077	-0.059	-0.0154	-0.017	-0.0758
Lagged minimum wage elasticity	.....	.....	-0.057	.....	
Province dummies	Yes	Yes	Yes	No	Yes
Weighted	No	Yes	Yes	Yes	Yes
Adjusted R-square	0.96	0.99	0.99	0.98	0.99

Note: The dependent variable is the ratio of teen employment to teen population in levels. T statistics in parenthesis. *N*=171 (19 years, 1980-98, for nine provinces). Weights are the population in each province of 15-64 year olds.

Table 2A: *Logarithmic* Specifications of the Teen Employment Equations (15-19 year old) Equations with varying Time and Province Effects

	(1)	*(2)*	*(3)*	*(4)*	*(5)*
Minimum wage ratio	-0.31	-0.15	-0.18	-0.2	-0.19
	(-3.98)	(-1.68)	(-1.5)	(-1.11)	(-1.56)
Minimum wage ratio lagged	.....	.....	0.000831	.....	.....
			(0.0068)		
Unemployment rate	-0.323	-0.23	-0.22	-0.101	-0.28
	(-7.28)	(-6.44)	(-6.07)	(-2.37)	(-5.2)
Population ratio (x 1,000)	-0.26	-0.18	-0.26	-0.18	0.13
	(-1.9)	(-1.37)	(0.14)	(-1.04)	(0.87)
Real gross domestic product	0.014	0.555	0.635	0.618	0.32
	(0.087)	(5.06)	(5.32)	(8.8)	(1.94)
Trend	0.066	0.082	0.095	0.087	.....
	(5.88)	(8.45)	(8.45)	(2.52)	
Trend squared	-0.003	-0.0038	-0.0044	-0.004	.....
	(-8.84)	(-10.6)	(-10.35)	(-2.73)	
Province dummies	Yes	Yes	Yes	No	Yes
Weighted	No	Yes	Yes	Yes	Yes
Adjusted R-square	0.97	0.99	0.99	0.95	0.99

Note: The dependent variable is the ratio of *natural log* of teen employment to *natural log* of teen population in levels. T statistics in parenthesis. *N*=171 (19 years, 1980-98, for nine provinces). Weights are the population in each province of 15-64 year olds.

Table 3A: *Linear* Specifications of the Teen *Part-Time* Employment Equations (15-19 year old) Equations with varying Time and Province Effects

	(1)	*(2)*	*(3)*	*(4)*	*(5)*
Minimum wage ratio	-0.014	-0.018	0.0004	-0.031	-0.029
	(-2.35)	(-1.02)	(0.017)	(-1.72)	(-1.57)
Minimum wage ratio lagged	.....	.....	–0.027	.....	.....
			(-1.11)		
Unemployment rate	-0.001	-0.018	-0.017	-0.0004	-0.021
	(-1.91)	(-7.16)	(-6.93)	(0.27)	(-7.93)
Population ratio (x 1,000)	-0.52	0.18	2.1	2.7	0.027
	(-1.66)	(0.28)	(2.63)	(7.96)	(0.048)
Real gross domestic product	0.0481	0.0165	-0.020	0.00038	-0.002
	(2.3)	(-4.07)	(-4.93)	(3.99)	(-4.67)
Trend	0.027	0.003	0.003	0.006	.....
	(11.8)	(3.88)	(4.56)	(5.65)	
Trend squared	-0.001	-0.0001	-0.00014	-0.00023	.....
	(-12.95)	(-4.16)	(-4.66)	(-5.17)	
Minimum wage elasticity	-0.013	-0.016	-0.00036	-0.029	-0.022
Lagged minimum wage elasticity	.....	.....	-0.024	.....	
Province dummies	Yes	Yes	Yes	No	Yes
Weighted	No	Yes	Yes	Yes	Yes
Adjusted R-square	0.98	0.99	0.99	0.98	0.99

Note: The dependent variable is the ratio of *part-time* teen employment to teen population in levels. t- statistics in parenthesis. *N*=171 (19 years, 1980-98, for nine provinces). Weights are the population of 15-64 year olds in each province.

Table 4A: *Logarithmic* Equations of Teen *Part-Time* Employment (15-19 year olds) Equations with varying Time and Province Effects

	(1)	*(2)*	*(3)*	*(4)*	*(5)*
Minimum wage ratio	-0.37	-0.26	-0.2	-0.21	-0.022
	(-4.4)	(-2.5)	(-1.47)	(-0.92)	(-1.7)
Minimum wage ratio lagged	.....	.....	–0.1	.....	.....
			(-0.7)		
Unemployment rate	-0.13	-0.01	-0.008	-0.044	-0.11
	(-2.66)	(-0.23)	(-0.2)	(-0.83)	(-1.95)
Population ratio (x 1,000)	-0.47	-0.31	-0.32	-0.27	-0.52
	(-3.13)	(-2.03)	(-2.0)	(-1.25)	(-3.12)
Real gross domestic product	-0.1	0.54	0.59	0.66	0.17
	(-0.55)	(4.23)	(-4.39)	(7.63)	(0.94)
Trend	0.09	0.12	0.13	0.13	.....
	(7.62)	(10.57)	(10.32)	(3.0)	
Trend squared	-0.004	-0.0048	-0.005	-0.005	.....
	(-9.59)	(-11.33)	(-11.0)	(-2.8)	
Province dummies	Yes	Yes	Yes	No	Yes
Weighted	No	Yes	Yes	Yes	Yes
Adjusted R-square	0.97	0.99	0.99	0.93	0.99

Note: The dependent variable is the ratio of the *natural log* of *part-time* teen employment to the *natural log* of teen population in levels. T statistics in parenthesis. *N*=171 (19 years, 1980-98, for nine provinces). Weights are the population in each province of 15-64 year olds.

Table 5A: Linear Equations for All Employed (20-24 year olds)
Equations with varying Time and Province Effects

	(1)	*(2)*	*(3)*	*(4)*	*(5)*
Minimum wage ratio	-0.04	0.03	0.018	-0.29	0.015
	(-0.44)	(2.165)	(0.83)	(-8.2)	(1.02)
Minimum wage ratio lagged	.....	.....	0.016	.....	.....
			(0.8)		
Unemployment rate	-0.006	-0.02	-0.02	0.01	-0.02
	(-7.47)	(-9.67)	(-8.78)	(3.23)	(-10.26)
Population ratio (x 1,000)	-0.7	1.10	1.29	0.91	0.74
	(1.88)	(4.4)	(4.79)	(3.46)	(3.83)
Real gross domestic product	-0.0022	0.0005	0.0001	0.00193	-0.0004
	(7.0)	(0.144)	(0.29)	(17.9)	(-0.12)
Trend	0.025	0.002	0.0025	0.003	.....
	(5.7)	(4.07)	(3.89)	(1.28)	
Trend squared	-0.001	-0.00008	-0.0009	-0.00013	.....
	(-6.59)	(-3.85)	(-3.71)	(-1.26)	
Minimum wage elasticity	-0.025	-0.018	0.0102	-0.18	-0.008
Lagged minimum wage elasticity	.....	.....	0.0891	.....	
Province dummies	Yes	Yes	Yes	No	Yes
Weighted	No	Yes	Yes	Yes	Yes
Adjusted R-square	0.98	0.99	0.99	0.97	0.99

Note: The dependent variable is the ratio of teen employment to teen population in levels. t-statistics in parenthesis. *N*=171 (19 years, 1980-98, for nine provinces). Weights are the population in each province of 15-64 year olds.

Table 6A: Logarithmic Equations for All-Employed (20-24 year old)

Equations Varying with Time and Province Effects

	(1)	*(2)*	*(3)*	*(4)*	*(5)*
Minimum wage ratio	-0.165	-0.14	-0.06	0.08	-0.08
	(-3.02)	(-2.07)	(0.68)	(1.12)	(-1.11)
Minimum wage ratio lagged	.....	.....	0.11	.....	.....
			(-1.21)		
Unemployment rate	-0.14	-0.06	-0.06	0.012	-0.08
	(-4.29)	(-2.03)	(-2.0)	(0.67)	(-2.42)
Population ratio (x 1,000)	-0.24	-0.03	-0.07	-1.19	-0.17
	(-2.17)	(-0.27)	(-0.66)	(-25.58)	(-2.52)
Real gross domestic product	0.45	0.84	0.89	1.02	0.77
	(3.9)	(9.47)	(9.4)	(42.4)	(7.8)
Trend	0.018	0.045	0.05	-0.03	.....
	(1.74)	(4.9)	(3.94)	(-2.85)	
Trend squared	-0.001	-0.0017	-0.0018	-0.00035	.....
	(-3.16)	(-5.63)	(-4.59)	(0.67)	
Province dummies	Yes	Yes	Yes	No	Yes
Weighted	No	Yes	Yes	Yes	Yes
Adjusted R-square	0.97	0.99	0.99	0.99	0.99

Note: The dependent variable is the ratio of *natural log* of teen employment to *natural log* of teen population in levels. t-statistics in parenthesis. *N*=171 (19 years, 1980-98, for nine provinces Weights are the population in each province of 15-64 year olds.

Table 7A: Linear Equations for Part-time Employed (20-24 year old)
Equations with varying Time and Province Effects

	(1)	*(2)*	*(3)*	*(4)*	*(5)*
Minimum wage ratio	-0.09	0.33	0.01	-0.06	0.047
	(-1.74)	(2.066)	(0.017)	(-3.91)	(2.86)
Minimum wage ratio lagged	.....	.....	0.03	.....	.....
			(1.47)		
Unemployment rate	0.002	0.015	0.016	0.01	0.02
	(4.15)	(6.3)	(6.73)	(8.127)	(7.32)
Population ratio (x 1,000)	0.6	-2.51	-2.59	-0.4	-2.4
	(2.63)	(-8.8)	(-8.85)	(-3.72)	(-10.9)
Real gross domestic product	0.0007	0.0016	0.0014	0.0005	0.00155
	(-3.69)	(3.28)	(3.69)	(11.39)	(4.105)
Trend	0.003	-0.0023	-0.003	-0.0005	.....
	(1.1)	(-3.85)	(-4.24)	(-0.508)	
Trend squared	0.00017	-0.00097	-0.00012	-0.00052	.....
	(1.84)	(3.94)	(-4.37)	(1.22)	
Minimum wage elasticity	-0.30	0.011	0.003	-0.017	0.016
Lagged minimum wage elasticity	.....	.....	0.011	.....	.....
Province dummies	Yes	Yes	Yes	No	Yes
Weighted	No	Yes	Yes	Yes	Yes
Adjusted R-square	0.98	0.99	0.99	0.91	0.97

Note: The dependent variable is the ratio of *part-time* teen employment to teen population in levels. t-statistics in parenthesis. *N*=171 (19 years, 1980-98, for nine provinces). Weights are the population in each province of 15-64 year olds.

Table 8A: Logarithmic Equations for Part-time Employed (20-24 year old),
Equations Varying with Time and Province Effects

	(1)	*(2)*	*(3)*	*(4)*	*(5)*
Minimum wage ratio	-0.03	-0.474	-0.26	-0.32	-0.2
	(-0.22)	(-3.87)	(-1.57)	(-2.0)	(-1.03)
Minimum wage ratio lagged	.....	.....	-0.27	.....	.....
			(-1.63)		
Unemployment rate	0.12	0.507	0.54	0.186	0.62
	(3.94)	(9.4)	(9.98)	(4.45)	(7.20)
Population ratio (x 1,000)	-0.95	0.036	0.02	-1.14	-1.86
	(-16.07)	(0.18)	(0.12)	(-10.7)	(-11.0)
Real gross domestic product	0.13	0.75	0.767	0.955	1.17
	(8.3)	(4.56)	(4.5)	(17.2)	(4.56)
Trend	-0.04	0.054	0.05	-0.03	.....
	(-2.0)	(3.24)	(2.53)	(-1.1)	
Trend squared	0.002	0.00014	-0.0002	0.0025	.....
	(3.12)	(0.249)	(0.3)	(2.09)	
Province dummies	Yes	Yes	Yes	No	Yes
Weighted	No	Yes	Yes	Yes	Yes
Adjusted R-square	0.86	0.99	0.99	0.97	0.99

Note: The dependent variable is the ratio of *natural log* of *part-time* teen employment to *natural log* of teen population in levels. t-statistics in parenthesis. *N*=171 (19 years, 1980-98, for nine provinces). Weights are the population in each province of 15-64 year olds.

ENDNOTES

[1] On the other hand, Hamermesh (1993) argues that "it is difficult to believe that the small uncovered sector can provide an outlet for workers displaced by the minimum wage".
[2] Other models include: (1) General Equilibrium model; (2) Shock Effect; (3) Macroeconomic model. For an explanation of each, refer to McKee and West (1980)
[3] Previously the model was suggested by Rebitzer and Taylor (1991)
[4] Card (1995) does not agree for the case of US, but for the case of Canada see the part titled "Who Earns Minimum Wages" in section three.
[5] Card and Krueger received much controversy after the publication of their book (1995) where they summarise their findings. See section 4 for the summary of their findings.
[6] Card et al (1995, p.46) also indicate that their approach has concentrated on FTE and has ignored possible changes in the distribution of full-time and part-time workers.
[7] Two types of youths are examined, ages of 15 to 19 and 20 to 24.
[8] If min. wages have changed more than once during a year, we take the weighted average (with respect to months). Also manufacturing wage is used as a market-clearing wage, Baker et al (1999) and Partridge (1998) also use other wage rates to explore the sensitivity of their results. Both studies find that the change of this variable has no effects. We accept this finding and do not perform the same sensitivity analysis.
[9] BBS also do not include school enrollment rates in their regression analysis- perhaps due to the reasoning that including this variable could raise endogeneity problems if minimum wage minimum wage hikes affects school enrollment
[10] The statistical package used in this study is EVIEWS 3.1
[11] Source Statistics Canada Catalogue no 72-005-XPB.