

# The effect of minimum wages on consumption in Canada

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## Abstract

We use Canadian data over the period of 1991Q1 to 2019Q2 to examine the effect of higher minimum wages on consumption, measured as the real retail trade sales per adult population. Such an examination is rare in the extant literature and it is timely given the increasing debate concerning the stimulus versus inflationary effects arising from wage policies because of COVID-19 global pandemic. We apply the autoregressive distributed lag model to determine the causal relationship between these variables. We find one long-run cointegrating relationship that runs from the real minimum wage to the real retail trade sales. In addition, we find that a 1% increase in the minimum wage is associated with almost a 0.5% increase in real retail trade sales in the long run. While our findings rest on several statistical assumptions, there is strong evidence in support of the position that minimum wage strengthens aggregate consumer spending, and thereby the standard of living, economic growth and stability. This is a position that differs from the conclusions drawn from mainstream academic and policy debates on the economic usefulness and efficacy of minimum wage increases.

**JEL Codes:** C30, E21, E24

## Keywords

autoregressive distributed lag, cointegration, consumption, minimum wage

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## Introduction

Given the pronounced increases in the minimum wage in 2018 across Canadian provinces, examining the impacts of changes in the minimum wage on economic aggregates is topical as well as intriguing for this country. In addition, an analysis of these impacts is particularly pertinent with growing discussions surrounding the stimulus versus inflationary effects arising from wage policies because of COVID-19 global pandemic. While much of the extant literature focuses on the effects of minimum wage increases on employment and prices, there exists a lacuna for little attention has been paid on the relationship between minimum wage and consumption. We contribute to filling this gap in the literature by explicating the relationship between minimum wage and consumption, conducting a related statistical exercise using Canadian data, and discussing the implication of our findings.

The debate on the impact of increases in the level of minimum wages on economic aggregates has a long history and it has focussed mainly on employment and price. Most studies until the 1980s argued that increasing the minimum wage caused a rise in unemployment.<sup>1</sup> From the assumptions of the neoclassical school of thought, marginalist theorists argued that increasing the minimum wage should have a detrimental impact on the employment of low-skilled workers since marginal productivity determines the wage of workers. On the contrary, the heterodox theorists posit that minimum wage hikes would raise the efforts exerted by workers and increase the effective demand in the economy. Concerning the price effects, mainstream arguments are grounded within a standard perfectly competitive system. In such a system, a hike in the minimum wage would generate an industry-wide shock and the rise in the cost would be passed onto the consumers in the form of them paying higher prices for goods and services. However, as Aaronson (2001) noted, the degree to which an increase in the labour cost is shifted to consumers depends on the demand elasticity, convexity of the demand, the elasticity between marginal cost and output, and the degree of competition.

The role of the minimum wage as an instrument for relieving economic hardship through its effect on consumption is another area of debate. This effect is a priori ambiguous and thus necessitates an empirical investigation. The consumption effect comprehensively captures the negative and positive effects of minimum wage increases on both employment and prices. From a neoclassical perspective, an increase in the minimum wage is expected to affect consumption negatively by its effect on employment through its impact on labour supply at the intensive and extensive margins. The price effect from the neoclassical perspective occurs when firms raise the prices of consumer goods and services to compensate for increased labour expenses. Therefore, the price effect should have a negative impact on consumption.<sup>2</sup>

On the positive side, raising the minimum wage should increase consumption through the ripple effect (Gramlich et al., 1976; Grossman, 1983). This ripple effect occurs because the increase in the minimum wage raises the relative wage of low-skilled workers. In response to an increase in the minimum wage, firms replace lower skilled workers with the higher skilled workers and this will lead to an increase in the demand and wage for higher skilled workers. In addition, if firms would like to re-optimize their workers' effort in the face of a minimum wage increase, the firms must mitigate the deterioration

of the relative wage between workers by raising wages for higher skilled workers (Grossman, 1983). The overall increase in the wage by the ripple effect will have a positive effect on consumption. The minimum wage as a redistributive tool would also affect consumption positively if income is redistributed favourably towards the low-income households with a higher propensity to consume (Freeman, 1996). If the positive effects dominate the negative effects, the rise in the minimum wage must increase consumption. From a post-Keynesian perspective, minimum wage legislation can stabilise consumption, aggregate supply and price in the economy. During a recessionary period, expansionary fiscal policies<sup>3</sup> with a legislated minimum wage can increase employment and consumption, reduce the volatility of price, and output deviation from its full-employment level. In this context, our article captures a broader array of the effects of minimum wage changes than would be possible from focusing on employment effect alone as is done in most of the literature.

In view of the foregoing, we contribute to the literature by examining the effects of the minimum wage on consumption in Canada. To our knowledge, this article is the first empirical study that investigates the relationship between minimum wage and consumption in Canada in this way. Specifically, we empirically answer the following questions:

1. Does a change in the level of the minimum wage impact consumption in Canada?
2. What is the nature of the short-run and long-run relationship between these variables?

For this empirical analysis, we use quarterly data spanning the period 1991Q1 to 2019Q2. We apply the autoregressive distributed lag (ARDL) bounds testing modelling framework to cointegration to illuminate the causal relations between minimum wages (in real terms) and consumption. Consumption is measured in terms of the real retail trade sales per adult population and we control for macroeconomic factors by including measures of the stock price, house price, unemployment rate and the 3-month treasury bill rate.

To preview, there are two overarching findings. First, we find a unique long-run equilibrium cointegrating relationship among the variables that run from the real minimum wage and macroeconomic controls to the real retail trade sales per adult population. The associated short-run dynamics from this relationship indicates that almost half of any shock to equilibrium is corrected within one quarter. Second, in the long-run equilibrium relationship, every 1% increase in the minimum wage is associated with a 0.463% increase in the real retail trade sales per adult population. As with any empirical analysis, our findings do rest on a number of statistical assumptions. However, this does not prohibit us, given the robustness of this analysis, from offering a general view of these findings. This view is that there is compelling evidence in favour of supporting the position that higher minimum wages can lead to higher aggregate consumer spending, and thereby an improved standard of living, economic growth and macroeconomic stability. This position contrasts with that often taken in mainstream academic and policy discussions around the economic merits of having minimum wages.

The rest of this article proceeds as follows. In the following section, we review the effects of the minimum wage on economic aggregates with a discussion of the Canadian

context and our contribution to the literature. This next section describes the data and methodology. This is followed by our empirical findings. The penultimate section provides a discussion, and the last section concludes the article.

## **What we know about minimum wages?**

### *Recent case studies published in Economic and Labour Relations Review*

In recent years, much has been discussed on the minimum wage. Among other journals, *Economic and Labour Relations Review* has been on the forefront of this discussion. Several scholars have papers in this journal that examine country case studies to shed light on issues related to the minimum wage. For example, Quinlan and Sheldon (2011) provided a historical discussion on the transformation in labour standards in relation to minimum wages in industrialised and industrialising countries. Lukiyanova and Vishnevskaya (2016) discussed the impact of the minimum wage setting reform in Russia on the real values and earnings of low-paid workers. The history of minimum wage setting in Russia goes back to the Soviet era when the government set the rate with the approval from the parliament. The unions barely played any role in the process of minimum wage setting. Lukiyanova and Vishnevskaya (2016) argued that the reformed minimum wage setting rule, which started in 2007, made the minimum wage setting decentralised, and regions gained the power to set up their own minimum wages. The new system increased the earnings of low-paid workers by increasing the real value of the minimum wage.

Ng et al. (2018) studied the outcomes of Singapore's Progressive Wage Model that was mandated in the cleaning industry in 2015. The authors found that there were some improvements in wages and conditions particularly in the areas of paid sick leave, vacation leave, health benefits, transport allowances and meals for restaurant workers. Nonetheless, low-paid cleaners were still subject to certain vulnerabilities. These vulnerabilities, as Ng et al. (2018) pointed out, were often structural problems within the workplace environment, and therefore, eroded the potential benefits of having minimum wages set at living wage levels. In many cases, workers were unaware of the benefits, and employers violated employee rights. While these recent case studies provide important information on the evolution and efficacy of minimum wage standards, there is still somewhat of a gap in empirical analysis on the impact of minimum wages on consumption. Our article contributes towards filling this gap.

### *Minimum wage standards: Partial effects*

Scholars who examined the partial effects of changes in the minimum wages tended to focus on the impacts on employment, prices and income in specific sectors or occupational groups of workers. The first set of scholars used either time-series data or state-level cross-sectional data. According to Ehrenberg (1992),

[t]he time-series studies exploited the fact that the minimum wage varies over time relative to other wages both because of changes in the minimum wage and because of changes in other wages. The cross-section studies exploited the fact that, although the federal minimum wage is

constant across states at a given time, minimum wage levels under state laws and their coverage vary across states, as do the prevailing values of other wages. (p. 3)

Two influential studies by Brown et al. (1982) and Brown (1988) showed that increases in the level of minimum wages tended to affect teenage workers disproportionately. Their findings indicated that a 10% increase in the minimum wage would increase teenage unemployment between 1% and 3%. After these early studies, the new minimum wage research was set in motion in the early 1990s.<sup>4</sup> In one such research, Neumark and Wascher (1992) examined the geographic differences in the national time-series data on minimum wage. They found that a 10% increase in the minimum wage reduced teenage employment by 1% to 2% and young adults' employment by 1.5% to 2%. In contrast, Wellington (1991) found that a 10% increase in the minimum wage reduced teenage employment by less than 1%. Furthermore, Wellington (1991) did not find any strong statistically significant impact of increases in the minimum wage on the employment of young adults. Broecke et al. (2017) conducted a study on the impact of minimum wage on employment in a set of emerging countries.<sup>5</sup> They covered a qualitative review of 95 studies, meta-analyses of elasticities from 28 studies and partial correlation from 56 studies. They found that youth and low-skilled workers were more predisposed to any adverse effects of the minimum wage, although the effect was small.

In this new minimum wage research, scholars have found that higher minimum wages can be effective at increasing the income of low-wage workers without reducing employment. For example, Card (1992) found no strong evidence of decreasing unemployment due to a rise in the minimum wages in the State of California. The minimum wage hikes of July 1988 increased the income of low-wage earners by 5% to 10% without having any unfavourable effect on teenage employment or relative job losses in the retail trade sector in California. Katz and Krueger (1992) used a longitudinal dataset of fast-food restaurants in Texas to study the impacts of minimum wage hikes in 1990 and 1991. Their results were that the firms that were most affected by minimum wage hikes actually increased employment. In addition, they did not find any association between price changes due to changes in wages resulting from the minimum wage increase.

Like Katz and Krueger (1992), Card and Krueger (1994) also found robust evidence of increased employment in the fast-food outlets due to a rise in the minimum wage in New Jersey.<sup>6</sup> However, differing from Katz and Krueger (1992), the findings from Card and Krueger (1994) showed that the prices of fast-food meals rose because of an increase in the minimum wage. Therefore, they concluded that some of the rising costs were passed onto the consumers. Dube et al. (2007) examined the effects of San Francisco's indexed minimum wage, which increased from USD 8.50 in 2004 to USD 9.14 in 2007. They did not find any evidence of job loss or an increased rate of business closure associated with the minimum wage increase. Several other studies that found no evidence of rising unemployment due to minimum wage are Addison et al. (2009), Allegretto et al. (2011), Allegretto et al. (2017), Dube et al. (2010), Machin and Manning (1994), and Totty (2017).

### *Minimum wage: The general macroeconomic effects and consumption*

There exists a voluminous literature on the general macroeconomic impacts arising from increases in the minimum wage. Since the seminal paper of Stigler (1946), researchers and

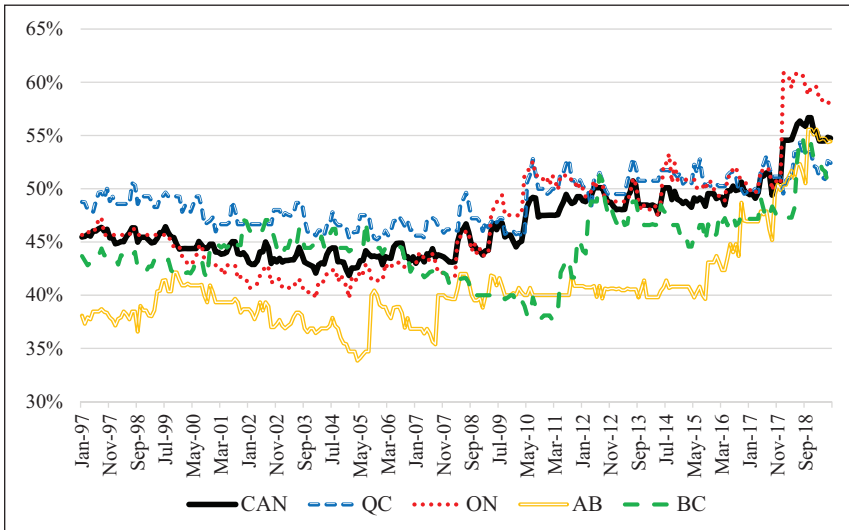
policymakers have long discussed the general effects of changes in the minimum wage on various macroeconomic aggregates. Studies have focused on the effects of minimum wage on other wages (Brown, 1999; Campolieti, 2015; Grossman, 1983; Neumark and Wascher, 2004; Rama, 2001), wage inequality (Engbom and Moser, 2018; Fortin and Lemieux, 2015), poverty (Addison and Blackburn, 1999; Campolieti et al., 2012; Neumark and Wascher, 2002), firms' profits (Draca et al., 2011; Mason et al., 2006; Riley and Rosazza-Bondibene, 2015), work hours (Dube et al., 2010; Hirsch et al., 2015; Michl, 2000; Zavodny, 2000) and prices (Arpaia et al., 2017; Campolieti, 2018; Cooper et al., 2020; Lemos, 2008).

In regard to the consumption effects arising from changes in the minimum wage, the focus of this article, there is no consensus. Some scholars have found the effects to be minimal to negative while others have found it to be positive. This lack of consensus is due to a higher minimum wage potentially causing changes in employment and risk of unemployment, real labour income, prices and the transfer system (taxation and benefit) in ways that may have opposing impacts on consumption (Arpaia et al., 2017; Dube, 2019). For example, the impact of an increase in the minimum wage can be minimal to no effect on consumption if such an increase is viewed as a temporary advancement in real labour income. This view arises from households anticipating that higher minimum wages will lead to the prices of goods and services increasing in the future. Thus, households engage in consumption smoothing. Higher minimum wages could also mean that the risk of unemployment may increase. That risk, in turn, may cause households to increase their precautionary savings. This increase in precautionary savings can lead to no change or a significant attenuation in consumption in the face of the higher minimum wage, especially among poorer households (Campolieti et al., 2012).

At the same time, higher minimum wages could potentially increase consumption. This happens when employment is relatively unchanged and labour income increases concomitantly. This causes an increase in household spending through the familiar Keynesian aggregate demand channels. Theoretically, the low-wage earners, who have a high marginal propensity to consume will increase their consumption with a rise in the minimum wage (Kaldor, 1955; Kalecki, 1971; Robinson, 1949). A few studies have corroborated this. Aaronson et al. (2012) used panel (survey) data from the United States and found that a rise in the minimum wage by USD 1 per hour increased household income by USD 250 and consumption by USD 700 per quarter. Therefore, the marginal propensity to consume out of minimum wages was 2.8. The authors argued that most of the additional consumption was made by a small number of households, who faced collateral constraints, purchasing large durable goods such as vehicles. Aaronson and French (2013) made similar conclusions. Recently, Dautović et al. (2019) estimated the response of the Chinese household consumption to the changes in the minimum wage and found that increases in the minimum wage led to a significant increase in consumption of low-income Chinese households from 2000 to 2009. The authors noted that the additional income was mostly spent on health or education.

### *The Canadian context and our contribution*

As illustrated in Figure 1, the ratio of the minimum wage to the median wage was even trending downwards until around the late 2000s in Canada and the big four provinces,



**Figure 1.** The ratio of minimum to median wage in Canada and big four provinces.

Source: Government of Canada (2019b) <https://open.canada.ca/data/en/dataset/390ee890-59bb-4f34-a37c-9732781ef8a0>. Statistics Canada (2019) <https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1410006401>.

namely Ontario (ON), Quebec (QC), Alberta (AB) and British Columbia (BC). However, the minimum wages in Canada have increased during the past few years. The provinces of Alberta and Ontario have the highest minimum wages in Canada. Alberta raised its minimum wage from CAD 13.60 to CAD 15.00 in October 2018.<sup>7</sup> Ontario's minimum wage increased from CAD 11.60 to CAD 14.00 on 1 January 2018. Consequently, as seen in Figure 1, the ratio of the minimum wage to the median wage has reached a historic high in Canada and the four big Canadian provinces. As a result, the proportion of workers earning the minimum wage reached 10% of the labour force as of early 2018 (Morissette and Dionne-Simard, 2018).

An overview of the Canadian literature on the minimum wage suggests that the major focus was placed on the relationship between minimum wage and employment, poverty and inflation. One of the earlier papers on minimum wage legislation in Canada is by Baker et al. (1999). The authors examined the effect of changes in the level of minimum wages on teenage employment over the period 1975–1993. The results showed that a 10% increase in the minimum wage reduced employment by approximately 2.5%. Therefore, the minimum wage–employment elasticity estimated for Canada was similar to what was found by Neumark and Wascher (1992) for the United States. Campolieti (2018) analysed the employment effects by examining the lag and pass-through effects of minimum wages on employment growth and prices in the restaurant sector of Canada. The author did not find evidence of any significant employment growth during 1983–2000 but observed a negative effect of minimum wage on employment from 2001 to 2016. Other Canadian studies that showed an adverse employment effect of minimum wage hikes include Campolieti et al. (2006), Rybczynski and Sen (2018), and Sen et al.

(2011). Brochu and Green (2013) examined how the employment transition rate varies between the high and low minimum wage regimes in Canada. They used data from 1979 to 2008 and found that the higher real minimum wage regimes were associated with the lower job separation rates and lower hiring rates.

Several studies discussed the association between minimum wage levels and poverty in Canada. From a theoretical perspective, if the minimum wage of poor workers increases, the overall income of the poor households will increase, and there will be a strong possibility of reducing poverty in the society. However, if the low-wage earners are not from the poor households,<sup>8</sup> the potential impact of the minimum wage policy on poverty alleviation will be statistically insignificant. Mascella et al. (2009), who examined if minimum wage increases had been successful in alleviating poverty in the Canadian province of Ontario, found the latter result. They used Statistics Canada's 2004 Survey of Labour and Income Dynamics data and found that more than 80% of low-wage earners did not come from poor households, and over 70% of poor households did not supply low-wage workers. Therefore, the authors concluded that the level of poverty in Ontario would not be alleviated by implementing minimum wage legislations. Similarly, Campolieti et al. (2012) did not find evidence of a statistically significant effect of minimum wages on poverty in Canada. Furthermore, they argued that only 30% of any additional gain from minimum wage hikes went to poor households.

To our knowledge, the only paper that studied the relationship between minimum wages and consumption in Canada is by Brouillette et al. (2017). They used the general equilibrium model simulations and predicted that minimum wage increases would increase consumer price index inflation by increasing the marginal cost of the firms. They further forecasted that higher inflation would lead to a slight increase in the interest rate and this would offset the higher labour income. Thus, consumption would fall slightly due to minimum wage hikes.

### *On our econometric approach in the literature*

While the growing body of literature examined the effect of minimum wage on the macroeconomic variables in Canada, the direct impact of minimum wage hikes on consumption using the Canadian data has not been adequately examined. In our article, we use the ARDL econometric modelling approach to analyse this issue. This approach has not been widely used to study the relationship between the minimum wage and consumption. Nonetheless, our approach has a noteworthy advantage over other approaches typically used. The ARDL technique allows us to establish a long-run causal relationship between changes in the minimum wage and consumption. Since our examination of the minimum wage and consumption is from a long-run perspective, the adoption of the ARDL approach as a research tool further adds to our contribution to the literature. Although we use the ARDL method, our findings are generally consistent with the findings of others who use different econometric techniques. For example, to analyse the consumption effect at micro level, Aaronson et al. (2012) used the panel data method and Dautović et al. (2019) used two-stage least square estimation for panel data. At the macro level, Arpaia et al. (2017) employed ordinary least squares regression for income quantiles and Cooper et al. (2020) used an ordinary least squares regression with distributed lags. A



general overview of these results suggests a positive consumption effect arising from increases in the minimum wage.

## Data and methods

### Data

The data for retail trade sales are seasonally adjusted monthly data and were obtained from the Canadian socioeconomic database from Statistics Canada (2019) for the period January 1991 to June 2019. The real retail trade (RT) sales are calculated by adjusting the nominal retail trade sales with the all-items consumer price index. We then calculated quarterly real retail trade sales by using the process of temporal aggregation of the monthly real retail trades.<sup>9</sup> The quarterly real retail trade sales are divided by the quarterly average of the adult population to obtain the real retail trade sales per adult population.<sup>10</sup> Retail trade sales include the expenditure on items such as motor vehicle and parts, food and beverage, furniture and home furnishings, electronics and appliance, food and beverage, health and personal care, clothing and accessories, gasoline, sporting goods, and cannabis.

In Canada, the minimum wage exists only at the provincial level.<sup>11</sup> Thus, we construct the Canadian minimum wage as the weighted average of provincial minimum wages with the employment number of each province. Then we calculated the real minimum wage (RMW) of Canada by adjusting the nominal minimum wage by the all-items consumer price index. To control for the effects of other macroeconomic variables on consumption, we include the Canadian stock price index (STI), house price index (HPI), the seasonally adjusted employment rate (UR) and the 3-month treasury bill rate (TB3). Since the data for the retail trade sales are quarterly, we allowed for the quarterly frequency of RMW and all other control variables by temporal aggregation of the monthly data.<sup>12</sup>

### Methods

To tease out the effects of changes in the level of minimum wages on consumption, our empirical framework is situated within the ARDL approach to cointegration. To start, we transform the variables RT, RMW, UR, TB3, STI and HPI by applying the natural logarithm to stabilise their variances with the added advantage that this allows for the easy interpretation of the coefficients on the independent variables as elasticities. These transformed variables are denoted as LNRT, LNRMW, LNUR, LNTB3, LNSTI and LNHPI, respectively. Next, for the transformed variables, we test for unit roots using the Augmented Dickey Fuller (ADF) tests (Dickey and Fuller, 1979, 1981). If all variables are integrated of utmost order one, we can proceed to apply the ARDL bounds testing framework to determine the direction and number for cointegrating relationships among the variables.

Without loss of generality, the ARDL bounds testing approach to cointegration can be described as follows. Consider for simplicity the case of three variables  $x$ ,  $y$  and  $z$ , where  $y$  is treated as the dependent variable

$$\Delta y_t = \beta_0 + \sum_1^n \beta_{1i} \Delta y_{t-i} + \sum_0^p \beta_{2i} \Delta x_{t-j} + \sum_0^q \beta_{3i} \Delta z_{t-k} + \gamma_1 y_{t-1} + \gamma_2 x_{t-1} + \gamma_3 z_{t-1} + e_t \quad (1)$$

The lag lengths  $n$ ,  $p$  and  $q$  are chosen to minimise the Akaike information criterion and such that the resulting residuals (estimate of the true error term  $e_t$ ) are well-behaved, namely, serially uncorrelated, normally distributed and homoscedastic. Furthermore, the parameters from equation (1) should be structurally stable in the case where there exists a long-run relationship among the variables. Well-behaved residuals can be ascertained from testing for normality with the Jarque–Bera test, serial correlation with the Breusch–Godfrey Lagrange Multiplier (LM) test and heteroskedasticity with the Breusch–Pagan–Godfrey test. Structural stability is assessed by the Ramsey Regression Specification Test (RESET), the Cumulative Sum of the Recursive Residuals (CUSUM) and the Cumulative Sum of the Recursive Residuals Squares (CUSUM squares).

From Pesaran and Shin (1998) and Pesaran et al. (2001), the determination of the existence of a long-run relationship running from  $x$  to  $y$  and  $z$  involved an  $F$ -test and  $t$ -test. The  $F$ -test is the null hypothesis of the joint significance of  $\gamma_1 = \gamma_2 = \gamma_3 = 0$  that indicates evidence of no long-run relationship. If the null cannot be rejected, equation (1) reduces to equation (2) wherein the variables are estimated in first differences

$$\Delta y_t = \beta_0 + \sum_1^n \beta_{1i} \Delta y_{t-i} + \sum_0^p \beta_{2i} \Delta x_{t-j} + \sum_0^q \beta_{3i} \Delta z_{t-k} + e_t \quad (2)$$

The  $F$ -test statistic is contrasted against the upper,  $I(1)$ , and lower,  $I(0)$ , bound critical values. If the  $F$ -test statistic is higher, more extreme, than the upper bound critical value, then there is evidence in favour of cointegration, and we reject the null hypothesis of no long-run levels relationship. If the  $F$ -test statistic is between the lower and upper bound critical values, the test result is inconclusive. If the  $F$ -test statistic is below the critical value, then we fail to reject the null of no long-run levels relationship. Now in the case when the conclusion is to reject the null hypothesis of no long-run levels relationship, the  $F$ -test statistic being greater than the upper bound critical value, the  $t$ -test comes into play. It serves as a necessary condition to confirm the results of the  $F$ -test. For the  $t$ -test, we evaluate the null hypothesis that of  $\gamma_1 = 0$  against the alternative hypothesis of  $\gamma_1 < 0$  based on equation (1). We reject the null hypothesis if the computed  $t$ -test statistic is more extreme than the  $t$ -test statistic's upper bound critical values and fail to reject otherwise.

In our article, we conduct the ARDL bounds testing for cointegration on LNRMW, LNUR, LNTB3, LNSTI and LNHPI such that each variable takes on the role of the dependent variable and the others, the independent variables. Where there are cointegrating relationships, we can report the long- and short-run equations. The ARDL bounds testing approach is advantageous in a few respects over traditional approaches to cointegration such as the Johansen method. First, the simple setup of a single equation allows for greater degrees of flexibility in describing the data-generating process associated with each variable. The second advantage is that we can analyse variables that are

**Table 1.** Augmented Dickey Fuller (ADF) unit root test.

Variable	No Intercept or Trend		With Intercept		With Intercept and Trend	
LNRT	2.768		-1.483		-1.854	
$\Delta$ LNRT	-9.893	***	-10.499	***	-10.538	***
LNRMW	3.289		0.686		-0.517	
$\Delta$ LNRMW	-9.013	***	-9.757	***	-9.791	***
LNUR	-1.387		-1.216		-2.143	
$\Delta$ LNUR	-7.017	***	-7.150	***	-7.119	***
LNTB3	-1.991	**	-2.202		-3.209	*
$\Delta$ LNTB3	-6.560	***	-6.550	***	-6.551	***
LNSTI	1.914		-1.460		-2.959	
$\Delta$ LNSTI	-8.257	***	-8.481	***	-8.471	***
LNHPI	2.022		-0.369		-2.135	
$\Delta$ LNHPI	-2.914	***	-3.601	***	-3.563	**

Source: Authors' calculation from Statistics Canada (2019).

The null hypothesis of the ADF test is that the series contains unit roots.

\*\*\*, \*\* and \* indicate statistical significance level at less than the 1%, 5% and 10% levels, respectively.

integrated of order one or zero. The third is that the loss in degrees of freedom will be much smaller than other methods because there will likely be fewer parameters to be estimated. Thus, the ARDL is well suited for estimations that involve small samples.

Now, the ARDL approach will allow us to ascertain the number and direction of cointegration relationships among the variables. However, if there are two or more cointegrating relationships, the disentanglement of the short-run and long-run causal relations must be determined under the system equation setup such as a vector error correction model (VECM). Consequently, if we find that there are two or more cointegration relationships among LNRMW, LNUR, LNTB3, LNSTI and LNHPI, we will apply the VECM framework after conforming the number of cointegrating relationships by applying the Johansen test.

## Results

### *Unit root and ARDL bounds tests*

Table 1 reports the ADF unit root test results for the levels and first differences of LNRMW, LNUR, LNTB3, LNSTI and LNHPI. For additional robustness of these results, we conducted the unit root tests across three data generating processes: (1) no intercept or trend, (2) with intercept and (3) with intercept and trend. From Table 1, LNRMW, LNUR, LNSTI and LNHPI are all unambiguously integrated of order one across different specification variants of the ADF test. In each case, at conventional levels of statistical significance, we fail to reject the null hypothesis of the presence of a unit root level but cannot reject the same null hypothesis for the variables at first differences. For the 3-month treasury bill, LNTB3, with the no intercept or trend and with intercept

**Table 2.** *F*- and *t*-statistics from ARDL.

Model	<i>F</i> -statistic		<i>t</i> -statistic	
LNRT = F(LNRMW, LNUR, LNTB3, LNSTI, LNHPI)	7.313***		-6.841***	
LNRMW = F(LNRT, LNUR, LNTB3, LNSTI, LNHPI)	3.866*		-3.560	
LNUR = F(LNRT, LNRMW, LNTB3, LNSTI, LNHPI)	3.406		-3.380	
LNSTI = F(LNRT, LNRMW, LNTB3, LNUR, LNHPI)	2.818		-4.005	
LNHPI = F(LNRT, LNRMW, LNTB3, LNUR, LNSTI)	3.683		-0.455	
LNTB3 = F(LNRT, LNRMW, LNUR, LNSTI, LNHPI)	2.524		-2.156	
Statistical Significance	<i>I</i> (0)	<i>I</i> (1)	<i>I</i> (0)	<i>I</i> (1)
5%	2.62	3.79	-2.86	-4.19
2.5%	2.96	4.18	-3.13	-4.46
1%	3.41	4.68	-3.43	-4.79

ARDL: autoregressive distributed lag.

Source: Authors' calculation from Statistics Canada (2019).

\*\*\* and \* indicate statistical significance level at less than the 1% and 5% levels, respectively.

and trend specifications, we reject the null hypothesis of a unit root in levels at the 5% and 10% levels of statistical significance, respectively. At the same time, for LNTB3, with intercept specification, we do not reject the null hypothesis of a unit root at conventional levels of significance. However, at first difference, LNTB3 is stationary across the three data generating process specifications. We conclude from these results that LNTB3 is probably integrated of order zero but certainly not more than one.

Given the unit root findings that none of the variables are integrated of order two or more, the ARDL bounds testing framework to cointegration can be applied. Table 2 reports these results. The top part of this table shows the equation estimated by dependent and independent variables, the *F*-test statistic and the *t*-test statistic. The bottom part of the table shows the *F*-test and *t*-test lower, *I*(0), and upper, *I*(1), bound critical values by statistical significance at the less than 1%, 2.5% and 5% levels. For the real retail trade equation, LNRT, the *F*-test statistic value is 7.313, and this is higher than the *F*-test upper bound critical value of 4.68 at less than the 1% level of statistical significance. From this result, we conclude that there is evidence in favour of rejecting the null hypothesis of no long-run levels relationship. As such, we can proceed to the *t*-test for confirmation. In this case, the *t*-test statistic is -6.841 and this is more extreme than its 1% upper bound critical value of -4.79. We conclude that there is evidence that the null hypothesis of no long-run levels relationship from LNRMW, LNUR, LNTB3, LNSTI, LNHPI to LNRT can be rejected.

Turning to the LNRMW equation, we observe from Table 2 that its *F*-test statistic value is also more extreme than the upper bound critical values at less than 5% level of statistical significance. However, the *t*-test statistic, in this case, is less extreme than the *t*-test upper bound critical values even at the less than 5% level of statistical significance (-3.560 vs -4.190). Consequently, we cannot reject the null hypothesis of no long-run levels relationship running from the other variables to LNRMW. For the equations LNUR, LNSTI and LNHPI, none of the *F*-test statistics or the *t*-test statistics are higher

**Table 3.** ARDL cointegrating and long-run forms.

Equation: LNRT = F(LNRMW, LNUR, LNTB3, LNSTI, LNHP1)		
Variable	Coefficient	Standard Error
LNRMW	0.463***	0.101
LNUR	-0.133**	0.058
LNTB3	-0.021***	0.008
LNSTI	0.064**	0.023
LNHP1	-0.068	0.045
Short-Run Error Correction Term	-0.497***	0.073
ARDL Model	(1, 3, 0, 9, 3, 8)	
Time Period	1991Q1–2019Q2	
Number of Observations	105	

ARDL: autoregressive distributed lag.

Source: Authors' calculation from Statistics Canada (2019).

\*\*\* and \*\* indicate statistical significance level at less than the 1% and 5%, respectively.

than their respective upper bound critical values at the less than 5% level of statistical significance. Thus, we cannot reject the null hypothesis of no long-run levels relationship for these variables. Now, the 3-month treasury bill unit root test results presented evidence in favour of its being integrated of order zero but certainly not more than one. From the LNTB3 equation, the  $F$ -test statistic is closer to zero than the  $F$ -test statistic critical value at the 5% level (2.524 vs 2.62). In addition, the  $t$ -test statistic is also closer to zero than the  $t$ -test lower bound critical value at the 5% level of significance (-2.156 vs -2.57). In this case, the test results are inconclusive.

### ARDL cointegration and long-run form

From the ARDL bounds testing results, we found evidence in favour of only one long-run levels relationship among the variables. This long-run levels relationship is from LNRMW and the other variables to LNRT. With a unique long-run levels relationship established, we estimate the cointegrating form of the ARDL model wherein the estimated long-run coefficients and the short-run error correction term can be obtained. Table 3 reports the levels equation and the short-run error correction term. The results for the full error correction regression are omitted due to space constraints and the fact that they are not of primary interest. These results are available upon request.

What we observe from Table 3 that of interest is the following. First, the short-run error correction term, the speed of adjustment, is of the correct sign and size indicating the long-run levels relationship is cointegrating. It is less than one in absolute value, negative and statistically significant at less than the 1% level. Its value of -0.497 indicates that almost half, specifically 49.7%, of any shock that results in a deviation from the long-run equilibrium relationship among the variables is corrected within a quarter. In other words, it takes about 6 months for the variables to converge in the long-run equilibrium. Second, from the long-run levels relationship, the coefficients of LNRMW, LNUR, LNTB3 and LNSTI are statistically significant at the 1% or 5% level. The

impacts of changes in LNRMW and LNSTI on LNRT are both positive. From Table 3, an increase in stock market wealth has a smaller impact. A 1% increase in LNSTI is associated with a 0.064% increase in LNRT. Increases in LNUR and worsening credit market conditions, as measured by LNTB3, are negatively related to changes in LNRT. In the case of the unemployment rate, a 1% increase is associated with a 0.133% decrease in the real retail trade expenditure. For the 3-month treasury bill, the effect is smaller. A 1% increase in LNTB3 is associated with a 0.021% decline in LNRT. The impact of the housing price is not statistically significant at the conventional levels of significance.

Turning now to how the changes in minimum wage impacts consumption, we look at the coefficient on LNRMW in Table 3. From this table, we note that, on average, a 1% increase in the real minimum wage is associated with a 0.463% increase in the real retail trade sales per capita. This is a result in favour of changes in the level of the real minimum wage having contributed positively to the average level of consumption expenditure over the sample period.<sup>13</sup> This result merits further discussion as it is the focus of this article.

From a theoretical perspective, heterodox economists have long argued that the aggregate propensity to consume out of wage income is much larger than the propensity to consume out of profits (Kaldor, 1955; Kalecki, 1971; Robinson, 1949). This increase in consumption may be more prominent when an economy operates below the full-employment level. With the assumption of sticky prices, an increase in the minimum wage would likely increase the effective demand (Prasch and Sheth, 1999). Therefore, the economy should experience an overall positive consumption-led growth due to the increase in the minimum wage (Lavoie, 2014; Stabile, 2018). In the existing literature, some of which was mentioned in an earlier section, there is evidence that a higher minimum wage can increase aggregate consumption. For example, Rehkopf et al. (2018) studied the impact of a minimum wage on consumption in the Dominican Republic. They found that workers who received a higher wage spent more on computers, furniture, home repair and groceries, and these workers also increased their protein and dairy intake. In another study, Reich et al. (2017) conducted a simulation exercise to examine the consumption and employment effect of the scheduled minimum wage increases to USD 15 by 2023 in Fresno County, California. They found that a minimum wage increase would increase worker purchasing power, which would, in turn, increase consumer spending.

### **Robustness checks**

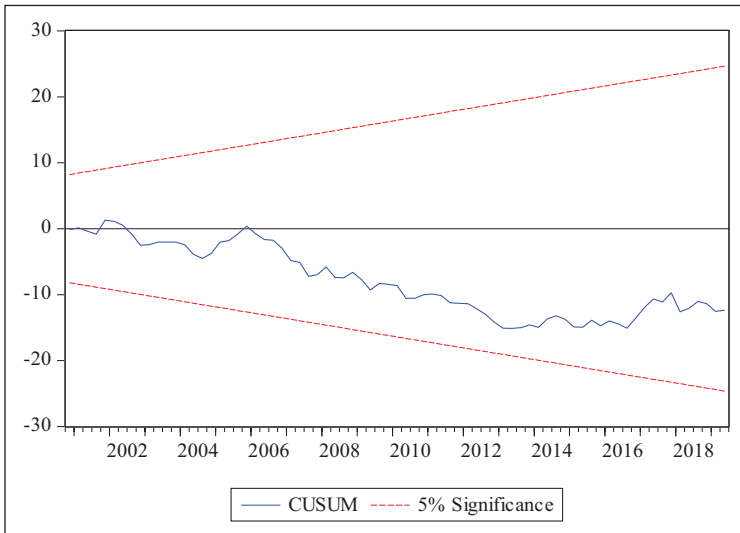
The extent to which we can have confidence in the inferences drawn from the ARDL depends on whether the model is internally valid insofar as the residuals are well-behaved and the parameters of the cointegrating relationship being stable over the sample period. Table 4 reports the results from the test for normality, serial correlation, heteroskedasticity and the Ramsey RESET test for misspecification and coefficient stability. The results indicate the ARDL model is internally valid. For the Jarque–Berra test of normality of the residuals, we cannot reject that they are normal at conventional levels of statistical significance. Similarly, we fail to reject no serial correlation and no heteroskedasticity based on the Breusch–Godfrey, serial correlation LM and the Breusch–Pagan–Godfrey heteroskedasticity tests. In terms of stability and misspecification, the results from the

**Table 4.** Diagnostic tests.

Test	Statistic
Normality, Jarque–Bera (JB) Test	1.507
Breusch–Godfrey, Serial Correlation Lagrange Multiplier (LM) Test	2.192
Breusch–Pagan–Godfrey, Heteroskedasticity Test	1.025
Stability, Ramsey RESET Test	0.212

Source: Authors' calculation from Statistics Canada (2019).

(1) JB Test  $H_0$ : Normality; (2) LM Test  $H_0$ : No serial correlation; (3) Heteroskedasticity Test  $H_0$ : Homoskedasticity; (4) RESET Test  $H_0$ : Functional form is correct.

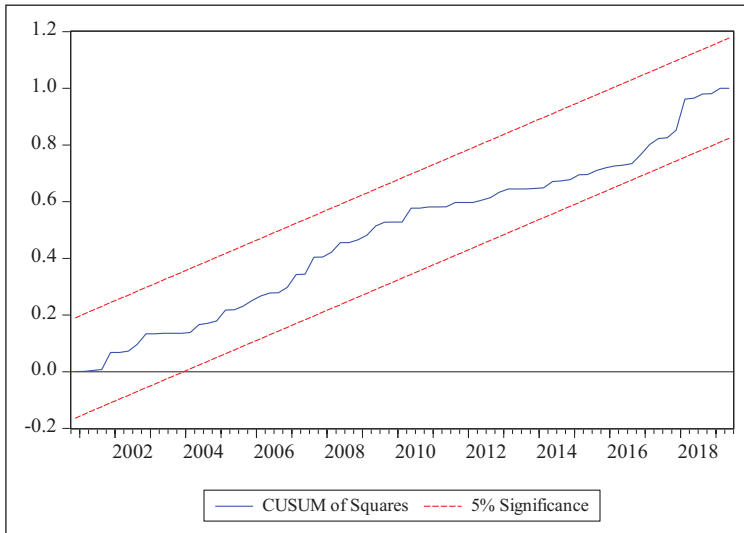


**Figure 2.** Cumulative sum (CUSUM) of the recursive residuals.

Source: Authors' calculation from Statistics Canada (2019).

Ramsey RESET test allow us to conclude that the null hypothesis of stability from the perspective of functional form correctness cannot be rejected.

Stability of the cointegration over time can also be further assessed by considering CUSUM of the recursive residuals and the CUSUM of the recursive residual squares. The former allows us to identify visually parameter instability and the latter variance instability in the cointegrating relationship over time. If either the CUSUM or the CUSUM squares lie outside the 5% significance confidence band, then this could be suggestive that the current ARDL is not statistically adequate as it would not reflect in a consistent manner the dynamics of the equilibrium relations among the variables over time. The CUSUM and the CUSUM squares for the ARDL are reported in Figures 2 and 3, respectively. From Figure 2, there is no indication of parameter instability, and from Figure 3, there is no concern that there is variance instability. Consequently, we can conclude that our ARDL model is statistically adequate in these respects as well.



**Figure 3.** Cumulative SUM (CUSUM) of the recursive residual squares.

Source: Authors' calculation from Statistics Canada (2019).

## Discussion

The findings from this article can be positioned within the context of broader economic outcomes. On one hand, minimum wage policies are of continued interest as it is said they help prevent the exploitation of workers, typically non-unionised, in what can be classified as lower skilled occupations (often precarious as well) from receiving wages that are egregiously low (Employment and Social Development Canada, 2019).<sup>14</sup> On the other hand, the policies are also of interest because they could potentially have wide scale impacts on economic activity. In this respect, household consumption expenditure has an important role to play in influencing the short-run and long-run trajectories in economic growth. The findings of the current article demonstrate that the existence of a minimum wage policy and the raising of the minimum wage have the potential to support economic growth by raising aggregate consumption expenditure.

The findings from the current article can also be positioned within the schools for economic thought. Both classical and neoclassical economics tend to suggest that wages are determined by market forces. However, it is important to unpack the original motivation of the classical argument. In his seminal work *The Wealth of Nations*, Adam Smith made a strong argument for *high wages* for workers. Smith (1776) believed that high wages were the engine of economic development. Smith (1776) noted, ‘. . . in order to bring up a family, the labour of the husband and wife together must, even in the lowest species of common labour, be able to earn something more than what is precisely necessary for their own maintenance’ (p. 77). Even though Smith was generally a pragmatic liberal that preferred less government intervention in the market, he believed at that time that the masters and mercantilists, who were motivated by self-interests and owned most factors of production, would not have any incentive to provide *high wages*



to workers. Plowman and Perryer (2010) critically examined Adam Smith's *high wage* proposition. Plowman and Perryer (2010) asserted that '(t)here is evidence of Smith's writing to support the view that, in contemporary industrialised societies, Smith would support mandated minimum wages' (p. 17). We posit that our findings are evidence in line with Smith's idea of the *high wage* that is necessary for workers to have their *own maintenance*.

In the post-Keynesian literature, the minimum wage is closely associated with the *job guarantee* (JG) programme. The JG programme attempts to address, in a more satisfactory way, the problems of inflation and unemployment. Prominent post-Keynesian studies such as Harvey (1989), Minsky (1965), Mitchell (1998), Mitchell and Muysken (2008), Mosler (1997), Tcherneva (2018), Wray (1998), and Wray et al. (2018) proposed, developed and discussed different versions of the JG programme. The most general form of this programme is known as the employer of last resort (ELR) in which the government creates jobs for every individual who is entitled to work. Different variations of the minimum wage have been proposed by advocates of this programme (Wray, 2008). For example, Harvey (1989) proposed a wage close to the *market wage* wherein the variations in the wage among workers are commensurate with their skill level. Wray (1998) and Burgess and Mitchell (1998) called for a uniform hourly wage with a package of benefits. Tcherneva (2018) proposed a living wage of USD 15 per hour plus benefits.

Post-Keynesian economists pointed out that the ELR plays the important role of a buffer stock and thereby helps to stabilise prices and output (Sawyer, 2003; Wray, 1998). The countercyclical attribute of the buffer stock mechanism is that unemployed workers will be hired in the ELR programme during recessions and will be paid a minimum wage. With the eventual recovery, these workers would be paid a wage higher than the minimum wage (Tcherneva, 2018). Thus, government can create (reduce) deficits (surplus) to finance the ELR programme during recessions and create (reduce) surplus (deficits) during recovery. This countercyclical feature will relieve inflationary and deflationary pressures in the economy and assist in stabilising prices. The other aspect of stabilisation is the stabilisation of output. Tcherneva (2018) noted that the ELR programme will create jobs, employ workers and continuously supply goods and services during recessions. Therefore, the deviation from the full-employment level of output will be small.

The potential economic efficacy of the JG programme with respect to achieving positive economic outcomes is supported by our findings. Furthermore, there is the potential consumption-led economic growth stemming from an increase in the minimum wage. The growth is generally congruent with stability in an economy, given the range and frequency over which such increases typically take place. In addition to the dimensions of stability aforementioned, there is also potential stability on the employment front with minimum wages. In this regard, firms typically experience lower turnover rates and workers are more attached to the labour market, both of which support positive economic growth outcomes (Brochu and Green, 2013).

## Conclusion

In the presence of mixed evidence on the relationship between the minimum wage, employment and even prices, an indirect way to measure the macroeconomic effect of

the minimum wage is to estimate its impact on consumption. Moreover, much of the mainstream literature takes it as a given that a higher minimum wage is detrimental to employment and overall economic welfare. In recent years, the minimum wage debate has gained a lot of attention among Canadian academics, policymakers and politicians. Labour organisations and anti-poverty campaigns called for raising the minimum wage at the federal level (Employment and Social Development Canada, 2019). Within this context, we examine the causal relationship between consumption, measured as real retail trade per adult population, and the real minimum wage in Canada over the period 1991Q1 to 2019Q2. We apply the bounds testing framework to analyse the relationship between these variables while controlling for potentially macroeconomic confounding factors related to the labour market, household wealth and credit conditions. From the results, there are two key findings. First, we find evidence of a long-run cointegration relationship running from the minimum wage and the macroeconomic controls to real retail trade per adult population. Second, in the long run, a 1% increase in the real minimum wage is associated with almost a 0.5% increase in the real retail trade per adult population. This finding does not support the argument that minimum wage hikes would decrease the aggregate demand of an economy, certainly not in Canada and at levels that have taken place over the period examined.

While our results rest on several statistical assumptions, we offer some suggestions for future lines of research and policy. First, in terms of research, we note that the findings of our article indicate that the positive effects of minimum wage increases in Canada dominate the negative effects. Given that most studies on the minimum wage effects of Canada have found negative employment effects, we can presume that the spillover effects such as ripple- and/or redistribution effect must be significantly positive in Canada. Consequently, a fruitful area of research could be to further examine the ripple and redistribution effect of minimum wages and the associated policy implications. Another future research possibility is an examination of the relationship between the minimum wage and consumption at the household level to have a better understanding of the impact of minimum wages on households with differential income. Second, the findings of this article also provide a suggestion for the design of minimum wage policy. The criticisms put forward against increasing the minimum wage are mainly based on the controversial prediction that the minimum wage reduces employment. If the minimum wage contributes to boosting aggregate consumption, as our findings suggest, despite its potential adverse impacts on employment, the minimum wage can be a useful instrument to enhance the economic growth and welfare. Put differently, policymakers and governments are well advised to pay additional attention to the spillover and redistribution effects when they design minimum wage policy.

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## Notes

1. See Brown et al. (1982), Brown (1999), Neumark and Wascher (2007), and Arpaia et al. (2017) for a comprehensive survey on the employment and other economic effects of minimum wage.
2. From a mainstream perspective, when the economy can fully adjust in all markets in response to changes in the economic environment, the price level is determined by the money supply, which for stability reasons is taken as given. The price level being determined in this way means that it will not change because the unit labour input cost will be constant in response to any diminution in employment arising from increases in the minimum wage.
3. An example of such policies is the *job guarantee* (JG) programme for which the heterodox school, and particularly post-Keynesian economists, have long advocated. We will have a thorough discussion of the JG programme after we present the empirical findings in the article.
4. The term 'new minimum wage research' originated from the 'New Minimum Wage Research Conference' held in November 1991, which was sponsored by the ILR-Cornell Institute for Labor Market Policies and Princeton University's Industrial Relation Section (Neumark and Wascher, 2007).
5. Fourteen emerging countries including Argentina, Brazil, Chile, China, Colombia, India, Indonesia, Mexico, Poland, the Philippines, Russia, South Africa, Thailand and Turkey were included in the dataset.
6. However, the positive employment effect of the minimum wage has been criticised. For example, Neumark and Wascher (1995) used payroll data to re-examine Card and Krueger (1994) and found that the employment is reduced by 4.6% relative to the control group. See also Sloan (1996) and Valentine (1996) for more details on the criticism.
7. Under the provincial government of Alberta New Democratic Party, the general minimum wage rose to CAD 15.00 per hour in October 2018. After the provincial election in April 2019, the newly elected United Conservative Party reduced the minimum wage to CAD 13.00 per hour for students under 18 years old. The general minimum wage remained at CAD 15.00.
8. For example, these would be among students, and teenage and young workers as noted by Campolieti et al. (2012).
9. Freeman (1989) pointed out that the temporal aggregation, which is the practice of summing or averaging observations over some interval in time-series data, can be misleading due to serially correlated errors. To check the possibility of bias, we performed the robustness check including the serial correlation Lagrange multiplier test and found no evidence of the bias.
10. We used the adult population to calculate the retail trade sales per person because the total population is not released in the labour force statistics in Canada.
11. Before 1996, there was a federal minimum wage that applied to workers in the federal labour jurisdiction (e.g. railways, shipping, banking). From 1996, the federal minimum wage is set to the minimum wage where the employee sells his or her labour.
12. We also ran the autoregressive distributed lag (ARDL) with data sets of monthly frequency and obtained the similar results. Moreover, we found that the quarterly data can perform the model with shorter lags and improved the results in terms of stability and diagnostic test. The data sources are as follows:  
Retail trade sales: <https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=2010000801>

Minimum wage in Canada: <https://open.canada.ca/data/en/dataset/390ee890-59bb-4f34-a37c-9732781ef8a0>

Unemployment rate and labour force characteristics: <https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1410028701>

Consumer price index: <https://www150.statcan.gc.ca/t1/tbl1/en/cv.action?pid=1810000401>

Canadian All-share Price Index: <https://fred.stlouisfed.org/series/SPASTT01CAM661N>

House price index: <https://www150.statcan.gc.ca/t1/tbl1/en/cv.action?pid=1810020501>

13. The effect of increases in the minimum wage may only be valid over a certain range of increases. In other words, there may be nonlinear effects beyond a certain point. This limits the extent to which one could increase the minimum wage in an attempt to raise consumption to achieve a level of aggregate demand corresponding to the full-employment level. For example, Jardim et al. (2017) evaluated the effects of the two phase increases in Seattle's minimum wage from USD 9.47 to USD 11 per hour in 2015 and USD 11 to USD 13 in 2016 on employment and found the second phase increase yielded more substantial disemployment effects. Gorry and Jackson (2017) used a calibration model to show that high levels of the minimum wages have a larger effect on unemployment. The consumption effect of the minimum wage could also be nonlinear. As far as we know, there is no previous study on the nonlinear effects on consumption and it is out of scope of this article but certainly a possible area for future research.
14. A minimum wage policy is of particular policy relevance for Canada where only 31.8% of all employees were unionised in 2015, a rate of unionisation that is falling (Employment and Social Development Canada, 2015; Statistics Canada, 2018).

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