THE IMPACTS OF MINIMUM WAGE ON POVERTY AMONG CANADIAN PROVINCES

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Ezana Sahle*

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*ezana.sahle@ryerson.ca

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Ezana Sahle
Master of Arts in International Economics and Finance
Ryerson University, 2022

ABSTRACT

This paper intends to determine whether increases in the minimum wage in Ontario, Quebec, and British Columbia led to a decrease in poverty for these provinces between 1976 and 2019. This paper conducted 10 panel data regression models each with differing poverty rates that measure various segments of the population. The results of this analysis demonstrated 8/10 regressions provided statistically significant results. These regressions all showed positive minimum wage estimates, which demonstrate that increases in the minimum wage are related to increases in the poverty rate. These estimates were highest among low-income families.

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1. Introduction

Minimum wage policy is endorsed by many politicians and policy makers. This paper intends to determine whether minimum wage policy has been an effective poverty reduction tool in Canada, specifically Ontario, Quebec, and British Columbia between 1976 and 2019. These three provinces were selected for this paper due to their comparable population size, labour market characteristics, and similar minimum wage rates throughout the time period. In Canada, the United States, and many other countries minimum wage policies have been implemented based on the premise of their efficacy as a poverty reduction tool. The ongoing debate regarding the efficacy of minimum wage policy makes it an interesting issue to examine.

According to Akyeampong (1989), minimum wage's primary purpose was to limit the exploitation of young and female employees. Implementing a minimum wage enabled these marginalized groups to receive a practical wage without fear of discrimination based on age or gender. However, at some point this anti-discrimination tool became an anti-poverty tool. According to MaCurdy (2015), this change in the narrative around minimum wage was based on two reasons: first, raising minimum wage would increase the income of impoverished families; and second, it would cause insignificant costs to the public and society (MaCurdy 2015, 497). Both reasons are highly debated in the literature.

In Canada, minimum wage policy resides within the provincial government's jurisdiction and each province has the autonomy to maintain or increase their respective general minimum wage rate. The minimum wage rate in British Columbia increased to $15.20 per hour on June 1st, 2021. The minimum wage rate in Quebec increased to $13.50 per hour on May 1st, 2021. On October 1st, 2021, Ontario's minimum wage increased from $14.25 per hour to $14.35 per hour. According to the Ontario 2021 Fall Economic Statement, another increase from $14.35 to $15.00 per hour will

be introduced and if passed would be effective as of January 2022. These recent increases in Ontario are tied to increases in Ontario's Consumer Price Index (CPI). Considering the unprecedented nature of government spending from both the federal and provincial government caused by the pandemic, inflation will likely continue to rise. If the provincial government continues to tie minimum wage to CPI, then we could see more significant increases to minimum wage in the future.

In 2006, 650 economists in the United States signed a statement from the Economic Policy Institute that called for a 40% increase in the federal minimum wage. This support led the federal government to increase the minimum wage from $5.15 to $7.25 between 2005 and 2009 (MaCurdy 2015, 498). Similarly, as part of Canada's 2021 Federal Budget, the government announced that it will establish a new federal minimum wage of $15 per hour effective December 29th, 2021. The federal minimum wage, however, will only be applied to the federally regulated private sector including air transportation, banks, federal crown corporations, etc. The federal government also cited inflation and poverty reduction as its main reasons for enacting this minimum wage change. Although raising the minimum wage seems to have a minimal impact on the public and society, Drucker, Mazirov and Neumark (2021) state that minimum wage policies are redistributive in nature since employers are required to pay a higher wage to their employees earning low wages. However, they argue that minimum wage is only redistributive if the wages are paid by employers at the top of the employer income distribution. For example, large corporations that pay minimum wage would be forced to pay a higher wage leading to a redistribution of income, but small businesses that cannot afford to pay higher wages would be worse off, leading to no redistribution of wealth, but adverse employment effects instead.

Although minimum wage is a popular policy tool, when analyzing its impacts, the academic literature contains some conflicting conclusions. There is evidence that states that minimum wage does not effectively reduce poverty. These academic studies depict increases in minimum wage as providing a significant benefit to the teenage population, while also generating negative employment effects. Furthermore, the teenage population that is benefiting from increased wages typically do not to come from low-income households. These studies suggest that minimum wage policies do not reach their target population, low-income individuals/households. However, there are many studies that provide evidence that minimum wage does in fact reduce poverty. Therefore, this difference of opinion presents a problem that this paper will attempt to analyze further.

This paper will conduct 10 panel data regressions using data from 1976 to 2019 to determine the impact of minimum wage on various poverty rates, while controlling for various demographic variables, provinces, and time. The data sets utilized in this paper include two publicly available data sets downloaded from Statistics Canada: one for low income (Table:11-10-0135-01); and another for labour force statistics (Table:14-10-0023-01), and a third data set which contains each province's historical minimum wage data which was downloaded from the Employment and Social Development Canada's (ESDC) Open Data Catalogue (see Appendix: Data Sources for more information). The results of this analysis showed that there is statistically significant evidence that minimum wage does not reduce poverty, but instead slightly increases poverty. All of the panel data regressions support this claim, and 8/10 had statistically significant p-values.

First, this paper will provide a detailed literature review highlighting both sides of this discussion. Second, it will utilize Statistics Canada's poverty measures and provincial minimum wage data to depict how minimum wage, poverty rates and the labour force have changed over time in the three provinces. Third, it will provide an empirical analysis to demonstrate how various

poverty rates have been impacted by the ongoing increases in minimum wage from 1976 to 2019. Fourth, it will provide results of the empirical analysis. Finally, it will provide concluding remarks.

2. Literature Review

There are many notable studies on the impacts of minimum wage on poverty. Rybczynski and Sen (2018) used Canadian provincial panel data from 1981 to 2011 to assess the impacts of minimum wage on the employment rate of teens and prime aged adults. The authors found that a 10% increase in minimum wage correlates to a 1-4% reduction in employment rates among teenagers as well as lower employment among working-age immigrants. MaCurdy (2015) found that increasing the minimum wage leads to increases in prices, comparable to a sales tax but stated that minimum wage policies are more regressive in nature since price increases are applied indiscriminately across the population. Campolieti et al (2012) found that increasing minimum wage did not have a significant benefit for those below the poverty line, when utilizing both low-income measure and low-income cut off measures in Canada from 1997 to 2007. The authors also show that 30% of net earnings gains from minimum wage increases go to the poor, while 70% goes to the non-poor. Campolieti et al (2012) uses a methodology that is similar to the methods that will be utilized in this paper. Mascella, Teja, and Thompson (2009) provide evidence that shows increasing minimum wage in Ontario leads to insignificant impacts on the poverty levels in the province. These authors also state that minimum wage increases do not effectively provide targeted benefits to those in poverty. They argue that other policies/programs such as prescription drug programs and child assistance programs provide more direct benefits to low-income families with children. Sabia (2014) argues that minimum wage does not significantly decrease poverty and is not the most efficient policy tool to mitigate poverty. Sabia argues that federal or state earned

income tax credits are a far better poverty reduction tool since family income would determine eligibility and the costs are not solely placed on the employer, mitigating adverse employment effects. Furthermore, Sabia (2014) states that jointly implementing minimum wage policy and income tax credits is counterproductive and policy makers should abandon minimum wage policy altogether.

In addition to the efficacy of minimum wage, there are also articles that claim it has adverse employment impact. Shannon and Beach (1995) analyzed the employment effects of increasing Ontario's minimum wage to 60% of the average wage in Ontario. This increase led to employment loss that disproportionately impacted young workers, and part-time workers with a high-school education or less, who come from families with low household earnings. Belman and Wolfson (2014) analyzed more than 37 US studies on minimum wage and found that there was a 'consensus' range for adverse employment effects when the minimum wage was increased. This range of employment effects refer to the employment elasticity, which measures the change in employment relative to changes in the minimum wage. This range was previously -0.3 to -0.1, but Belman and Wolfson found the range to be less significant as it was -0.13 to -0.07, based on their review of 37 US studies on minimum wage.

Alternatively, there are several studies that advocate in favour of minimum wage policies. These studies argue that minimum wage policies reduce poverty and find that these policies do not lead to adverse employment effects. Dube (2019) used individual-level U.S. data from the Current Population Survey between 1984 and 2013 and found that higher minimum wages increase the income of low-income families, and this increased income is related to a decrease in public assistance. Specifically, Dube found that there was a statistically significant long run poverty rate elasticity between -0.22 and -0.459 for the various income cut offs. Sen et al. (2010) found that a

10% increase in minimum wage provided a significant 3-5% drop in teen employment and a 4-6% increase in families living under the Low-Income Cut Off (LICO). Sen et al. (2011), used Ordinary Least Squares (OLS) and Instrumental Variables (IV) methods on data from Canadian provinces from 1981 to 2004 to achieve these results. Addison and Blackburn (1999) analyzed state-level data between 1983-1996 to determine the impacts of minimum wage policies on teenagers, young adults, and junior high school dropouts. Their results showed that increases in the minimum wage in the 1990s have reduced poverty, in particular the results are more significant when analyzing junior high dropouts. The authors also found evidence that minimum wages reduced poverty among teenagers, but these results depend on state-specific effects, and the authors admit that these results are not as strong during the 1980s.

Autor, Manning and Smith (2016), conduct a reassessment of the effect of the U.S. minimum wage on inequality over the last three decades. The authors conducted an OLS and instrumental variable analysis and find that minimum wage has had a significant impact on growing inequality that occurred between 1979-2019. The authors found that the steep decline in the real minimum wage was responsible for 30-55% of the lower tail inequality that occurred during that period and contributed significantly to female inequality. However, these consequences are much smaller than the results of previous studies, which used panel data with time periods that were shorter than the one used in this study. Zipperer (2016), shows that when the U.S. federal minimum wage increased from $5.15 per hour to $7.25 per hour between 2007 and 2009, the negative employment effects of the policy are overstated. Zipperer argues against studies (Clemens and Wither, 2016) that claim the federal minimum wage increase during this time led to increased declines in employment. The author argues that studies must account for the composition of wages in each state since the employment effects in each state face significant variation based on their pre-existing minimum

wage level. States with low pre-existing minimum wage levels face a greater shock than states with a relatively high pre-existing minimum wage level.

An important aspect of the debate stems from the research design of these minimum wage studies. Allegretto, Dube, Reich and Zipperer (2013), ADRZ hereafter, assessed various research designs to determine which ones are appropriate for minimum wage studies. ADRZ apply six approaches on four data sets and found that the employment effects were minimal for each approach. ARDZ found that states in the U.S. that had more substantial minimum wage increases varied from other states with less substantial increases in terms of business cycle severity, greater inequality, regional distribution, and political economy. Neumark, Salas and Wascher (2014), NSW hereafter, argue that recent studies that use panel data and attempt to control for spatial heterogeneity are not applying an appropriate methodology for minimum wage research. The authors claim this research design makes it difficult to identify reliable relationships due to their control groups. Instead, the authors prefer methods that allow the control groups to be determined by the data itself. The authors conclude by stating that their results show that increasing minimum wage creates adverse employment effects and found employment elasticity of -0.15 among teenagers. ADRZ (2017), respond to NSW (2014) on the topic of credible research design. ADRZ argue that data from 1979 to 2014 is contrary to the results of NSW (2014) because when using a Least Absolute Shrinkage and Selection Operator (LASSO) process that considers heterogeneous state by state trends, they found an employment elasticity of -0.01. LASSO is a shrinkage method that is used to decrease variance and improve the fit of a regression (Hastie et al., 2009, 215). Therefore, ADRZ (2017) conclude by stating their results, with LASSO, for employment elasticity are near zero, meaning that adverse employment effects are minimal when accounting for time-varying heterogeneity. Furthermore, Neumark and Wascher (2017), NW hereafter, respond to

ADRZ's (2017) response to their earlier papers. NW make a number of counterpoints; first, ADRZ do not address the treatment of state-level panel data; and second, the validity of their methodology for correlating minimum wage to low skill labour markets using the "close controls" has been questioned in a number of other articles. NW concludes by reaffirming that higher minimum wages reduce employment of the lowest skilled labour and minimum wage elasticities are larger than -0.1 to -0.2.

3. Data

This paper will utilize three data sets to conduct its analysis. These data sets contain different variables that are used in this paper's empirical model. The dependent/output variable is the poverty rates found in the low-income data set from Statistics Canada (Table:11-10-0135-01). The independent/input variables are the labour force variables found in the labour force data set which is also from Statistics Canada (Table:14-10-0023-01). These datasets were both formerly part of the CANSIM database, tables 282-0008 and 206-0041, respectively. The labour force variables are the control variables. The minimum wage rate is also an independent/input variable from the ESDC open government initiative. The minimum wage rate, however, is the explanatory variable. The specific variables and their descriptions are listed in Table 1 and Table 2.

The first data set is from the federal government's Open Government Initiative, which was published by the ESDC. This data set contains the effective date (month, day, and year) that a minimum wage rate change occurred in its respective province and the new minimum wage level. The other two data sets are both from Statistics Canada. Of the two data sets, one captures each province's labour force characteristics, and the other captures the various low-income rates of each province. Unfortunately, both data sets are not available in monthly figures, so annual figures were used for this paper. To effectively combine these three data sets, a weighted average of the previous

minimum wage and the new minimum wage was applied based on the month in which a minimum wage change took effect. For example, if the minimum wage increased from $6.85 per hour to $7.15 per hour on February 1st, 2004, the weighted average would be $7.13. Since February is the second month in the year, the new minimum wage would be applied to most of the year, but the weight of the previous minimum wage would slightly lower the yearly average. The weighted average ensures that when conducting the empirical analysis, there are no periods of time that are unaccounted for in the minimum wage rate.

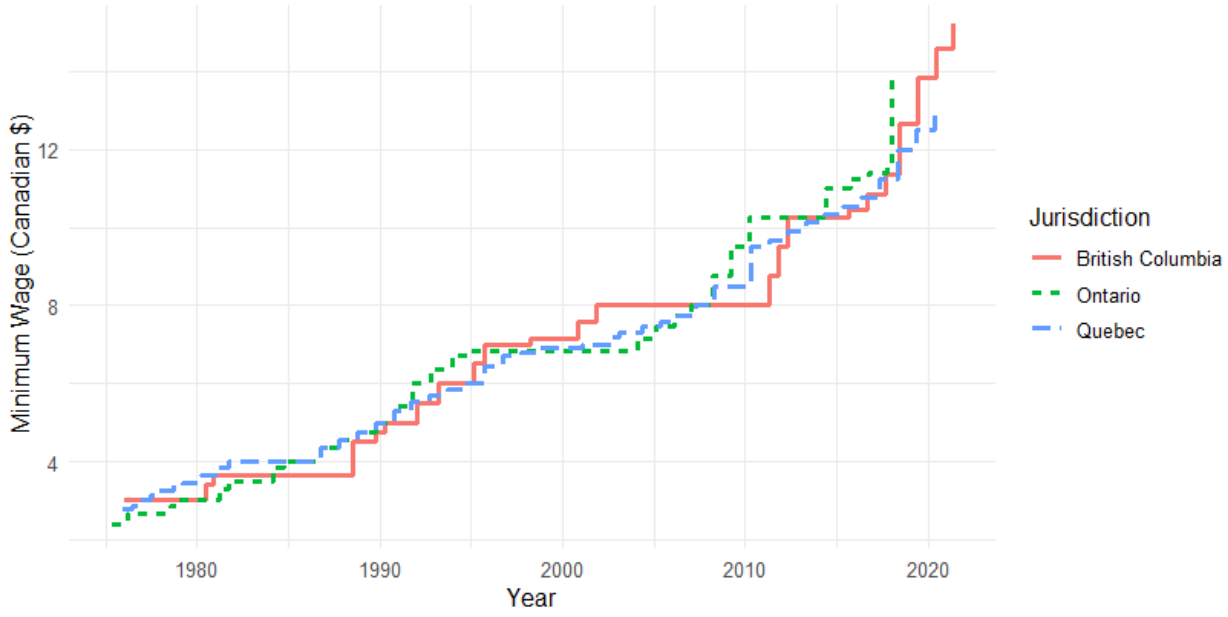
The labour force data set includes data on each province from 1976 to 2020, however, since the low-income data set only goes up to 2019, this paper will only use the labour force data from 1976 to 2019. The labour force data set also has 81 variables. These variables include the year, each province, and Canada's figures for age (15 and over, 15-24, 25-54 and, 55 and over), the labour force, the number of employed persons, the full-time employment rate, the part-time employment rate, and the unemployment rate. A few of these variables will be used as input variables in the empirical analysis to control for the general labour statistics in each province.

Similarly, the low-income rates in the second Statistics Canada data set contain variables for Ontario, BC, Quebec, and all of Canada, and within each of these regions there are poverty rates for the entire population, the male population, the female population, multi-person households, and single-person households. The poverty rates included in this data set are either low-income cut off (LICO) poverty rates or low-income measure (LIM) poverty rates. LICO is calculated by taking the average percentage of income that a family spends on clothing, food, and shelter, then adds 20% to the average to determine the cut-off point. LIM is calculated using 50% of the median family income as the threshold. These measures can be found in both before-tax and after-tax figures, however, there is not much difference between the results either way (Campolieti et al.,

2012, 292). This paper will utilize various after-tax LIM and LICO poverty measures to determine whether changes to the minimum wage level has a significant impact on the poverty.

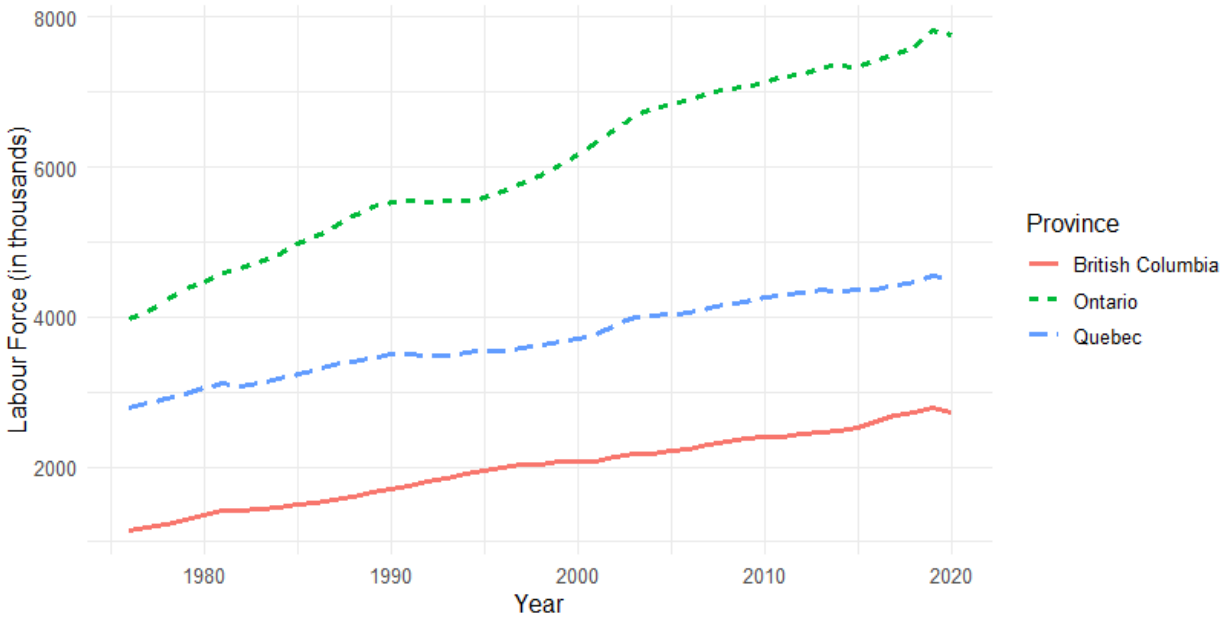
To get a sense of the data sets used in this analysis, the subsequent figures depict how minimum wage, LICO, and LIM have increased over time in each province. Figure 1 shows the minimum wage level in the three provinces from 1976 to 2019. This data set does not include the minimum wage in Ontario ($14.35, as of October 1st, 2021), and Quebec ($13.50, as of May 1st, 2021). However, the figure does show that all three minimum wage levels have been steadily increasing at similar rates throughout this paper's time period. There are periods in the late 1990s and early 2000s where the minimum wage rate in each province plateaus for about five to ten years at the $7-8 per hour range, before picking up again rapidly around 2008 and 2009. This relatively consistent nature of these increases across provinces and shows the bipartisan nature of these minimum wage increases. The Ontario government was largely run by the Conservative Party in the 1970s, then Liberal Party and New Democratic Party (NDP) in the 1980s, then NDP and Conservative in the 1990s, then Conservative and Liberal from the 2000s to present day. Similarly, BC and Quebec had a mix of different parties in power and their minimum wage rates also continued to grow. This shows that there is a persistent force that is leading different governments to increase minimum wage over time. It is also interesting to note that minimum wage changes have never gone down in any of these provinces. The rates have always remained constant or have been increased. Although there is a lot of evidence on either side of the debate regarding the efficacy of minimum wage policies, none of these governments have decided to decrease minimum wage but have opted to avoid any political backlash and keep the rate the same.

Figure 1: Minimum Wage by Province



Similar to the minimum wage rates in these jurisdictions, the labour force was also increasing steadily during this time period. The respective increase in the size of the labour force in each province is not as equal across the provinces. As we can see in Figure 2, Ontario's labour force is much larger than the other two provinces' labour forces and Ontario's has been growing at a faster rate as well. BC and Quebec's labour forces have been increasing at similar rates, but Quebec's labour force is notably larger. The overall labour force in Canada in 2020 was about 19.9 million people: about 4.5 million of which were from Quebec; about 2.7 million were from British Columbia, and 7.8 million were from Ontario. Therefore, together the three of these provinces make up 75.4% of Canada's total labour force. Therefore, even though this paper is only analyzing three provinces, the results make up a large portion of the Canadian labour force and have a lot of relevance to a vast majority of the working population. The labour force along with the other variables in the data set are important since they are used as control variables for the 45 regression model that are assessed later in this paper.

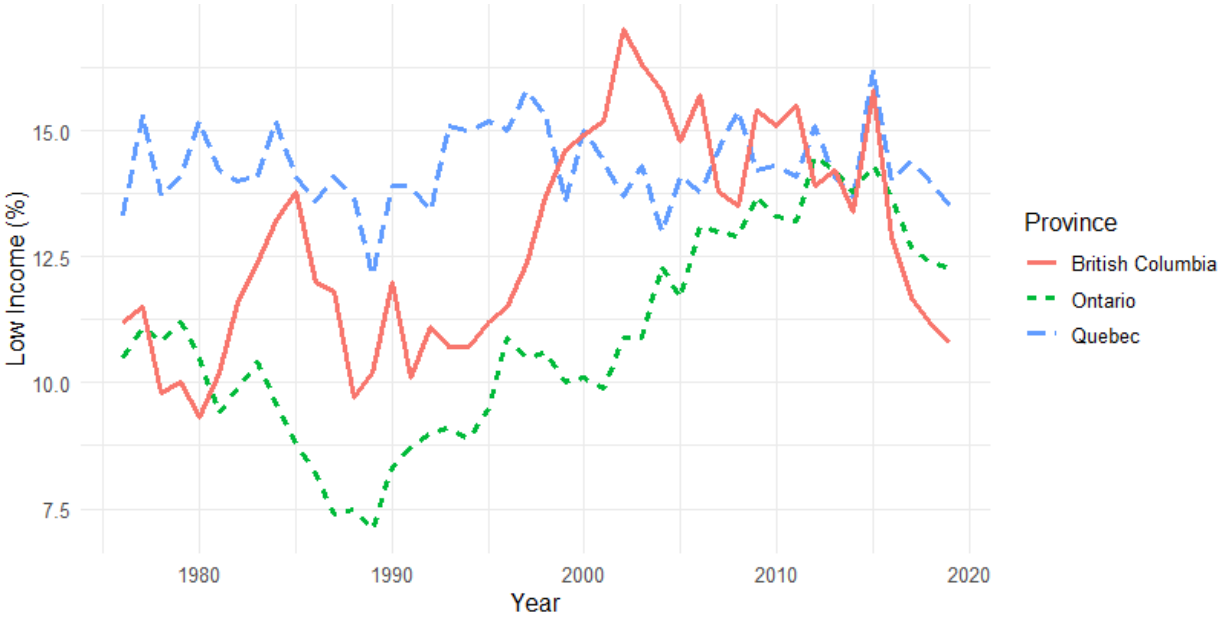
Figure 2: Labour Force (15 Years and Over)



As mentioned previously, an individual or household would be captured by LIM if they have less than half of the median household income in their respective jurisdiction. For example, Canada's median household after-tax income was $62,900 per year in 2019 according to Statistics Canada (Canadian Income Survey, 2019). Therefore, the LIM for that year would be $31,450 per year. Figure 3 depicts this measure for the three provinces and shows a lot of volatility among all the provinces. Quebec's LIM seems to be the most stable of the three provinces, as it starts at 13.3% in 1976 and trends slightly downwards throughout the time period, yielding 13.5% in 2019. The range of Quebec's LIM is also not very large, as it has a minimum LIM of 12.1% and has a maximum LIM of 16.2%. Quebec's LIM also has a median of 14.1%, and a mean of 14.3%. Ontario's LIM is relatively low compared to the other two provinces at 10.5% in 1976 but has an upward trend throughout the time period and concludes at 12.3% in 2019. Despite Ontario's slight upward trend, it has a larger range with a minimum LIM of 7.1% in 1989 and a maximum LIM of 14.5% in 2012. Ontario's LIM also has a median of 10.7% and a mean of 10.93%. BC's LIM

begins at 11.25% in 1976 and ends at 10.8% in 2019. However, BC has the highest overall maximum LIM of all the three provinces at 17.0% in 2002 since it saw a relatively steep upward rise in poverty from the late 1980s up to the early 2000s, then a sharp decrease in the poverty rate up to 2019. BC's LIM also has a median of 12.4% and a mean of 12.76%.

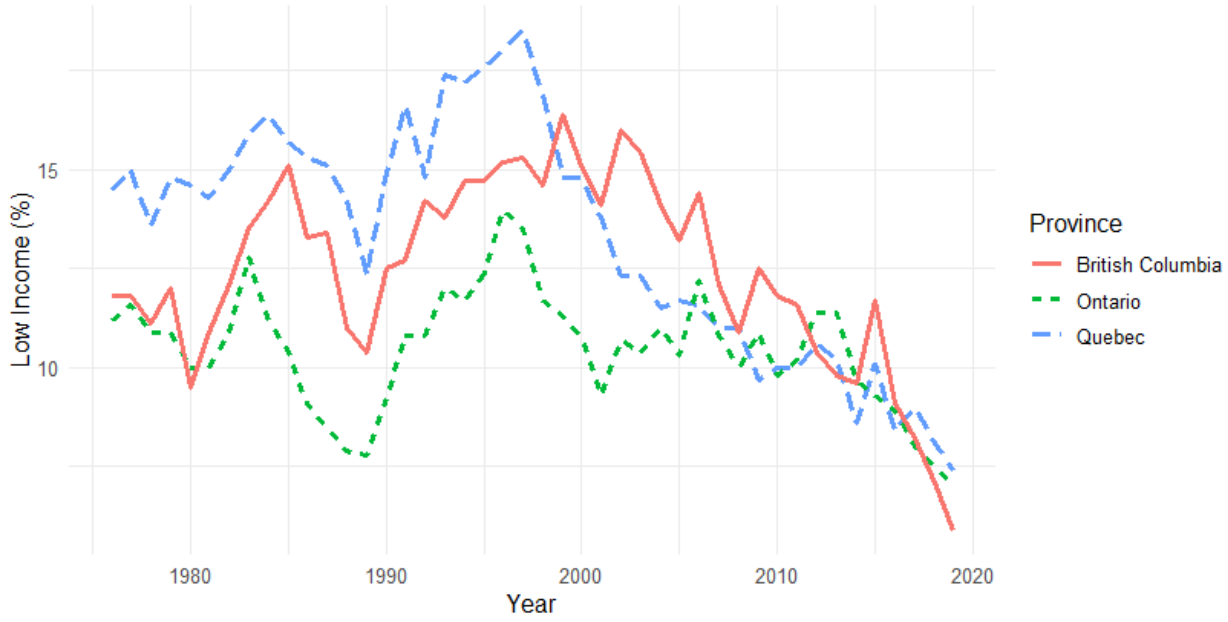
Figure 3: After-Tax LIM (15 Years and Over)



As mentioned previously, an individual or household would be captured by LICO if their total income is less than 120% of what average income families spend on their basic needs. Using the same example as before where Canada's median household after-tax income of $62,900 per year in 2019. If the average family spends 40% of their income on food, shelter, and clothing, then the LICO would be $25,160 per year. These figures would fluctuate to a greater degree based on the cost of living in the various provinces, particularly in high-cost regions. Figure 4 depicts after-tax LICO in the provinces and shows the downwards convergence of their LICO rates. Quebec's LICO begins and ends at the highest levels for the three provinces. Quebec begins at 14.5% in 1976 and

ends at 7.4% in 2019. The range of Quebec's LICO is also large, as it has a minimum of 7.4% in 2019 and maximum of 18.5% in 1997. Quebec's LICO throughout this time period has a median of 14.25% and the mean is 13.31%. Ontario's LICO is also downward sloping but has the flattest overall trend. Ontario's LICO begins at 11.2% in 1976 and ends at 7% in 2019. The range of Ontario's LICO is between its minimum of 7% and maximum of 14%. The median LICO is 10.8% and the mean is 10.46%. BC's LICO, like the other provinces is downward sloping, as it begins at 11.8% in 1976 and ends at 5.9% in 2019. The range of BC's LICO is large with a minimum of 5.9% and a maximum of 16.4% in 2002. BC's LICO also has a median of 12.5% and a mean of 12.44%. Compared to Figure 3's after-tax LIM, there is some congruency between the provinces after-tax LICO in Figure 4. All three provinces seem to converge downward for both LICO and LIM, but the figures show that LICO for each province are lower than their LIM, due to the lower threshold found when calculating the LICO relative to LIM.

Figure 4: After-Tax LICO (15 Years and Over)



4. Empirical Analysis

This paper will conduct an empirical analysis of the effects of minimum wage increases in Ontario, Quebec and British Columbia using a panel data regression model. This paper aims to determine whether increases in minimum wages across these provinces resulted in a significant impact on their respective poverty rates. The regression used in this paper is similar to the one found in Campolieti et al. (2012), which take the following form:

$$PR_{it} = \alpha\, MW_{i,t} + \beta X_{i,t} + a_i + b_t + \varepsilon_{i,t}, \quad (1)$$

This equation above depicts the panel data regression model, which includes time fixed effects, as well as province fixed effects. Time fixed effects allow the model to control for variables that are constant across entities but change over time. Province fixed effects allow the model to control for variables that are constant across entities but also differ from province to province. PR_{it} represents the natural log of the poverty rate in province *i* (Ontario, Quebec, or British Columbia), at time *t* (a year between 1976 and 2019). MW_{it} represents the minimum wage in province *i* at time *t*. X_{it} represents the control variables that depict different labour market statistics with the same subscripts. a_i represents a set of provincial dummy variables, one for each of the three provinces. b_t represents the time trend variables which includes a dummy variable for each of the 44 years.

The output/dependent variable in the equation is PR_{it}. The various poverty rates that were utilized in 10 separate panel model regressions are listed in Table 1. The input/independent variables in the equation are MW_{it}, b_t, a_i and X_{it} are listed in Table 2. To determine whether minimum wage increases have had an impact on poverty rates, the regression above is run on each of the poverty rates in Table 1. The estimate for α of each poverty rate is assessed in the results

section, along with its standard error, t-statistic, and p-value. These statistics are used to determine whether there is a statistically significant relationship between the poverty rate and the minimum wage. The results section will depict these statistics in Table 3 and Table 4.

Table 1 – Output Variables

Variable Name	Type	Description
LIM AT All	Output	Natural log of after-tax LIM for all individuals
LICO AT All	Output	Natural log of after-tax LICO for all individuals
LIM AT Male	Output	Natural log of after-tax LIM for all males
LICO AT Male	Output	Natural log of after-tax LICO for all males
LIM AT Female	Output	Natural log of after-tax LIM for all females
LICO AT Female	Output	Natural log of after-tax LICO for all females
LIM AT Family	Output	Natural log of after-tax LIM for all families
LICO AT Family	Output	Natural log of after-tax LICO for all families
LIM AT Single	Output	Natural log of after-tax LIM for all single persons
LICO AT Single	Output	Natural log of after-tax LICO for all single persons

Given this time-period spans 44 years, the total number of observations for each province in the panel data set is 44, therefore $T = 44$. Since there are three provinces used in the dataset, $n = 3$, the total number of observations is n multiplied by T which is 132. For each panel data regression, there is only one output variable and 5 input variables, so there are 6 variables total, and $\rho = 5$. When evaluating these panel data regressions, the only input variable of interest is the minimum wage rate, since all the other variables are control variables. The linear regressions also include a 1 in the X_{it} variable which is used to represent the y-intercept.

Table 2 – Input Variables

Variable Name	Type	Description
Minimum Wage	Input	Natural log of the minimum wage rate in Ontario
Year	Input	Years within the time period; sequence from 1976 to 2019
Jurisdiction	Input	Name of the Province (Ontario, British Columbia & Quebec)
15+ LF	Input	Labour force above 15 years old
15+ ER	Input	Employment rate for those above 15 years old

To avoid some of the pitfalls highlighted in the research noted in the literature review of this paper, this analysis will be performed at the provincial level. Based on Figure 1, the minimum wage levels for the three provinces were very similar throughout the time period but conducting the analysis at this level will avoid any cross-state/province heterogeneity. This provincial level analysis will mitigate any impacts of the differing minimum wages across the provinces. The province fixed effects also control for any changes that may not have been mitigated through the selection of these particular provinces. All the input variables are also utilizing provincial level data in each regression to ensure consistency and accuracy.

5. Results

The results of this analysis yielded 10 regressions: five after-tax LICO regressions and five after-tax LIM regressions. Since this paper uses a panel data model, all three provinces are captured in each panel data regression. For each regression the minimum wage estimates, along with its corresponding standard errors, t-statistics, and p-values were assessed. The results for each regression can be found in Tables 3 and 4. Based on our regression equation from the empirical analysis section, a hypothesis test will determine whether there is a relationship between PR_{it} and MW_{it}. The null hypothesis claims that there is no relationship between minimum wage and the poverty rate. The null hypothesis is $H_0: \alpha = 0$ and the alternative hypothesis is $H_\alpha: \alpha \neq 0$. To ensure that α is not zero, the standard error is required. The standard error measures how close the estimate is to predicting the real value of the output variable. If the standard error is small, then the estimate, $\hat{\alpha}$, has sufficient evidence (Hastie et al., 2009, 66). The t-statistic assesses how many standard deviations $\hat{\alpha}$ is from zero. If there is no relationship between the two variables, then the t-distribution would have *n-2* degrees of freedom. The p-values determine the probability of the number of observations equal to the absolute value of the t-statistic. If the p-value is small (less

than 0.05 or 0.01), then this paper will reject the null hypothesis, but if the p-value is large (greater than 0.95 or 0.99), then this paper will fail to reject the null hypothesis (Hastie et al., 2009, 67).

Table 3 displays the results for various after-tax LIM poverty rates. Three of the five estimates in the table have p-values that are less than 0.05 but none that are less than 0.01. These p-values show that for LIM All, Male and Family, the estimates are statistically significant, whereas the estimates for LIM Female and Single are not statistically significant. Therefore, this paper rejects the null hypothesis which stipulates H_0: $\alpha = 0$ for these three estimates but fails to reject the null hypothesis for LIM Female and Single. The minimum wage estimates themselves are all positive and show that increases in the minimum wage have the largest impact on LIM Family, at 0.97511. The second largest impact was seen on LIM Male, at 0.97278. Although these relationships are positive, they are not beneficial. These positive relationships state that an increase in the minimum wage leads to increase in the respective poverty rate. The results for LIM Single individuals had the least impact, at 0.61664, which is still not promising and does not show that minimum wage policies reasonably reduce the poverty rate. Overall, the data does not show that changes in minimum wage led to any reduction in the any of the poverty rate. The p-values display strong statistical significance in support of this claim.

Table 3 – Comparing the Results for After-tax LIM

Dependent Variable	MW Estimate	Standard Error	T-Statistic	P-Value
LIM All	0.81871	0.36597	2.2370	0.0279651*
LIM Male	0.97278	0.40883399	2.3794	0.019635*
LIM Female	0.67531	0.34981161	1.9305	0.0569611
LIM Family	0.97511	3.8922e-01	2.5053	0.0141891*
LIM Single	0.61664	5.4179e-01	1.1381	0.2583332

Table 4 below displays the remaining five panel data regression models for after-tax LICO poverty rates for the same five groups. All the estimates for after-tax LICO have p-values that are

less than 0.05, but none that are less than 0.01. Since all of these estimates are less than 0.05, they are all statistically significant. Therefore, this paper rejects the null hypothesis which stipulates $H_0: \alpha = 0$. The minimum wage estimates for after-tax LICO are also all positive demonstrating the adverse impact of minimum wage policy on each of the poverty rates. Using LICO as the poverty rate, the table shows that LICO Single has the worst/highest estimate, at 1.5438. The second worst/highest estimate was LICO Family, at 0.82865. LICO Male had the best/lowest estimate at 0.82477. Therefore, these results also do not support the implementation of minimum wage policies and show that increasing the minimum wage also leads to an increase in the poverty rate, especially for after-tax LICO families.

Table 4 – Comparing the Results for After-tax LICO

Dependent Variable	MW Estimate	Standard Error	T-Statistic	P-Value
LICO All	0.76303	3.3135e-01	2.3028	0.0237936*
LICO Male	0.82477	3.8042e-01	2.1681	0.0330180*
LICO Female	0.72416	3.1208e-01	2.3204	0.0227731*
LICO Family	0.82865	3.5552e-01	2.3308	0.0221902*
LICO Single	1.5438	6.2382e-01	2.4747	0.0153693*

The results of this analysis demonstrate that there are statistically significant relationships between poverty rates and minimum wage. These significant relationship holds across both LIM and LICO poverty rates, but more so for LICO. Overall, 8/10 poverty rates had p-values that were less than 0.05. The results show that all of these statistically significant minimum wage estimates were positive, which demonstrate that increases in the minimum wage do not lead to a decrease in the poverty rate, but rather marginal increases the poverty rate. This empirical analysis controlled for both province and time fixed effects which eliminates the risk of bias due to any omitted variables that may have emerged during the specified time period.

5. Conclusion

The implementation of increasing minimum wage policy in Ontario, Quebec, and British Columbia and across Canada is an ongoing debate. Historically, minimum wage rates have continued to increase, while the debate regarding the efficacy of this policy continues. This paper set out to add to the existing literature on the topic of minimum wage by analysing whether minimum wage increases in Ontario, Quebec and British Columbia have decreased minimum wage. This paper conducted a total of 10 panel data regression models, using 10 different poverty rates. This empirical analysis controlled for province fixed effects as well as time fixed effects and found that increasing the minimum wage does not reduce the poverty. These results were statistically significant for 8/10 regressions and showed small positive relationship between the minimum wage and poverty rate, and although not by much, these positive relationships were highest among low-income families.

Appendix: Data Sources

The labour force data set is from Statistics Canada and is called Table 14-10-0023-01 labour force characteristics data by industry, annual. Figure 2 was created using this data source. This data set can be found using the following in links:

- https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1410002301
- DOI: https://doi.org/10.25318/1410002301-eng

The low-income data is also from Statistics Canada and is called Table 11-10-0135-01 low income statistics by age, sex and economic family type. Figures 3 and 4 were created using this data source. This data set can be found using the following links:

- https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1110013501
- DOI: https://doi.org/10.25318/1110013501-eng

The minimum wage data was from the Federal Governments Open Government Initiative and was published by the Employment and Social Development Canada (ESDC). This data set includes minimum wage data for all the provinces and territories in Canada along with the effective date that the minimum wage was implemented. Figure 1 was created using this data source. This data source can be found using the following link:

- Historical minimum wage rates in Canada - Historical Minimum Wage Rates in Canada - Open Government Portal

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