

**The Effect of Minimum Wage Increase on Employment: Panel Data
Evidence From Canadian Provinces**

By

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Rachel. A. Siyanpeter

Abstract

This paper studies the effects of a minimum wage increase on the employment rates of immigrants and non-immigrants in Canada's Atlantic region, particularly those with high school or more education. In estimating the effects, we used a balanced panel data across four Canadian provinces from 2008 to 2018. Ordinary least squares estimates suggest that a 1% increase in minimum wage will result in a 1.022% decline in the employment rates of immigrants and a 1.239% decline in the employment rates of non-immigrants. The increase in the minimum wage from 2008-2018 for both groups shows that the employment rate of non-immigrants is more affected than immigrants. Furthermore, more attention should be paid to understand why minimum wage affects non-immigrants more. Our results are statistically significant, and the findings are consistent with the predictions of conventional economic theory.

Keywords: Minimum wage, Employment rate, Immigrants, Non-immigrants

[JEL Classification: J30, J71, J23]

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1. Introduction

There have been many studies that have researched the minimum wage effects on various groups such as teenagers, immigrants, and workers in industries with a large proportion of minimum wage earners such as fast-food restaurants. The United States (U.S) has more research work done concerning the effects of minimum wage when compared to Canada. Most studies empirically estimate the effects of minimum wage on teenagers and low-skilled workers who earn minimum wage. There have been limited studies done on immigrants and non-immigrants both in the U.S and Canada. Presently there is controversy around who is more affected by minimum wage among these studies, which has generated conflicting opinions in this area of study. The conventional economic theory sticks to the competitive market model, which predicts that a higher minimum wage has a negative impact on employment. The recent studies did not rely on similar comparative methodology because they identified a positive impact of higher minimum wage on employment. In other words, the research by several recent studies suggests that an increase in minimum wage does not result in unemployment (See, for example, Neumark (1992), Thompson (2009)). One issue with these several recent studies is that they do not cover the more significant welfare effects of the minimum wage. For instance, they did not address several important questions, such as how minimum wage affects income inequality and how minimum wages compare to various redistributive tools like benefits allocated to children and their uses. These questions were left unanswered relative to the effort of the studies, which established the positive effects between unemployment and minimum wage.

This study contributes to the literature by addressing how minimum wage impacts the employment rate of immigrants and non-immigrants within the same age group in the following ways. First, it uses a rich cross-province and time-series Canadian data to ascertain the minimum wage effects. Furthermore,

Canada is an exciting place for this study because it experienced a rapid increase in minimum wage across Canadian provinces. This data will help avoid spatial heterogeneity by using provincial and year-fixed effects to evaluate the variation in Canadian minimum wages. Secondly, this study proposes a novelty that addresses the effects of minimum wage on the employment rates of immigrants and non-immigrants. To the best of the authors' knowledge, this is the first study to compare the effects of minimum wage on the employment of educated immigrants and non-immigrants. Most studies analyze the effect of minimum wage on less educated people assuming that they are more likely to earn minimum wage and therefore be more affected. The author identifies the group, which is more affected by the increase in the minimum wage, and discusses possible reasons why this group is affected more. This study contributes to the emerging body of literature on immigrants because only a few studies have analyzed the effects of minimum wage on the employment of immigrants. Thirdly, this paper focuses on the same age-group of educated immigrants and non-immigrants. Finally, this study on the Canadian minimum wage will confirm if the findings are consistent with previous studies. However, this paper should be useful to policymakers in both Canada and other countries.

Our findings show that minimum wage hikes lead to a lower employment rate for immigrants and non-immigrants. Specifically, the estimates show that a 1% increase in minimum wage will result in a 1.022% drop in the employment rates of immigrants and a 1.239% drop in the employment rates of non-immigrants. The results are statistically significant at the 1% level. We think this result is significant because the minimum wage increases set by the government of each Canadian province have a significant negative effect on the employment rates of these groups. In general, the findings of this study are not consistent with recent studies, which found that increases in the minimum wage have no significant employment effect.

The remainder of this paper will be organized as follows: Section 2 will focus on the literature review; Section 3 will discuss the empirical methodology, models, and methods of estimation used for the analysis in the study; Section 4 will describe the data sources; Section 5 will provide and discuss the results of our analysis, and finally, the conclusions will be presented in Section 6.

2. Literature Review

The standard economic theory of minimum wage establishes that the quantity of a good or services demanded decreases as its price increases relative to the prices of other goods and services. The model of demand and supply further explains that when the price of labor (wage) rises, profit-maximizing firms will substitute other inputs (machines) for labor and reduce their demand for workers(employment). According to researchers, individuals who earn near the minimum wage should be more affected. For example, if the employer decides to substitute more-skilled workers for less-skilled workers when the wage increases, this will not result in a fall in the total net employment but across subgroups. The theory explains that a higher minimum wage will lead to a fall in employment rates. From a theoretical point of view, the minimum wage impact is felt more by immigrants than non-immigrants.

There is a long list of literature that analyses minimum wage increases on economic outcomes like employment rates. Over the years, we have seen an increasing debate in the empirical literature on minimum wage hikes and employment rates for all groups in an economy. This debate has been characterized into two different groups with the same focus but different results that lead to conflicting groups on the subject. However, the researchers on both sides continue to carry out empirical analyses using improved methodologies to find possible answers that might end this debate. This paper reviews the two groups of studies that have tried to figure out the reason why an increase in minimum wage could have a significant effect on employment.

The first group majorly consists of early studies that employed the use of time-series data. These researchers found a negative and significant relationship between minimum wage and employment, supported by the neoclassical labor market model. Their findings generally suggest that an increase in minimum wage will result in a decrease in employment. Although the findings by this group fall in line with the neoclassical model of the labor market, researchers such as Addison (2012), Dube (2010), and Allegretto (2011) have criticized the method used in analyzing these studies. These studies suggest that the result's significance disappears when jurisdiction-specific linear trends are used in the regression analysis. Furthermore, they believe that other factors such as economic conditions are not considered when comparing employment in years when the minimum wage was high with employment in years when the minimum wage was low. According to this group of analysts, even though studies use the gross domestic product (GDP) to control for economic shocks, this may not be enough. If the GDP does not control for changes in the economy, the minimum wage will be endogenous, and the estimates in the results will be biased.

The second group of literature consists of recent studies that found no negative relationship between minimum wage and employment. One common thing about these studies is that they used a case study approach that involves time-series variation in the minimum wage change across states. The use of this approach caused some limitations of unobserved heterogeneity, which could make their estimations biased. Although there are very few studies that provide definite evidence of the positive effects minimum wage increase has on employment, the few studies show that there can be an increase in employment when the minimum wage is increased.

The group of studies discussed below falls under the literature strand that found a negative and statistically significant relationship between minimum wage and employment. Neumark (1992) evaluated how state minimum wage laws affect economic conditions such as employment in the U.S

using panel data. Their results show that a 1% increase in minimum wage will lead to a 1-2% decline in the employment of teenagers, and about 1.5-2% decline in the employment of young adults. Following this result, the authors decided to find a solution to the adverse effects of the minimum wage by using subminimum wages. They estimated the role of subminimum wages in reducing the negative impacts of minimum wage on the employment of teenagers and young adults. Their findings indicate that the youth subminimum wage provisions passed into law by the state legislature provide moderation to the disemployment effects of minimum wage on teenagers. This result provides evidence on the vital role that subminimum wage plays in terms of reducing the harmful effect of a minimum wage increase has on employment. In a similar study carried out by Neumark (2007), the author reviewed the effect of minimum wage on employment in the U.S and other countries. The author reviewed these topics by gathering a significant proportion of studies that researched minimum wage in the early 1990s. The group of studies surveyed by the author gave a consistent result, although not always statistically significant. The review indicates that minimum wage negatively affects employment, both in the U.S and other countries.

By contrast, Thompson (2009) evaluated the role of the minimum wage in the employment of teenagers using county-level quarterly census data. Their findings show a statistically insignificant effect, but because the analysis included counties where the minimum wage is binding, the negative impact minimum wage had on employment was larger. The author of the paper clearly shows that the use of county-level data records a consistent result with previous research that used state panels. Similarly, Sabia, Burkenhauser, and Hansen (2012) used time-series data to analyze how minimum wage hikes directly affect the employment to population ratio of teenagers. The authors obtained a statistically significant result indicating that minimum wage increases negatively affect the employment of teenagers in New York.

The following studies fall under the second group of recent research that found a negative relationship between minimum wage and employment after empirical analysis. Card (1992) researched how the increase in minimum wage affects California's labor market outcomes. The author compared how the minimum wage increase affected teenage workers in California and other states. The comparison is relevant because about 50% of the workers in California earn less than the state minimum wage that increased recently. Using data from the Current Population Survey (CPS), the findings show that the increase in the minimum wage led to a growth of about 10% in teenagers' total earnings, and the employment rate also increased by 4%. This result is inconsistent with the model of low wage labor market predictions. In the same line, Katz (1992) examined how the increase in the federal minimum wage affects the labor market outcome of fast-food restaurants in Texas using a longitudinal survey. In contrast to the conventional predictions, their findings suggest that employment increased in firms that increased their minimum wage. This result implies that the changes in the minimum wage affect the low-wage labor market positively. Another study that examined the impact of minimum wage increase and its effect on employment is Krueger (1994). To evaluate the impact of minimum wage on employment, the author used a cross-sectional time-series data and a difference-in-difference method. The authors compared employment growth at fast-food outlets before and after the increase of minimum wage in New Jersey (where the minimum wage was increased) and Pennsylvania (where the minimum wage did not change). Their analysis shows no evidence that minimum wage increase reduced employment in New Jersey. Finally, Card, Kramarz, & Lemieux (1999) examined if the changes in the minimum wage affect the employment rates of different groups of people classified by age and education in Canada, the United States, and France. With the use of micro-data, the authors were able to know which country was more affected. Their study was based on the trade-off hypothesis when the labor markets have rigid wages and adverse employment demand shocks. The shock will lead to a more significant employment loss for the groups affected, which will be different if wages could change freely. Their findings suggest that wage

rigidity led to an increase in the employment rates of France, Canada, and the United States. Based on these findings, the authors pointed out that the evidence of the trade-off hypothesis presented is weak and needs further research.

As the brief review above indicates, there is no agreement yet on the overall effects of an increase in the minimum wage on employment. Among most studies carried out worldwide, we have seen reliable evidence that points to the negative effect of minimum wage on employment. However, the continuously stated opinion that recent studies do not support the traditional neo-classical model that the minimum wage increase reduces employment is certainly not correct. Few studies have identified the limitations in recent studies that disagree with the traditional view—these studies found reasons why the empirical evidence of recent studies is questionable. Neumark, Salas, and Wascher (2013) criticize the findings of Dube, Lester, and Reich (2010), who suggested that the statistically significant negative relationship between minimum wage and employment disappears with the inclusion of region year interactions in the analyses. Neumark, Salas, and Wascher (2013) demonstrate that the findings in the research of Dube, Lester, and Reich (2010) are sensitive to all the sensitivity checks, which shows that their result is biased. However, after Neumark, Salas, and Wascher's (2013) analysis, they obtained a statistically significant negative relationship between minimum wage and employment when they used the same data type Dube, Lester, and Reich (2010) employed in their analysis. Similarly, Sabia, Burkenhauser, and Hansen (2012) also discovered that the severe problem encountered in these recent studies is due to the research design used in controlling for heterogeneity. Furthermore, their findings suggest that using state-specific linear trends would eventually lead to a biased outcome. Finally, Baker, Benjamin, and Stanger (1999) used Canadian cross-province data to estimate the effects of minimum wage on teenagers' employment. These authors discovered that recent studies obtain insignificant elasticities in their estimation because of

frequency variation. Therefore, when the frequency is low, the results are negative and significant, but the result would be positive and insignificant with a high frequency.

There have been several studies based on Canadian data. These studies include Yuen (2003) and Campolieti (2004), which used panel data to evaluate the impact of the minimum wage increase on employment while other studies such as Swindisky (1980) and Baker (1999) used provincial time-series data. The results obtained from these studies all suggest that an increase in the minimum wage has a significant and negative effect on all groups' employment rates. This result supports Myatt's (2004) findings, who stated in his paper that Canada is the only country that has had a piece of consistent evidence on the effect of minimum wage on employment over the years.

The research that is the closest to this paper is by Sen (2018), who used the amendments of the minimum wage in Canadian provinces to analyze its effects on older teens and immigrants' employment rates. Using a panel data set of Canadian provinces from 1981-2011, the authors estimated how this amendment would affect employment. Their result suggests that minimum wage increase causes lower employment among teens and prime-aged immigrants. The authors also did robustness checks on various covariates, and the covariates were all robust. This paper's primary limitation is that the authors used a relatively small sample size in estimating the research question, but future research work can address this problem.

Our paper uses panel data to empirically analyze the impact of the minimum wage increase on the employment rate of immigrants and non-immigrants in Canada's Atlantic region between 2008 and 2018. We focus on finding which group is more affected and if the results are consistent with previous studies on Canada. Our paper is unique compared to previous studies because we carry out research that focuses on a group of people immigrants and non-immigrants separately, in the same age group of 15 to 65.

3. Empirical Methodology

The study will empirically analyze the effects of an increase in the minimum wage on the employment rates of immigrants and non-immigrants by using this model:

$$\ln EM_{ptg} = \alpha \ln(MW_{pt}) + \beta X_{ptg} + \mu_p + \rho_t + \epsilon_{ptg} \quad (1)$$

Where EM is the employment rate, MW is the minimum wage, and X is a vector of covariates. The subscripts p , t , and g refer to the province, time, and the group (immigrants or non-immigrants), respectively.

Based on the quality of the data used, the analysis done in this study remains open to two different panel regressions with two different logarithmic models for immigrants and non-immigrants. The reason for using two different models in this paper is in view of the fact that we have two outcome variables that are measured simultaneously throughout 11 years (mentioned in the Data section below). Secondly, the variables are in logs because it aids in the interpretation of the estimated coefficients. It makes it easier to understand the percentage change or the elasticity of employment rate with respect to changes in explanatory variables, including the minimum wage. It also makes it easier to identify which group has a more significant negative impact. Several studies, like Sen (2018), Campolieti (2004), and Yuen (2003) applied the use of this model in their empirical measurement:

$$\ln EMI_{pti} = \alpha \ln(MW_{pt}) + \beta X_{pti} + \mu_{pi} + \rho_{ti} + \epsilon_{pti} \quad (2)$$

$$\ln EMN_{ptn} = \alpha \ln(MW_{pt}) + \beta X_{ptn} + \mu_{pn} + \rho_{tn} + \epsilon_{ptn} \quad (3)$$

The list of the dependent and independent variables are all displayed in Table 1 below. The dependent variables $\ln EMI_{pti}$ and $\ln EMN_{ptn}$ are the natural logarithms of the employment rates of immigrants i and

non-immigrants n for province p and time t . These variables describe the portion of educated immigrants, and non-immigrants employed, based on the total population in each province and a given year. The variable $\ln(MW_{pt})$ represents the natural logarithm of the minimum wage for both groups (immigrants and non-immigrants) in each province and year. This variable is the primary covariate of interest in the model. Because the minimum wage changes do not occur at the beginning of a year and sometimes twice annually, I used the linear interpolation method to generate one minimum wage value annually. This method is not uncommon as previous studies such as BurkHauser (2000), Card (1995), Neumark (2013) all used this method and obtained accurate and similar results in their analyses based on minimum wage. We use the logs of the dependent variable and the key covariates to measure the group that is most affected by the minimum wage increase. X_{pt} is the vector of covariates for both groups at a given province and year. Previous studies like Card (1995), Harrison (2015), and Neumark (2013) used these covariates in their research work. The covariates used include the unemployment rate of prime-aged immigrants (**UEMI**), unemployment rate of prime-aged non-immigrants (**UEMN**), provincial real gross domestic product (**GDP**), and average wage per hour (**AWH**). It is necessary to convert covariates also to natural logarithm for consistency, which also enables estimation of the elasticity of employment rate with respect to the covariates directly from the estimated regressions. The unemployment rates of prime-aged immigrants and non-immigrants are used to control for the labor market factors. The provincial real gross domestic product (GDP) is used to control for business cycle fluctuations, and the average wage per hour is used to control for any increase observed in average wages. In equations 2 and 3, μ_p and ρ_t represent province fixed effects and year fixed effects. Fixed effects are used to control for any unobservable economic shocks that might be correlated with changes in the minimum wage, particularly to either a province over a period of time or in a year across different provinces. Finally, the ϵ_{pt} variable is the error term in both models.

4. Data

This section briefly describes the primary sources of data used to examine the impact of the minimum wage increase on employment for both immigrants and non-immigrants. All data sources in this study pertain to Canada's Atlantic region, i.e., Nova Scotia, Newfoundland and Labrador, Prince Edward Island, and New Brunswick over the 2008 to 2018 period. The author made use of provincial time series data to construct a balanced panel data. The panel data was limited to persons aged 15 to 65 years with high school or more education. However, the reason for limiting this study to this specific group of people is because most studies have overlooked that this group of individuals is as affected by the changes in the minimum wage as the other group (high school or less) is.

Some factors that cause the educated group of immigrants to work in low-medium skilled jobs and eventually earn minimum wage are lack of qualification, credential recognition, and experience they acquire from their home countries. However, the foreign countries they migrate to do not acknowledge their qualifications, credentials, and experiences. Similarly, educated non-immigrants also find themselves working in low-skilled jobs where they earn minimum wages. However, the reason for this is because the labour market doesn't favour them, and they are left with minimum wage jobs. In summary, using the data sources listed below to carry out the research will provide answers to several unanswered questions.

The author obtained the data on provincial minimum wage from Employment and Social Development Canada (ESDC). ESDC is a Canadian minimum wage database that provides the exact date, month, and year of changes in the general adult minimum wage for each province in Canada. Because this paper focuses solely on the Atlantic provinces in Canada, the minimum wage is essential and acts as the regression analysis's explanatory variable. Secondly, the government's powers in Canada are shared between the federal government and all the provinces; this provides a significant source of variation in

wages. This variation in wage will help us to understand why these changes occurred across the provinces. As a result of some provinces experiencing minimum wage changes twice in a year, some years had missing data. Since the changes occurred mainly mid-year and sometimes at the end of the year, some values were missing. To solve this problem, the author of this paper selected the last change made every year and used the linear interpolation method to generate the missing minimum wage values. This method has been used by Sen (2018) and other previous studies who encountered a similar problem during their estimation.

The second source and the major contributor of data to this research is the Statistics Canada Data (SCD), formerly known as CANSIM. SCD is a Canadian socio-economic time-series database that contains free aggregate data to the general public that is made available through Statistics Canada. Statistics Canada extracts the aggregate data from the Labor Force Survey (LFS). The LFS is a Canadian household survey carried out to collect information on labor force-related issues. The survey is carried out monthly and focuses on all individuals of a household who are 15 years old and above, whether they are employed or unemployed.

In Canada, the immigrant status is divided into two groups: immigrants and non-immigrants. Immigrants include persons who are, or who have ever been, landed immigrants or permanent residents (Statistics Canada, 2017). These people have the right to stay in Canada permanently with the immigration authorities' permission, while non-immigrants are categorized as persons who are Canadian citizens by birth (Statistics Canada, 2017). To move on with analyzing the effect of the minimum wage increase on immigrants and non-immigrants, we obtained data on both groups based on the definitions listed above.

The data gathered involves the total statistics on the employment status of educated immigrants and non-immigrants aged 15 to 65 years, but these are not available on SCD. Therefore, the data on immigrants' and non-immigrants' educational attainment in Canada was provided by SCD, while data on immigrants'

and non-immigrants' employment rates by province were obtained from LFS. The author manually constructed the aggregate labor force characteristics of immigrants and non-immigrants by educational status for each province annually by combining the data from both SCD and LFS. Because Canada's Atlantic region has a smaller population of immigrants, it made gathering data for all the four provinces challenging.

Furthermore, due to the small sample sizes from each province, we could not disaggregate the employment rate for immigrants and non-immigrants by sex. The other variables, such as unemployment rate of prime-aged immigrants and non-immigrants aged 15 to 54, the average wage per hour, and real provincial GDP, were also taken from SCD. However, the data set is detailed and covers all provinces, gender, and specified age groups.

Table 1 presents the summary statistics on minimum wage, which is conditional on all the other variables for the main estimation. Overall, the minimum wage was \$7.750, while the maximum minimum wage was \$11.55. Roughly, \$9.991 is the mean wage, with a standard deviation of 0.996.

The minimum wage ranged from \$7.750 to \$8 across the provinces in 2008. Prince Edward Island, Newfoundland and Labrador, and Nova Scotia recorded the highest minimum wage while New Brunswick had the lowest. In 2018 the minimum wage had increased from \$11.55 to almost \$12, with Prince Edward Island being the highest and Nova Scotia the lowest.

The changes in the minimum wage over the years ranged from 15 cents to over \$1. These changes varied yearly across all the provinces and provided a cross-province and time-series data that help determine how minimum wage changes affect immigrants and non-immigrants.

TABLE 1
Summary Statistics

Variables	Mean	Standard Deviation	Min	Max
Employment rates of immigrants	55.18	3.065	48.20	60.80
Employment rates of non-immigrants	57.03	3.345	49.80	62.20
Unemployment rate of prime-aged immigrants	9.880	4.469	6.100	28.51
Unemployment rate of prime-aged non-immigrants	8.941	1.925	5.900	13.20
Minimum Wage	9.991	0.996	7.750	11.55
Average wage per hour	26.15	2.126	22.29	30.14
Real provincial GDP	24,950	11,933	4,329	38,474

Notes: Table 1 is obtained from the data pooled across 4 Canadian provinces from 2008 until 2018, with the corresponding mean, standard deviation, minimum and maximum for all the variables

5. Results

In this study, we have used three alternative models and estimators to examine the effect of minimum wage on the employment rate. We also used Chow test and Hausman test to select the best model between pooled OLS, fixed effects, and random effects models. The results we have found has shed more light on which group is more affected by the minimum wage increase. The estimation results of the panel data regressions (equations 2 and 3) are using the pooled ordinary least square (OLS) approach, fixed effects model, and random effects can be seen in Table 2 below.

TABLE 2
Estimated Results from pooled OLS, fixed effects, and random effects Models.

Immigrants			
VARIABLES	OLS	Fixed Effects	Random Effects
lnMW	-1.022*** (0.207)	0.0854 (0.196)	-0.188 (0.186)
lnAWH	1.944*** (0.167)	0.229 (0.263)	0.495** (0.239)
lnUEMN	-0.0105* (0.00610)	-0.0314*** (0.0106)	-0.00719* (0.00418)
lnGDP	0.0111 (0.0146)	-0.183 (0.181)	0.00828 (0.00994)
Constant	3.611*** (0.409)	5.162*** (1.573)	2.811*** (0.409)
R-squared	0.9997	0.363	0.2583
Non-immigrants			
VARIABLES	OLS	Fixed Effects	Random Effects
lnMW	-1.239*** (0.302)	-0.179** (0.0754)	0.271 (0.167)
lnAWH	2.224*** (0.233)	0.0964 (0.109)	-0.452** (0.217)
lnUEMI	-0.00670* (0.00384)	-0.00130* (0.000708)	-0.00173 (0.00165)
lnGDP	-0.0304 (0.0216)	0.0819 (0.0634)	-0.0401*** (0.00908)
Constant	4.992*** (0.408)	3.342*** (0.492)	5.307*** (0.385)
R-squared	0.9993	0.260	0.4543

Notes: Coefficient estimates are presented with fixed and random effects with the standard errors in parenthesis underneath. * Significant at 10%; **significant at 5%; ***significant at 1%.

5.1 Model Selection Test

The results presented in Table 2 suggest that the pooled OLS is the better model in terms of significance and the R-squared value when compared to the fixed effects and the random effects models. However, to determine the best estimation model between the three models, the Chow test and Hausman test are used.

5.1.1 Hausman Test for Fixed-Vs-Random Effects

The Hausman test examines if the individual effects are uncorrelated with other regressors in the model. It follows the chi-square distribution and also reports p-value. This test will help us in choosing the best model between the fixed effects and the random effects models. However, for our convenience, we focus on p-values to help us determine the model that is most appropriate and reject or not to reject the null hypothesis.

The null and alternative hypothesis for the test are:

$$H_0: P > 0.05 \text{ (Random effects model is appropriate)}$$

$$H_1: P < 0.05 \text{ (Fixed effects model is appropriate)}$$

The results of the Hausman test, presented in Table 3 suggest that we choose the fixed effects model. The P-values recorded in the table for both immigrants and non-immigrants are less than 0.05, and hence we reject the null hypothesis and accept the alternative hypothesis. The results furthermore explain that random effects are not independent of explanatory variables, and therefore, we conclude that the fixed effects model is the appropriate model. Studies like Feld and Heckemyer (2011) and Stanley and Doucouliagos (2012) also used the Hausman test in their paper to analyze the impact of minimum wage on various groups.

TABLE 3
Hausman Test results for immigrants and Non-immigrants

Immigrants				
VARIABLES	Fixed Effects	Random Effects	Difference	S.E
lnMW	0.0854	-0.188	0.274	0.09996
lnAWH	0.229	0.495**	-0.265	0.148
lnUEMN	-0.0314***	-0.00719*	-0.0242	0.00987
lnGDP	-0.183	0.00828	-0.192	0.180
Test Summary	Chi-square	d.f	P-value	
	11.06	3	0.0114	
Non-immigrants				
VARIABLES	Fixed Effects	Random Effects	Difference	S.E
lnMW	-0.179**	0.271	-0.450	0.0326
lnAWH	0.0964	-0.452**	0.548	0.0640
lnUEMI	-0.00130*	-0.00173	0.000	0.00022
lnGDP	0.0819	-0.0401***	0.122	0.0633
Test Summary	Chi-square	d.f	P-value	
	199.75	3	0.0000	

Notes: Coefficient estimates are presented with fixed and random effects, their differences, and standard errors. Estimates of the chi-square, degree of freedom and P-value are also presented above.

*Significant at 10%; **significant at 5%; ***significant at 1%.

5.1.2 Chow Test for Fixed-Vs-Pooled OLS

Chow test is a test used to determine whether the fixed effects model is better than the pooled OLS model.

The Chow test reports the F-test and p-values, but we focus on the p-values to help us determine the most appropriate model. We used the fixed effect estimator for the regression and estimated the test statistics for the Chow test. Examples of some studies that used the Chow test in choosing between the pooled OLS and the fixed effects model are Stephen Ba zen and John P. Martin (1991) and Fiky Nila Mustika (2019).

The null and alternative hypothesis for the test are:

$$H_0: P > 0.05 \text{ (Fixed effects model is appropriate)}$$

$$H_1: P < 0.05 \text{ (Pooled OLS model is appropriate)}$$

The results of the Chow Test can be seen in Table 4 below. The P-values recorded in Table 4 are less than 0.05; hence we reject the null hypothesis and accept the alternative hypothesis for both immigrants and non-immigrants. The results furthermore indicate that fixed effects might be correlated with the error term, and therefore, we conclude that pooled OLS is the appropriate model for both immigrants and non-immigrants.

TABLE 4
Chow Test results for immigrants and Non-immigrants

Test summary	F-test	d.f	P-value
Immigrants	3.69	(3,36)	0.0206
Non-immigrants	66.58	(3,36)	0.0000

The difference between the pooled OLS and fixed effects estimates cannot be solely explained by unobserved heterogeneity unless there is a strong reason to believe that fixed effects are correlated with changes in the provincial minimum wage. Another possible explanation for this difference can be the sample selection. The fixed effects estimates will exclude some observations that will make the difference between the pooled OLS and fixed effects estimates to ensure there is variation in the explanatory variables, which reflect the sample selection rather than heterogeneity. Therefore, it is expected that the fixed effects estimations are similar to the pooled OLS. However, our results suggest that the fixed effect models are different from the pooled OLS results. From the pooled OLS regression

results and Fixed effects results, we can infer that there is not any improvement in the model even after using fixed effects. Therefore, we focus on the estimated results of the pooled OLS model in this paper.

5.2 Immigrants

TABLE 5
Pooled OLS Estimates for Immigrants

VARIABLES	lnEMI
lnMW	-1.022*** (0.207)
lnAWH	1.944*** (0.167)
lnUEMN	-0.0105* (0.00610)
lnGDP	0.0111 (0.0146)
Constant	2.811*** (0.409)
Adjusted R-squared	0.9996
R-squared	0.9997

Notes: Coefficient estimates are presented with province and year fixed effects. The standard errors are in parenthesis underneath. * Significant at 10%; **significant at 5%; ***significant at 1%.

Table 5 above shows the regression result of the effects of the minimum wage on immigrants' employment rates. The coefficient estimate of the minimum wage variable is negative and statistically significant at 1% level of significance. For immigrants who have completed high school and more when the minimum wage increases by 1%, their employment rate decreases by 1.022%. Therefore, this result suggests that immigrants are affected by any rise in the minimum wage and become less active in the labor market. The result obtained in this paper is somewhat similar to those from other studies conducted in Canada and is consistent with the neoclassical model of the labor market.

Furthermore, the coefficient estimates of the average wage per hour and the unemployment rate of prime-aged non-immigrants are statistically significant at 1% and 10% levels, respectively. However, the real provincial GDP is not statistically significant at the 10% level. The coefficient of the prime-aged non-immigrant unemployment rate is negative, and the coefficients of the real provincial GDP and the average wage per hour are positive.

5.3 Non-immigrants

TABLE 6
Pooled OLS Estimates for Non-immigrants

VARIABLES	lnNEMI
lnMW	-1.239*** (0.302)
lnAWH	2.224*** (0.233)
lnUEMI	-0.00670* (0.00384)
lnGDP	-0.0304 (0.0216)
Constant	4.992*** (0.408)
Adjusted R-squared	0.9992
R-squared	0.9993

Notes: Coefficient estimates are presented with province and year fixed effects. The standard errors are in parenthesis underneath. * Significant at 10%; **significant at 5%; ***significant at 1%.

Table 6 above displays the estimates of the minimum wage effects on the employment rate of non-immigrants. These non-immigrants are educated and acquire minimum wage across all the provinces, gender groups, and the same age group. The estimated coefficient of the minimum wage variable is negative and statistically significant at the 1% level. The elasticities show a decrease of about 1.239% in the employment rate of non-immigrants when minimum wage increases by 1%. This result suggests that

non-immigrants are more affected by the minimum wage changes compared to immigrants. The reason for this higher effect is discussed below in section 5.4. The coefficient estimates of the average wage per hour and the unemployment rate of prime-aged immigrants are statistically significant at 1% and 10% levels, respectively. The estimated coefficient of real provincial GDP is not statistically significant at the 10 % level. However, the coefficients on the prime-aged immigrant unemployment rate and real provincial GDP are negative, while the coefficient of average wage per hour is positive.

5.4 Discussion

The results presented above for immigrants and non-immigrants suggest that non-immigrants are more affected by an increase in the minimum wage. The employment rate of educated immigrants decreases by 1.022%, while the employment rate of non-immigrants decreases by 1.239% in response to a 1% increase in the minimum wage. The first reason why the employment rate of non-immigrants is more affected by the increase in the minimum wage is due to the exponential rise in the immigrants' population in Canada. Immigrants help boost the labor force that is falling rapidly, and their employment rate is higher than that of non-immigrants. Secondly, non-immigrants are pickier in accepting employment opportunities while immigrants work in any economic sector. According to Zavodny (2008), immigrants can work in industries with low labor demand or even illegally. As a result, if immigrants are more productive than non-immigrants, the standard economic theory predicts that immigrants would experience lesser effects of employment than non-immigrants when the minimum wage increases.

The results also indicate that a 1% increase in the average wage per hour will lead to a 1.944% increase in the employment rate of immigrants and 2.224% increase in the employment rate of non-immigrants. This means that non-immigrants experience a higher increase in the employment rate when compared to immigrants. The employment rate of immigrants decreases by 0.010% in response to a 1% increase in the unemployment rate of prime-aged non-immigrants, while the employment rate of non-immigrants

decreases by 0.0067% in response to a 1% increase in the unemployment rate of immigrants. These results imply that immigrants are more affected by an increase in the rate of unemployment in the other group. The estimated elasticities of employment rate with respect to GDP are not statistically insignificant for both immigrants and non-immigrants. However the estimated values suggest that an increase in the gross domestic product (GDP) generates a positive effect on the employment rate of the immigrants and a negative effect on the employment rate of non-immigrants.

Given the small sample size used in this paper, care should be taken when emphasizing the results. The analysis in this paper further suggests that immigrants are always affected by increases in the minimum wage, whether educated or not. This result is not surprising because previous studies that analyzed the effect of the minimum wage increase on immigrants with high school or less education found similar results to our results. However, this paper presents a novelty by providing empirical evidence on the effect of a minimum wage increase on the employment rate of non-immigrants. There is a lack of research in the area of the effects of minimum wage on non-immigrants.

6. Conclusions

Recent empirical evidence that focuses on the effect of the minimum wage on employment is ambiguous, which has led to a debate among researchers. One group of analysts emphasizes the importance of controlling for unforeseen heterogeneity within provinces and finds that a higher minimum wage does not significantly affect the employment rate. In contrast, the other group which used panel data in their analysis suggests that an increase in the minimum wage has a significant effect on employment. This paper offers a different view on minimum wage effects on employment by using cross-province and time-series data from Canada. The author examined the impacts of minimum wage change on educated immigrants and non-immigrants in four provinces over eleven years. The results found in this research paper suggest that a rise in minimum wage will result in a lower employment rate among immigrants and

non-immigrants. Non-immigrants are more affected by the change in the minimum wage due to some factors such as the exponential rise in the immigrants' population in Canada, which makes immigrants more active in the labour force. In contrast, non-immigrants are pickier in accepting employment opportunities while immigrants work in any economic sector.

The findings in this paper are significant because they are consistent with previous Canadian studies carried out and present a novelty that addresses how minimum wage affects the employment of non-immigrants.

The limitation found in this paper is related to the sample size. The sample size used in estimating this study is small, and this needs to be improved on in future studies. These findings will be useful to policymakers concerned about minimum wage effects on the labor market outcomes such as employment. These results will make the government pay more considerable attention to understanding how immigrants and non-immigrants are affected each time there is an increase in the minimum wage. Furthermore, there is a need to design programs that will provide this group of people with good jobs based on their Canadian labor force qualifications. Finally, there is still potential in extending and modifying this analysis as minimum wage hikes persist.

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