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The Impact of the Bank of Canada's Monetary Policies on the Unemployment Rates of First Nations Off-Reserve and Métis Communities Within Canada

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Résumé

Dans ce mémoire, les effets d'un choc de politique monétaire restrictive provoqué par la Banque du Canada sur les taux de chômage des communautés des Premières Nations vivant hors réserve et des communautés Métis sont comparés aux effets du même choc sur le taux de chômage de la communauté non autochtone. Tout d'abord, les données sont recueillies sur (1) les taux de chômage de chaque communauté à partir de l'*Enquête sur la population active* de janvier 2008 à décembre 2017, et (2) les chocs de politique monétaire selon Champagne et Sekkel (2018). Ensuite, le mémoire reproduit les résultats de Champagne et Sekkel afin d'examiner les différences entre les tailles d'échantillon. Troisièmement, la réponse impulsionnelle de chaque communauté au choc de politique monétaire est ensuite estimée à l'aide de la méthode VAR et de la méthode d'estimation par projection locale. Les recherches effectuées démontrent que le choc de politique monétaire restrictive augmente les taux de chômage de chaque communauté après un horizon de trente mois. Cependant, le taux de chômage de la communauté des Premières Nations vivant hors réserve augmente plus que celui des deux autres communautés. L'analyse identifie initialement la présence de l'énigme des prix dans les six premiers mois, qui peut être expliquée par la taille de l'échantillon et la théorie macroéconomique. Le mémoire conclut en examinant les raisons possibles de la différence entre les réponses impulsionnelles des communautés.

Mots clés: taux de chômage, politique monétaire restrictive, autochtone, Premières Nations, Métis, choc.

Abstract

In this paper, the effects of a contractionary monetary policy shock, by the Bank of Canada, on the unemployment rates of the First Nations off-reserve and Métis communities are compared to the effects of the same shock on the unemployment rate of the non-Indigenous community. First, data is collected on (1) the unemployment rates of each community from the Labour Force Survey from January 2008 to December 2017 and (2) the monetary policy shocks from Champagne and Sekkel (2018). Second, the thesis reproduces Champagne and Sekkel's results to examine the differences between sample sizes. Third, the impulse response of each community from the monetary policy shock is then estimated using the VAR method and the Local Projection Estimation Method. The thesis finds that the contractionary monetary policy shock increases the unemployment rates of each community after a 30-month horizon. However, the First Nations off-reserve community's unemployment rate increases more than the other two communities. The analysis identifies an initial price puzzle in the first 6 months which can be explained by the sample size and macroeconomic theory. The thesis concludes by examining possible reasons for the difference in response between the communities.

Keywords: unemployment rate, contractionary monetary policy, indigenous, First Nations, Métis, shock

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I Introduction

Indigenous communities in Canada have long faced significant economic challenges, including high levels of unemployment, poverty, and economic inequality. These challenges are rooted in historical and ongoing systemic factors, caused by colonization, previous displacements, and ongoing discrimination. Numerous parties, such as non-governmental organizations, the Canadian government, the Indigenous communities themselves, and the Bank of Canada must work together to improve the different economic conditions of the numerous and different Indigenous communities within Canada but also know how each of their actions affects these communities specifically. This thesis aims to understand how an increase in the interest rate caused by the Bank of Canada's monetary policy affects the unemployment rates of Indigenous communities compared to the non-Indigenous community, to aid policymakers' understanding of how future policies may differentially affect these various groups.

Monetary policy refers to the actions of a central bank, such as the Bank of Canada, to influence the supply of money and credit in the economy to achieve price stability and support sustainable economic growth. Monetary policy decisions, such as changes in interest rates or the supply of money, can have far-reaching effects on the economy, including employment levels. However, monetary policy decisions can also have unintended consequences, including on employment outcomes, which can disproportionately impact Indigenous communities in Canada. The Bank of Canada's monetary policy decisions can impact the economy through several channels. One channel is the interest rate channel, which operates through changes in the cost of borrowing. When the Bank of Canada raises interest rates, borrowing becomes more expensive, which can lead to a decrease in business investment and consumer spending. This, in turn, can lead to a decrease in demand for goods and services, which can lead to lower levels of employment. Another channel is the exchange rate channel. When the Bank of Canada raises interest rates, the Canadian dollar tends to appreciate, as foreign investors seek to invest in Canada to take advantage of the higher interest rates. A stronger Canadian dollar can make Canadian exports less competitive on the global market, leading to a decrease in demand for Canadian goods and services. This, in turn, can lead to a decrease in employment levels in export-oriented industries.

The impact of a contractionary monetary policy shock on Indigenous communities in Canada is of particular interest, given the persistent economic challenges faced by these communities. While the Indigenous population in Canada accounts for just over 5% of the total population, Indigenous peoples experience significantly higher levels of unemployment and poverty than non-Indigenous Canadians. Additionally, Indigenous peoples in Canada have historically been marginalized from the mainstream economy, making it more difficult for them to access employment opportunities (Trovato et al., 2011). The impact of monetary policy on Indigenous employment outcomes is not well understood. While some studies have examined the impact of monetary policy on the Canadian labour market more broadly, to our knowledge, none have specifically focused on the impact on Indigenous peoples. However, in the United States, studies (Bartscher et al., 2021; Chetty et al., 2020; Lee et al., 2021; Nakajima, 2021) have examined the impact of monetary policy on the racial labour market. They found that there was substantial heterogeneity between the reaction of the Caucasian unemployment rate and other unemployment rates to the same monetary policies. These results could be transposed onto the diverse Canadian labour market. Although, the geographical and historical particularities of the Indigenous communities are very different from other minorities within the Canadian population. Thus, analyzing the relationship between these communities and the Bank of Canada's monetary policy is relevant for understanding the policy's repercussions on these populations.

This thesis seeks to build on past research and examine the specific impact of a contractionary monetary policy shock (e.g., an exogenous increase in the nominal interest rate) on specific Indigenous minority groups' employment outcomes. Specifically, the thesis will address the impact of a contractionary monetary policy shock by the Bank of Canada on the unemployment rate of First Nations off-reserve and Métis communities compared to the impact of a contractionary monetary policy shock on non-Indigenous employment outcomes.

To address this research question, the thesis will use two approaches, a structural vector auto-regression model and a local projection estimation method. These analyses will be conducted using Canadian labour market data from Statistics Canada and the monetary policy measure calculated by Champagne and Sekkel (2018). The analysis includes a comparison between a time-series analysis of the relationship between monetary policy shocks and the two Indigenous communities' employment outcomes over time and the relationship between monetary policy shocks and the non-Indigenous community's employment outcome.

This thesis finds that there is a difference in the response to an increase in interest rates between the non-Indigenous, the Métis, and the First Nations off-reserve communities. While the non-Indigenous and Métis communities' response after the 30-month horizon is qualitatively similar, a 1.0% increase in the Canadian interest rate leads to an increase of 0.5% in both of their year-on-year unemployment rate differences, this was not the case for the First Nations off-reserve community. The First Nations off-reserve community has a more severe and lagged reaction to an increase in interest rates. They have a 5-month lagged reaction compared to the other two communities, and a 1.0% increase in the Canadian interest rate leads to an increase of 1.0% in their year-on-year unemployment rate difference. We look at other studies which analyze the response of certain variables, such as different age groups, geographical location, and educational attainment, to a monetary policy shock and use these results to help explain the different responses between the three unemployment rates. The different reactions between the communities suggest closer attention to the transmission and effects of Canadian shocks to the different communities within Canada is warranted.

The remainder of this thesis is organized as follows. Section II describes the past relevant literature conducted in Canada and the rest of the world. Section III presents data sources and discusses the methodology. Section IV presents and discusses the results, and Section V concludes.

II Literature Review

Although studies have demonstrated a causal effect between a central bank's monetary policy and the aggregate unemployment rate (Champagne and Sekkel, 2018; Primiceri, 2005), recent studies have demonstrated that this effect is not homogenous. Abell (1991) explains that while the Federal Reserve's policies simply consider aggregate conditions, such as the unemployment rate, interest rate, inflation, and GDP, the institutions which are directly affected by these policies are often the causes behind distributional distortions. In the case of Canada, some of the institutions which Abell describes as the causes behind the distributional distortions are known as the chartered banks, or Schedule I Banks. These chartered banks are identified as the “Big Five” national banks (Royal Bank of Canada, Toronto-Dominion Bank, Bank of Nova Scotia, Bank of Montreal, and Canadian Imperial Bank of Commerce) and the second-tier banks (National Bank of Canada, HSBC Bank of Canada, Laurentian Bank of Canada, and Canadian Western Bank). Thus, while the central banks create new money, it is the banking industry that decides which individuals in the economy can have access to the new funds. As Greider (1987) states, it is the banks that decide which projects are strategically beneficial and wise to invest in. This, in part, can lead to heterogeneous effects of monetary policy, as banks help decide which individuals, neighbourhoods, cities, and regions of a country receive funding and which ones are too risky to invest in. Therefore, the entire financial sector decides where new money created by the central banks ends up. Schembri (2022) states that this information is relevant to the particularity of the Indigenous communities' reality. These communities tend to be in geographical locations which do not have easy access to financial institutions and therefore are directly part of this distortion mentioned by Abell (1991).

The distributional distortions found within the banking industry are not the only causes of heterogenous effects of monetary policy. Multiple studies since the 1990s have looked at the differences in the effect of monetary policy on different variables within a society. These variables include age, income level, race, and different economic and societal variables such as educational levels and geographical location. The relationship between racial unemployment and monetary policy has been a popular subject and has been analyzed in several recent papers (Bartscher et al., 2021; Chetty et al., 2020; Lee et al., 2021; Nakajima, 2021). These studies conclude that there is substantial heterogeneity between the reaction of the Caucasian unemployment rate and the African American unemployment rate to the same monetary policy. However, this difference is only significant for male unemployment rates and is not perceived for the female unemployment rate of both races.

Although some recent studies do agree with the heterogeneous effects of monetary policy, some studies have demonstrated that the effects might not have always impacted racial minorities in a greater proportion than the non-racial population. Zavodny et Zha (2000) and Bennani (2023) analyze the effects of monetary policies undertaken by the Federal Reserve on the unemployment of the African American community and the total labour force within the United States. They find that there were heterogeneous effects, but these effects varied over different decades. Zavodny et Zha (2000) find that monetary policy had slightly more adverse effects among the African American communities than among the total labour force in the 1980s. Yet, the policies implemented in the 1990s were substantially more beneficial to the African American communities compared to the total labour force. Although the Federal Reserve policies of the 1990s had the desired effect on the total labour force, including the African American labour force, their analysis concludes that the African American unemployment rate still responded slightly more to exogenous changes in the federal funds rate and to other macroeconomic variables compared to the overall unemployment rate's response.

The factors explaining the greater impact of monetary policy on minority unemployment in the United States can be transcribed to study the particularity of a minority group in Canada, the Indigenous communities. This minority has similar issues across both borders. Studies within the United States have demonstrated that although overall minorities tend to have a higher unemployment rate than the non-minority population, Native Americans have a higher unemployment rate than any other racial group (Sanchez et al., 2021). The situation is somewhat similar in Canada, although the gap between both populations is not as large. Monthly data between March 2007 and January 2023, gathered through the Labour Force Survey, demonstrate that the unemployment rate of the Indigenous population within Canada has continuously been above the Non-Indigenous population's rate.

Gastwirth and Haber (1976) examine another type of variable which spans the economic and societal spheres, the obtention of employment. They suggest that minorities have greater difficulty in obtaining employment because of their geographical location, often living in an area lacking job opportunities. They also mention that sometimes the lack of job opportunities is linked to individuals not having the skills necessary to obtain the jobs available in their region. Hence, government initiatives or actions taken by central banks may not be enough to affect certain minority groups. This is an important notion to consider when analyzing the situation Indigenous communities find themselves in because they tend to be situated in remote geographical regions with little to no job opportunities (Alasia et al., 2017) or, as explained further below, have lower educational attainments (Amir-Ahmadi et al., 2022).

Amir-Ahmadi et al. (2022) discusses the effects of an individual's educational level and his or her tendency to be unemployed. They mention that the effect of this variable on the unemployment rate differs between each group analyzed. They find that the effects of an increase in interest rates are more severe the less educated a group is, stating that the differences between each educational group is long-lived. This relationship between education and interest rates is important when analyzing the responses between the non-Indigenous communities and the Indigenous communities to increases in interest rates, as there are important differences between the levels of both communities, as well as differences between each particular Indigenous community's educational attainments (Gordon & White, 2014).

As shown in the next section, when looking at the data collected by Statistics Canada in its Labour Force Survey, there are signs demonstrating that the unemployment rates of Indigenous communities are decreasing. However, since the data began being collected, the gap between the unemployment rates of the different Indigenous communities and the non-Indigenous communities has not significantly decreased. This gap between both populations may be partly explained by the incomplete transmission of monetary policies within the Indigenous economy. Lawrence Schembri, who served as the Deputy Governor of the Bank of Canada from 2013 until his retirement in June 2022, remarked that numerous things could explain this incomplete transmission. However, the main factor was the lack of access to financial services, which led to primarily limited access to market-determined borrowing rates for the Indigenous economy. This in turn affected the population's income gap compared with the non-Indigenous population's (Schembri, 2022).

Schembri (2022) also mentioned other barriers which hindered the Indigenous economy. Similar to the United States, the population's "limited opportunities for education and skill development adversely affect [their] employment and income outcomes, access to credit, firm creation and economic development" (Schembri, 2022). This reality was also confirmed in Trovato et al. (2011)'s article stating that the discrimination of Indigenous people continued to be a barrier to their employment. The poverty, geographic isolation, and housing conditions that these individuals experience were also found to impact the well-being of Indigenous communities and were additional barriers to possible employment. Trovato et al. (2011) also state that the quality of and access to education were also a hindrance to Indigenous employment, and even though "employment rates increase with higher levels of education, they remain lower than the non-Indigenous population at all education levels."

A lot of the issues related to the economic situation of the Indigenous communities within Canada can be explained by the repercussions of the *Indian Act*, the pass and permit system and other policies of assimilation enforced by the Canadian government. The pass and permit system, which was part of the *Indian Act* until 1995, restricted the movement of Indigenous individuals and goods off reserves. This had a direct effect on the movement of goods created or farmed by an Indigenous person who needed a pass to leave a reserve and a permit to sell their goods at a market (Trovato et al., 2011).

Trovato et al. (2011) further describe these communities' economic situation by analyzing data obtained from the 2016 Canadian census. They look at three variables: the employment rate, income, and the participation rate. Although the rates of employment were lower for all the Indigenous communities compared to the Non-Indigenous communities, the rates varied between each community and geographical location. First Nations people on-reserve had an employment rate of 46.9%, while the ones off-reserve had a rate of 60.2%. On the other hand, Métis had a rate of 70.4%, while Inuit had a rate of 57.4%. These differences between the Indigenous groups were also present when looking at their income. An important statement by Trovato et al. (2011) concerns the reason for lower levels of participation in the labour force in the Indigenous communities. This can be partially explained by the structural constraints of the seasonal resources available because "some Indigenous people participate in activities that are not recognized as employment because they do not take place in the formal labour markets" such as the individuals who hunt, trap, fish or do other types of seasonal jobs.

Despite the important differential impacts suggested by the literature on the economic status of the Indigenous population and its unemployment/employment trends, no studies have looked at the effects of monetary policy on this particular community. The rest of this thesis aims to broach this subject.

3 Data & Methodology

3.1 Data

3.1.1 Monetary Policy Shocks

The monetary policy shocks used in the current analysis were obtained from Champagne and Sekkel's (2018) analysis. They adapt Romer and Romer's (2004) identification strategy of monetary policy shocks to the Canadian monetary policy framework. Their analysis proceeds in two stages. The first stage identifies the exogenous component of monetary policy by constructing a series of intended changes in the target policy interest rate, using real-time data and forecasts from the Bank of Canada's staff economic projections from 1974 to 2015. In the second stage, they then estimate a monthly recursive VAR that includes as a relevant policy rate the new measured shocks. In the first stage, to obtain their monetary policy shocks, they estimate:

$$\Delta i_m = \alpha + \beta_1 i_{t-d14} + \sum_{h=1}^{3} \rho_h u_{t-h} + \sum_{j=-1}^{2} \gamma_j \hat{y}^f_{m,j} + \sum_{j=-1}^{2} \delta_j \pi^f_{m,j} + \sum_{j=-1}^{2} \theta_j (\hat{y}^f_{m,j} - \hat{y}^f_{m-1,j})$$
$$+ \sum_{j=-1}^{2} \phi_j \left(\pi^f_{m,j} - \pi^f_{m-1,j}\right) + \beta_2 FFR_{t-d14} + \beta_3 ER_{t-d14}$$
$$+ \beta_4 \Delta FFR_{m-m_{-1}} \beta_5 \Delta ER_{m-m_{-1}} + \varepsilon_m$$

where Δi_m represents the change in the intended policy rate, which is measured at a meeting-by-meeting frequency which is indicated by the subscript *m*. The subscript *j* denotes the quarter of the real-time data or forecast relative to the meeting date, while subscripts *t-h* and *t-d*14 refer to information from the previous months and two weeks relative to the meeting date. $\hat{Y}^f_{m,j}$ denotes the forecasts of real output growth, while $\pi^f_{m,j}$ represents the forecasted inflation, u_{t-h} is the rate of unemployment for the previous three months, and ε_m is the monetary policy shock. The authors have an important difference in their method compared to Romer and Romer's (2004), which is that they further control for the level of changes in the U.S Federal Funds Rate (FFR) and use the logarithm of the USD/CAD nominal exchange rate ($ER_{t\text{-}d14}$) two weeks before the meeting. Like Champagne & Sekkel (2018), this thesis uses the residual from this first-stage regression as a monetary policy shock. The sample used in this thesis begins in January 2008 and runs until December 2017. The entire sample and the calculations undergone are identified in Appendix 7.2.

3.1.2 Labour Force Survey

The data used for the unemployment rates of the Métis and First Nations off-reserve communities and the non-Indigenous community come from Statistics Canada. They obtain the estimates from the Labour Force Survey (LFS) which publishes monthly economic data series collected the week following the referenced period. It provides estimates on employment by industry and occupation in the public and private sectors, hours worked and many other variables, which are all cross classified by a variety of demographic characteristics. This data is used to produce the unemployment rate and other standard labour market indicators. The LFS is used by different levels of government for the evaluation and planning of programs throughout Canada, as the estimates are produced at many levels of aggregation (i.e., for Canada, the provinces, territories, and many sub-provincial regions). The target population is the non-institutionalized population 15 years of age and over. The LFS is a nationwide survey which includes data from all the provinces. However, it excludes data from the territories and all Indigenous reserves.

The LFS uses a probability sample that is based on a stratified multi-stage design. This design consists of two stages. Initially, each province is divided into large geographic strata and then within the first stage of sampling, smaller geographic areas, designated as clusters, are selected from within each stratum. The second stage consists of selecting dwellings from within each selected cluster. A rotating panel sample design is used by the LFS so that the selected dwellings remain in the sample for six consecutive months. Statistics Canada approximates the LFS sample size to be about 56,000 households, which results in the collection of labour market information for approximately 100,000 individuals.

This thesis uses the unemployment rates of specific communities within Canada, namely the non-Indigenous and Indigenous communities off-reserve. The Indigenous community is further broken down into the First Nations individuals living off-reserve and the Métis. There is no specific data on the Inuit community because it is statistically insignificant in the data provided by the LFS. Both data series contain only nationwide rates.

3.1.3 Unemployment Rates

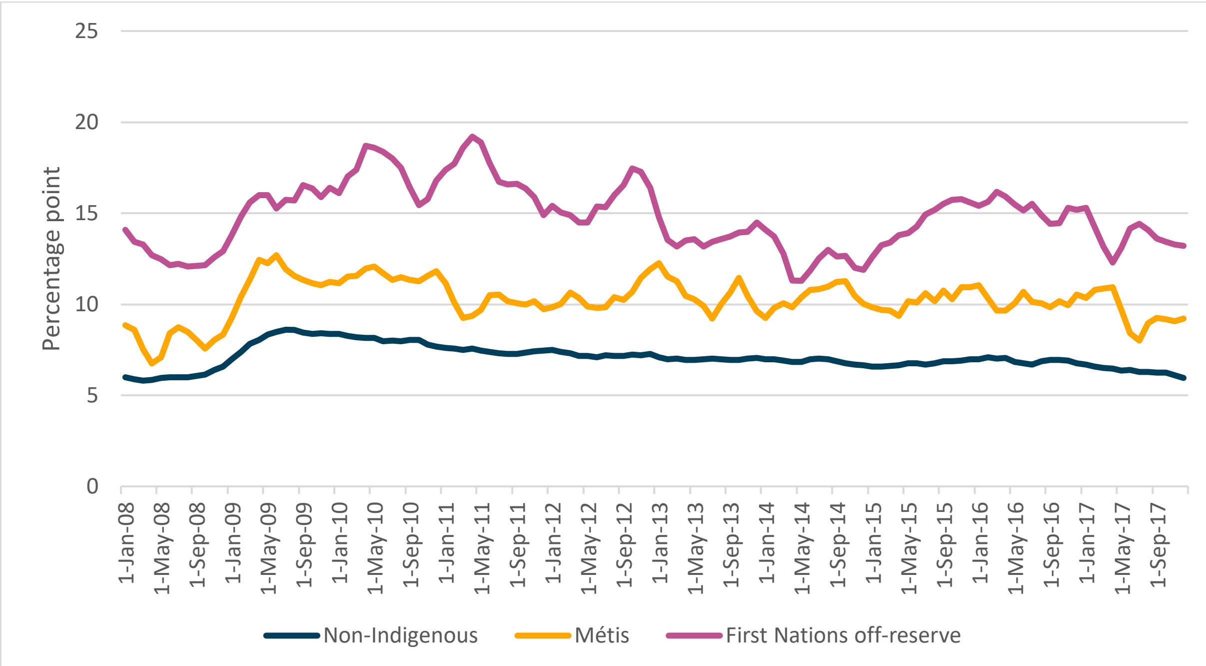
There are two particularities to consider about the unemployment rate series. First, there is limited coverage as the LFS began publishing its first data in March 2007 (and continued monthly until today). Therefore, the analysis of this data is not as robust an analysis containing the aggregate unemployment rate, which has a longer coverage by LFS. The second element is that the data obtained from the LFS contains seasonality which was removed by using differencing to permit a clearer view of the relationship between the shocks and the specific cyclical movements of unemployment rates. Differencing consists in taking the difference between the current value of a particular month and its value in the previous year. In other words, taking the difference between January 2009 and January 2008. The reason this is done is to ensure that the statistical properties of the time series remain consistent over time.[1]

The sample size used in this thesis contains 120 observations per variable. The dataset is raw monthly data from January 2008 to December 2017 and the manipulations undergone on the data are explained further in Appendix 7.2.[2] Figure 1 shows the variables after removing the seasonal trend.

[1] Alternatively, one could look at the difference in non-Indigenous and Indigenous unemployment rates, assuming the seasonality between the two series is the same. This is not done so that a direct comparison of the responses of the different groups is possible and so as not to assume seasonal patterns are the same across groups, which tend to differ in terms of the types of employment opportunities.

[2] While the original data obtained from Champagne and Sekkel were calculated until 2015, the authors provided an updated time series through 2017 for this thesis. The data series stops in December 2017 because the data used to obtain the shocks (such as the CPI and inflation projections done by the staff) are not publicly available (the Bank of Canada publishes these types of data every 5 years). Thus, Champagne and Sekkel were not able to provide further time series on monetary policy shocks past this date.

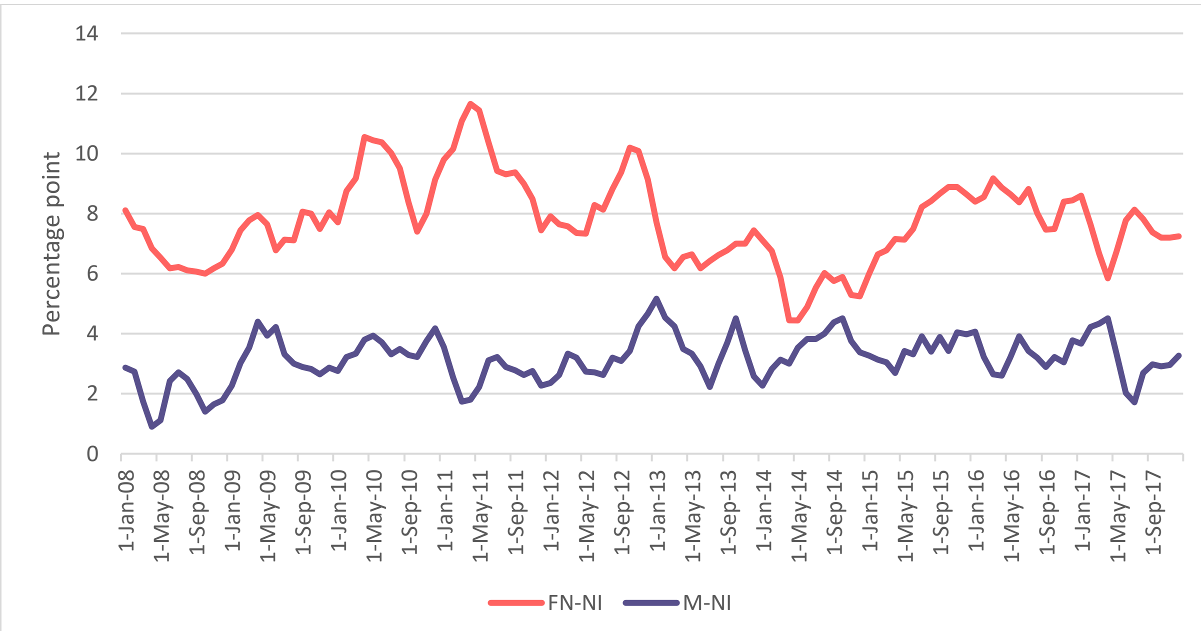
Figure 1: Unemployment rates without seasonality



When looking at Figure 1, it is important to notice the increase in every community's unemployment rate around May 2009, which could be explained by the financial crisis which took place from 2007 till 2009. From that date on, there is a clear presence of a decreasing trend in every variable. Thus, it is not accurate to compare the unemployment rate at the end of 2017 to the rate in the beginning of 2008 and state that there was no noticeable difference. It is important to take into account the financial crisis and the effects it had on the overall unemployment rates of the different communities. Therefore, although the trends in unemployment rates for the two Indigenous communities are decreasing, it is important to look at their trend compared to the non-Indigenous community's unemployment rate and see if the gap between the two has diminished over time.

Figure 2 shows the gap between the non-Indigenous community's unemployment rate and the First Nations off-reserve and Métis communities' unemployment rates. Although both Indigenous communities were affected by the financial crisis of 2008, the First Nations off-reserve community was much more affected. However, there was a decrease over time in its unemployment rate gap with the non-Indigenous community after 2008. While the gap was at 7.5% between the First Nations off-reserve and the non-Indigenous communities at the beginning of 2008, it increased to a high of 12% in 2011 before slowly decreasing back to its neutral position before the crisis. In addition, there was an increase in the gap between the Métis and non-Indigenous communities after the 2008 financial crisis, but it was an increase of 0.5% which stayed stable over the years.

Figure 2: Differences between unemployment rates[3]



Numerous actions undertaken by different communities involved, including the Canadian government and the Bank of Canada, to improve employment conditions could be the cause of the decrease in the different communities' unemployment rates after the financial crisis and the decrease in the gap between these communities' unemployment rates. The different variables which typically affect unemployment rates, such as access to funds and increasing education

[3] Figure 2 depicts the difference between the First Nations off-reserve (FN) and the non-Indigenous unemployment rates (NI), and the Métis (M) and the non-Indigenous unemployment rates.

levels, have improved the situation for all these communities. However, to fully explore the relationship between the Bank of Canada's monetary policy and each community's unemployment rate, a more technical analysis is necessary.

3.2 Methodology

3.2.1 Model Specification

A Vector Autoregression (VAR) model is a statistical model used to analyze the relationship between multiple variables which change over time. More specifically, it is a time series model that relates each variable's current and past observations with each other.

There are two types of VAR models: reduced form and structural. Stock and Watson (2001) describe them as follows. A structural VAR (SVAR) is a model which uses economic theory to obtain contemporaneous links between the variables. While the "reduced form VAR expresses each variable as a linear function of its own past values, the past values of all other variables being considered, and a serially uncorrelated error term" (Stock & Watson, 2001).

The structural VAR (SVAR) is a VAR model with p lags that can be written in the following way:

(1) $$Ay_t = B_0 + B_1 y_{t-1} + B_2 y_{t-2} + \cdots + B_j y_{t-j} + \mu_t,$$

Where y_t is a vector containing N variables, B_0 is a (N x 1) vector, $B_1, \dots, B_j$ are (N x N) matrices, μ_t is a (N x 1) vector of error terms, and

$$A = \begin{bmatrix} 1 & a_{12} & \dots & a_{1N} \\ a_{21} & 1 & \dots & \dots \\ \dots & \dots & 1 & \dots \\ a_{N1} & \dots & \dots & 1 \end{bmatrix}$$

The N disturbances are assumed to be uncorrelated.

This model was proposed by Sims (1992) and will be the model used for this thesis. This thesis analyzes demeaned data and thus the constant term c_0 is excluded. Therefore, equation (1) can be rewritten as follows:

(2) $$Ay_t = \Sigma_{j=1}^{p} B_j y_{t-j} + \mu_t,$$

The error term μ_t satisfies E[μ_t] = 0, E[μ_t μ_t'] = Λ, E[μ_t μ_s'] = 0 for s different from t.

To obtain the reduced form vector autoregression (VAR), we multiply each side by A^{-1}:

(3) $$y_t = \Sigma_{j=1}^{p} \delta_j y_{t-j} + \varepsilon_t,$$

where $\delta_j = A^{-1}B_j$ and the vector of reduced-form shocks can be written as:

(4) $$\varepsilon_t = A^{-1}\mu_t.$$

The variance-covariance matrix of the reduced form shock ε_t is:

(5) $$\sum_{\varepsilon} = E[\varepsilon_t\ \varepsilon_t'] = A^{-1}E[\mu_t\mu_t']A^{-1'} = A^{-1}\Lambda A^{-1'} = \Omega\ .$$

Given the VAR in (3) and using (4) we can express a SVAR as:

(6) $$y_t = \Sigma_{j=1}^{p} \delta_j y_{t-j} + A^{-1}\mu_t,$$

3.2.1.1 Identification

The goal to identify structural shocks is to obtain the covariance matrix of ε_t containing $\frac{n(n+1)}{2}$ independent observations to obtain the column of A which will correspond to the structural shock of interest. There are different approaches to identifying these elements. The approach used in this thesis is called recursive causal ordering followed by a *triangular factorization*.

This approach initially consists in placing restrictions on certain parameters for identification. Following Hamilton (1994), A is a matrix of n x n variables, and we restrict A to be lower triangular as follows:

$$A = \begin{bmatrix} 1 & \dots & 0 & 0 \\ \vdots & \ddots & \vdots & \vdots \\ \vdots & \dots & 1 & 0 \\ a_{i1} & \dots & a_{ij} & 1 \end{bmatrix}$$, where *j* goes to *n*-1.

This then implies that A^{-1} is also lower triangular:

$$A^{-1} = \begin{bmatrix} 1 & \dots & 0 & 0 \\ \vdots & \ddots & \vdots & \vdots \\ \vdots & \dots & 1 & 0 \\ -a_{i1} & \dots & -a_{ij} & 1 \end{bmatrix}$$

The SVAR model becomes the recursive model which imposes the restriction that on the variables obtained from the first equation of our matrix, there is no contemporaneous effect from the second. Although, since we suppose that $a_{ij} \neq 0$ we allow a possibility that the first equation has a contemporaneous effect on the variables of the second equation.

We then can identify a_{ij} from the elements of the reduced form variance-covariance matrix Ω. This is done through a closely related factorization obtained from the Cholesky factorization, which is the *triangular factorization.*

(7) $$\Omega = A^{-1}\Lambda A^{-1'}$$

$$\Lambda = \begin{bmatrix} \lambda_1 & \cdots & 0 \\ \vdots & \ddots & \vdots \\ 0 & \cdots & \lambda_j \end{bmatrix},$$

$$\lambda_i \geq 0, \qquad i = 1, \dots, j$$

Recall the SVAR identified (3):

$$y_t = \Sigma_{j=1}^{p} \delta_j y_{t-j} + \varepsilon_t,$$

Recall as well that:

$$\varepsilon_t = A^{-1}\mu_t$$

These structural errors denoted by μ_t have a diagonal covariance matrix Λ.

(8) $$\begin{aligned} E[\mu_t\, \mu_t'] &= AE[\varepsilon_t\, \varepsilon_t']A' \\ &= A\Omega A' \\ &= AA^{-1}\Lambda A^{-1'}A' \\ &= \Lambda \end{aligned}$$

It is important to state that the ordering of the variables in the identification of the SVAR using the triangular factorization can influence the identification. In the analysis depicted above, the ordering of the variables will have an impact because we suppose all upper triangle variables to be equal to 0. However, if we ordered these variables differently, then all the lower variables which are not initially impacted by the shock contemporaneously would now be equal to 0. Therefore, the ordering of the variables determines the recursive causal structure of the SVAR.

To obtain the optimal lag length of the variables, the Akaike information criterion was calculated where log$L$ (log-Likelihood) is a measure of model fit in which the higher the number, the better the fit and is obtained from statistical output. While $p + 1$ is the number of variables in the model (p) plus the intercept:

(9) $$AIC = -2logL + 2(p + 1)$$

The minimization of the *AIC* criterion then allows the selection of a lag structure that leads to a good fit and is parsimonious.

An impulse response is then used to study the effects of shocks on a specific endogenous variable and its effects on all other endogenous variables. The principle of the IRF method is to use the estimated reduced form VAR and assume a shock only to one variable.

To obtain the impulse response from our reduced form VAR, we rewrite equation (3) in the infinite vector-moving average representation of the VAR:

(10) $$y_t = \sum_{i=0}^{\infty} \phi_i \varepsilon_{t-i}$$

where $\phi = \delta$ identified in (3). Using the fact that $\varepsilon_t = A^{-1}\mu_t$, we can write the infinite moving average representation in terms of the structural shocks that enter the SVAR:

(11) $$y_t = \sum_{i=0}^{\infty} \phi_i A^{-1} \mu_t$$

Now consider a structural shock to one variable at time *t*, i.e. assume that μ_t contains one non-zero element, and let $\mu_s = 0$ for any $s \neq t$. The impulse responses to the structural shock are then given by:

$$y_t - \mu = A^{-1}\mu_t$$

$$y_{t+1} - \mu = \phi A^{-1}\mu_t$$

$$y_{t+h} - \mu = \phi_h A^{-1}\mu_t$$

Suppose we use the identified matrix B = A^{-1}:

$$B = \begin{bmatrix} 1 & \cdots & 0 & 0 \\ \vdots & \ddots & \vdots & \vdots \\ \vdots & \cdots & 1 & 0 \\ b_{i1} & \cdots & b_{ij} & 1 \end{bmatrix}$$

The impulse responses are then given by:

$$[y_{1t} - \mu_1] = \begin{bmatrix} 1 & \cdots & 0 & 0 \\ \vdots & \ddots & \vdots & \vdots \\ \vdots & \cdots & 1 & 0 \\ b_{i1} & \cdots & b_{ij} & 1 \end{bmatrix} \begin{bmatrix} 1 \\ \vdots \\ \vdots \\ 0 \end{bmatrix}$$

$$[y_{2t} - \mu_2] = \begin{bmatrix} \phi_{11} & \cdots & \phi_{1j} \\ \vdots & \ddots & \vdots \\ \phi_{i1} & \cdots & \phi_{ij} \end{bmatrix} [y_{1t} - \mu_1] = \begin{bmatrix} \phi_{11} & \cdots & \phi_{1j} \\ \vdots & \ddots & \vdots \\ \phi_{i1} & \cdots & \phi_{ij} \end{bmatrix} \begin{bmatrix} 1 & \cdots & 0 & 0 \\ \vdots & \ddots & \vdots & \vdots \\ \vdots & \cdots & 1 & 0 \\ b_{i1} & \cdots & b_{ij} & 1 \end{bmatrix} \begin{bmatrix} 1 \\ \vdots \\ \vdots \\ 0 \end{bmatrix},$$

Etc.

Thus, we can express the impulse response of variable y_t at horizon *t* + *h* to a shock to ε_t as:

(12) $$\frac{\delta y_{i,t+h}}{\delta \varepsilon_{i,t}} = \phi_{ij}^{h}$$

The IRFs plot ϕ_{ij}^{h}. These plots summarize how unit impulses of the structural shocks at time *t* impact the level of *y* at time *t* + *h* for different values of *h*. We then analyze these plots and the convergence of the overall system.

3.2.1.2 Bootstrap Method

The confidence intervals depicted in the impulse responses from the VAR method within this thesis were calculated by using the bootstrap method. This method was popularized by Bradley Efron in 1979. "Bootstrapping is a resampling procedure that uses data from one sample to generate a sampling distribution by repeatedly taking random samples from the known sample, with replacement" (Pennsylvania State University, 2023). The basis of this method is to perform computations on a sample of data to estimate the variation of point estimates.

In practice, this means that a data sample is obtained from a distribution F. One then statistically calculates the mean u. We then obtain an empirical distribution F* from resampling, which consists in choosing a new sample of the data, which will be of the same size as the original sample. From this new sample, we then calculate the mean once again, which will be denoted by u_1. This will be done multiple times to obtain as many bootstrap samples as desired and then from these samples, we obtain as many ranges of u as samples which we can denote as $u_1, \ldots, u_j$. The Bootstrap principle says that since F* is approximately equal to F, the statistic u is then also approximately equal to the distribution $u_1, \ldots, u_j$. This approximating distribution is then used to set the confidence intervals.

3.2.1.3 Local Projection Estimation Method

The second method to identify impulse responses is through the use of the Local Projection Estimation Method (LP) which was introduced by Jordà (2005). As Jordà states, VARs have four restrictive properties on their implied impulse responses: symmetry, shape invariance, history independence, and multidimensionality. This method addresses this fourth restriction, which is an important problem that can be generated through the IRF by the misspecification of the reduced-form VAR. If the VAR is misspecified, the IRF analysis will compound the specification errors at each horizon. The LP method, on the other hand, does not impose as many restrictions and thus avoids this misspecification. The LP forecasts future values of a variable (impulse responses to a shock) using a horizon-specific regression. This method consists in estimating a separate regression for each horizon. It is important to note that Plagborg-Moller and Wolf (2021) suggest that linear local projections and VARs estimate the same impulse responses. This holds only if the data used in the local projection model is weakly stationary and the lag structures in the two specifications are not restricted, as well as if the sample is long enough. Therefore, the local projection impulse responses for this thesis may diverge from the results obtained in the VAR analysis because of the size of the sample available.

Ramey (2016) explains in detail how Jordà's method works once you have identified the shock d_i. She states that the impulse response of y_i at horizon h can be estimated from the following single regression:

(13) $$y_{i,t+h} = B_{i,h} d_{it} + control\ variable + \zeta_{t+h}$$

where $B_{i,h}$ is the estimate of the impulse response of y_i at horizon h to a shock d_{it}.[4] Ramey explains that the control variables include deterministic terms (constant, time trends), lags of the y_i variable and lags of other variables that are necessary to "mop up" serial correlation and predictability.

According to Jordà (2005) the impulse responses from the local-linear projections model is then simply estimated by:

$$(14) \qquad \widehat{IR}(t, s, d_i) = B_{i,h} d_{it}$$

where d_i represents the shock to the i^{th} element in y_t.. We also assume that d_i is exogenous to the other variables contained in the control variables. We then estimate a separate regression for each variable and then calculate a 68% confidence interval for each element of the impulse response at time s. This confidence interval is estimated by obtaining the variance-covariance matrix $\hat{\Sigma}_L$ of the coefficients $B_{i,h}$ in equation 13 and then constructing the interval as $1 \pm (d_i' \hat{\Sigma}_L d_i)$.

Ramey (2016) states that while this procedure can be better than standard methods, its estimates are less precisely estimated and are sometimes erratic, which makes it a good heuristic check, but as Champagne and Sekkel (2018) state, its flexibility allows the estimation of impulse responses on certain variables that are more difficult to cast within a VAR and, therefore, can have additional benefits.

4 Results

4.1 Analysis of Macroeconomic Variables

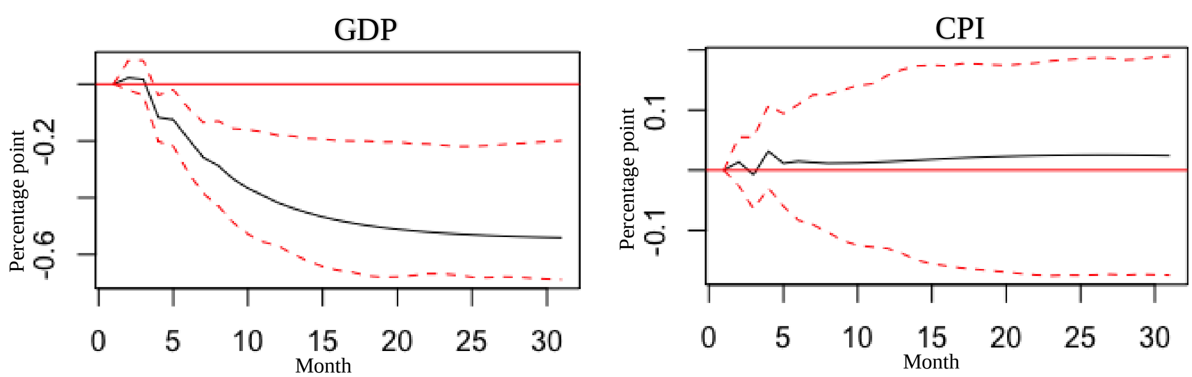
Since the time series for Indigenous communities' unemployment and participation rates is limited, it is necessary to first check how robust the aggregate implications of Champagne and Sekkel (2018) were over a shorter sample period. Towards this end, there was an attempt to initially replicate their results using their own data which spanned from April 1974 to October 2015. They

[4] Withing this thesis the estimate of the impulse response, y_i, represents the first difference in the unemployment rates.

analyzed the impulse responses of two variables, the real gross domestic product (GDP) and Canadian consumer price index (CPI), to their calculated monetary policy shocks. In their analysis, they used the logarithm of the real GDP and CPI and included the logarithm of the Bank of Canada's commodity price index (BPCI) as well as the average bank rate, and the cumulative measure of their estimated monetary policy shock. The cumulative measure consists of the sum of all shocks up until time *t*. In a VAR analysis, the level of the interest rate is usually included, however in the case of Champagne and Sekkel (2018), they replaced this variable with the cumulative shock because the interest rate is related to current and past shocks. That is, the current shock is what directly affects the interest rate at time *t*, while there is an assumption of history-dependence of past shocks (i.e., the interest rate at time *t* depends on the value of the interest rate at time *t*-1). In other words, the shock at time *t*-1 affected the level of interest rate at time *t*-1 and since the level of interest rate at time *t* depends on the level of interest rate at time *t*-1, it, in turn, depends on the shock at time *t*-1.

A VAR is estimated where the variables are ordered real GDP, CPI, BCPI, and the cumulative monetary policy shock. The impulse responses are then identified using a recursive identification as outlined in section 3.2.1.1. The estimated impulse responses to a monetary policy shock, including 65% confidence intervals, are depicted in Figure 3 below.

Figure 3: Macroeconomic VAR impulse responses[5]



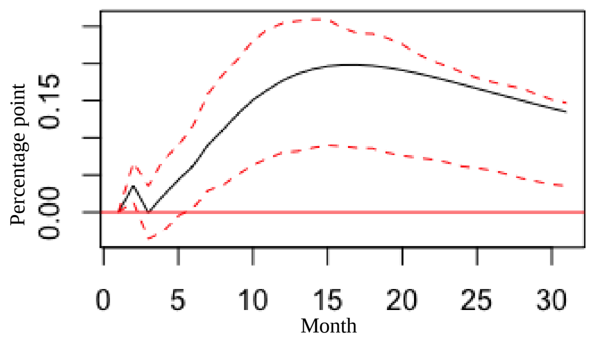
[5] Impulse responses to a 100 basis-point contractionary monetary shock with a horizon of 30 months using a VAR analysis with 68% confidence intervals and a bootstrap of 2000 which made the responses similar to Champagne and Sekkel (2018). The VAR includes log real GDP, log CPI, log BCPI and the measure of monetary policy shocks. Sample: 1974:M4 to 2015:M10. We use 4 lags for each variable.

The results obtained from our estimates depicted in Figure 3 are consistent with Champagne and Sekkel's (2018) findings. The results of a decrease in real GDP after a contractionary monetary policy shock are in line with macroeconomic theory. This is because the policy is typically done to curb inflation and stabilize the economy. Increasing the interest rate, leads to a reduction in consumer and business spending, as borrowing becomes more expensive and less accessible. This can, in turn, lead to a decrease in GDP as is perceived in Figure 3.

When looking at the results obtained for the CPI variable in Figure 3, various factors can explain the fact that its response is non-significant. The impact of monetary policy on the economy can take time to materialize. It may take several months for businesses and consumers to adjust their behaviour in response to changes in interest rates or credit availability. Another reason is that prices are often "sticky" in the short term, meaning that they do not adjust immediately to changes in supply or demand. This is because businesses often have existing contracts with suppliers or customers or may even be reluctant to change prices frequently for fear of alienating customers, especially in a competitive market. Another possibility is if the consumers and businesses expect the contractionary monetary policy to be temporary, they may not adjust their behaviour or prices significantly. These could all be factors explaining why the price level variable takes multiple months before becoming significant.

When adding the unemployment rate variable into equation 3 (the order becomes log real GDP, log CPI, log BCPI, unemployment rate, and the measure of monetary policy shocks), we are able to perceive the general response of this variable to the shocks calculated by the authors as shown in Figure 4. The response of the variable becomes significant only after the 5^{th} month. It is somewhat stable in the first 4 months and then begins to increase rapidly by 0.2% in the following 11 months. After reaching its peak at the 15^{th} month, it begins decreasing slowly the following 15 months. Thus, the results suggest there is an effect on the overall unemployment rate, and in the next section we will begin the main analysis of looking for differential effects.

Figure 4: Effects of monetary policy shocks on unemployment rate[6]

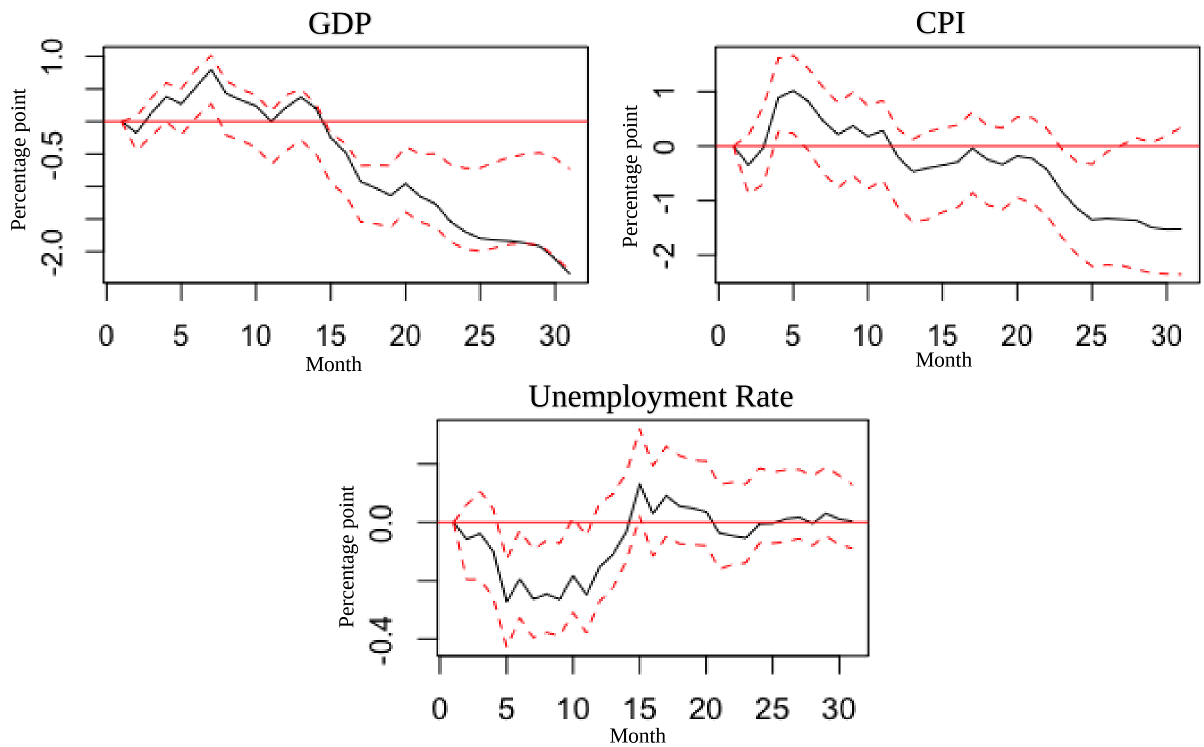


Given the shorter data availability for Indigenous unemployment rates, it is also relevant to look at the aggregate responses for a smaller sample of Champagne and Sekkel's (2018) data. Specifically, we considered the case where the time series started in January 2008, which is the same starting date as the data set used for this thesis, and ran until the sample end, which was October 2015. This particular analysis is relevant because it permits one to see how a short sample influences the results. The results are depicted in Figure 5 and demonstrate that the size of the sample has a direct effect on the results of the impulse response of variables. The figure shows that when looking at a shorter sample, the CPI is much less stable. It initially dips by 0.1% before rising to 1% after 5 months. It then slowly begins decreasing and reaches -0.4% on the 13th month at which point it stabilizes for 10 months before dropping again to -1% by the 25th month and continues dropping, but at a much slower rate afterwards. Another important point is that like the results of the CPI variable in Figure 3, the results for the CPI in Figure 5 are mostly non-significant as well. The results for the real GDP in Figure 5 react differently in the initial months compared to the results of the real GDP with a longer time period. When looking at Figure 5 it initially increases to 1% by the 7th month after which it begins decreasing constantly and reaches -2% by the 30th month. Unlike in Figure 3, the real GDP response is initially non-significant and only becomes significant after 15th months, after which it stays significant for the horizon analyzed. The

[6] Impulse responses to a 100 basis-point contractionary monetary shock with a horizon of 30 months using a VAR analysis with 68% confidence intervals. The VAR includes log real GDP, log CPI, log BCPI, the unemployment rate, and the measure of monetary policy shocks. Sample: 1974:M4 to 2015:M10. We use 4 lags for each variable. "Changes in monetary regimes and the identification of monetary policy shocks: Narrative evidence from Canada," by J. Champagne and R. Sekkel, 2018, Journal of Monetary Economics, 99, p. 72-87. Copyright 2018 by Elsevier B.V.

variable that had the greatest difference between the larger sample and the smaller sample is the unemployment rate variable. Unlike its response in Figure 4, the unemployment rate response decreases to -0.2% in the first 5 months when looking at a smaller sample size. It then stabilizes itself for 6 months before increasing rapidly to 0.2% in the following 4 months to then stabilize itself back to its neutral state around the 20th month.

Figure 5: Champagne and Sekkel reproduction using a smaller sample[7]



The response of the variables in the smaller sample exhibits a price puzzle. This anomaly in the theoretical expectations of monetary policy changes was first discovered by Sims (1992) and labelled 'the price puzzle' by Eichenbaum (1992). A price puzzle simply denotes that an increase in the policy rate, which should lead to lower inflation, actually results in an estimate of

[7] Impulse responses to a 100 basis-point contractionary monetary shock with a horizon of 30 months using a VAR analysis with 68% confidence intervals. The VAR includes log real GDP, log CPI, log BCPI, the unemployment rate, and the measure of monetary policy shocks. Sample: 2008:M1 to 2015:M10. We use 11 lags for each variable.

higher inflation. Sims states that there is a presence of a price puzzle because central banks have more information about possible future inflation than what can be adequately captured by a VAR.[8] The notion of a price puzzle is relevant to the unemployment rate because of its theoretical relationship with inflation. Inflation and unemployment have an inverse correlation. Simply put, as inflation rises, unemployment drops. With this notion, a contractionary monetary policy shock increases interest rates which should lead to a decrease in the inflation rate and therefore an increase in the unemployment rate. However, as the price puzzle denotes, a contractionary monetary policy shock has a temporary adverse effect in which the interest rate and inflation rates increase, and thus, a further extension of this puzzle could be the finding that the unemployment rate decreases. Champagne and Sekkel (2018) also mention that when analyzing their results without taking into account the 1-year break in the Bank of Canada's monetary policy, which consisted in the implementation of their inflation-targeting regime, they identified a price puzzle. However, this price puzzle disappeared when taking into account this break in the analysis of their data (which is over a longer sample than the results of Figure 5). These results are important to keep in mind within the analysis of this thesis because the size of the sample is also very short and therefore the effects of the sample size could have implications for the results.

4.3. Effect of the Monetary Policy on Unemployment Rates

4.3.1 Structural Vector Auto-regression

In this section, the results for the main analysis are presented, namely the estimated responses of the year-on-year unemployment rate differences of Indigenous communities, First Nations off-reserve and Métis, and non-Indigenous communities to the cumulated monetary policy shocks. Given the data constraints previously discussed, the results are for the sample January 2008 to December 2017. The benchmark model contains four variables: Y_t = [non-Indigenous

[8] The estimation used in this thesis is slightly different from the original estimation offered by Sims in that it follows from a first-stage estimation to directly identify the monetary policy shocks. This discussion is nonetheless relevant as Champagne and Sekkel's (2018) method to identify monetary policy shocks does not control for inflation expectations. We further note that Champagne and Sekkel do not obtain significant inflation effects in the short-run.

unemployment rate, Métis unemployment rate, First Nations off-reserve unemployment rate, summated monetary policy shocks]. The cumulative monetary shock variable was placed last in the model because of the assumption that it would have a lagged effect on the other three variables and, in addition, because monetary policy is thought to respond to other shocks within the period.[9] A lag length of 5 was obtained from equation 9 and included in further analysis and a forecast horizon of 30 months was used. Introducing these variables within equation 3 permits the obtention of the coefficients depicted in Table 1.

Table 1: Matrix A obtained from the VAR analysis (equation 3) done using non-Indigenous, Métis, First Nations off-reserve unemployment rates, and monetary shock variables [10]

	NI_Unemployment	M_Unemployment	FNOR_Unemployment	Monetary_Shocks
NI_Unemployment	1.00000	0.00000	0.00000	0
M_Unemployment	0.22356	1.00000	0.00000	0
FNOR_Unemployment	-0.07801	0.13960	1.00000	0
Monetary_Shocks	0.02544	-0.02982	0.04041	1

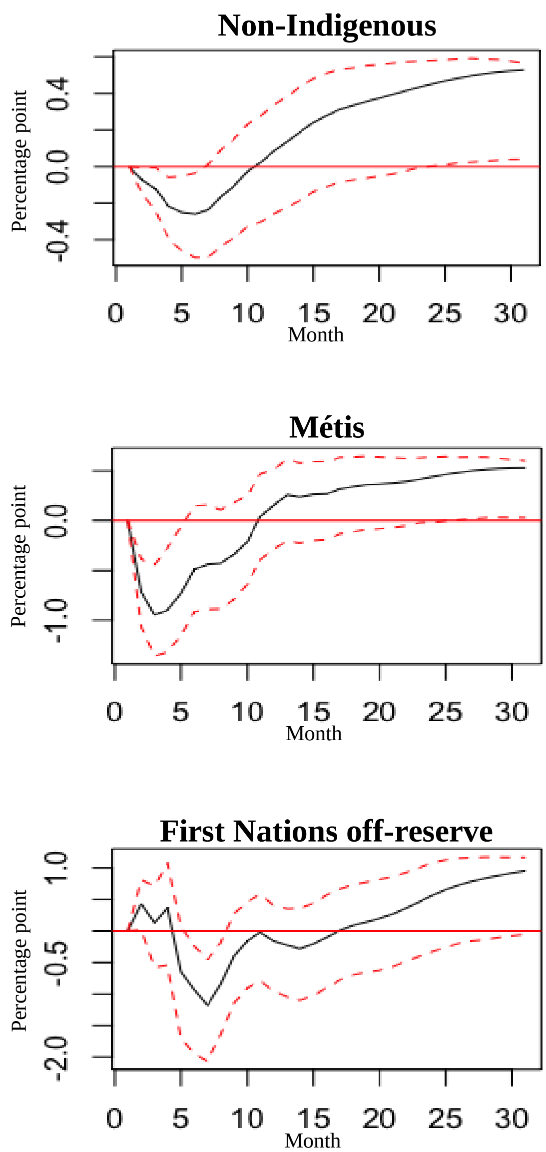
We then introduce these variables in equation 11 which will permit us to obtain the different impulse responses for each variable over a horizon of 30 months which will be represented as shown in equation 12. Figure 6 depicts the impulse responses of each variable to a 100-basis point contractionary monetary policy shock with a 68% confidence band.[11] As one can see, all three variables respond strongly to the contractionary shock. However, the effect over time varies between communities. The non-Indigenous year-on-year unemployment rate difference shows no initial response to the contractionary shock because of the Cholesky ordering but it falls after the first month. The variable's response falls by 0.2% in the first 5 months at which point it then stabilizes for 3 months and begins increasing for the remaining months, ending 0.5% higher

[9] The analysis was also attempted with a different ordering of the non-Indigenous and Indigenous variables. This different ordering consisted in placing the First Nations off-reserve variable before the Métis and another ordering was attempted with the Non-Indigenous variable placed after the two Indigenous variables. However, as depicted in Appendix Figure 1 and Appendix Figure 2, the impulse response results did not change significantly and thus the initial ordering of the variables was kept throughout the analysis of this thesis.
[10] Variables are non-Indigenous (NI), Métis (M), First Nations off-reserve (FNOR).
[11] Most variables are non-significant when the confidence bands were raised to a 95% level, which could be partly due to the short sample. For this reason, we use the confidence bands at 68%.

after a year and a half than its non-shocked state. The Métis community's response initially falls drastically by 1.0% in 4 months, much more than the non-Indigenous response. The response then begins increasing rapidly for 8 months at which point it begins stabilizing at a 0.5% increase in the year-on-year unemployment rate difference like the non-Indigenous stabilized response. The last variable, the First Nations off-reserve year-on-year unemployment rate difference, stays stable for the first 5 months and then falls rapidly in 3 months to a decrease of 1.0%. The following three months see a rapid increase of 1.0% in the year-on-year unemployment rate difference, to then stabilize itself for 5 months. After 15 months, the year-on-year unemployment rate difference response for the First Nations off-reserve slowly begins increasing, ending after 30 months at an increase of 1.0% of its non-shocked state, slightly higher than the other two variables. When the impulse response function is analyzed with a further horizon as depicted in Appendix Figure 3, we can state that the stabilization of this variable happens after 32 months and is 1.0% higher than the initial year-on-year unemployment rate difference.

When looking at Figure 6, another difference between the variables is noticeable: the periods at which the results are considered significant. While the non-Indigenous and Métis responses are significant from the start, they lose significance at different times. The non-Indigenous response stays significant longer and only becomes insignificant around the 8^{th} month, while the Métis response becomes insignificant at the 5^{th} month. Both responses, however, become significant again around the 25^{th} month. Relative to the other two year-on-year unemployment rate differences, the First Nations' off-reserve response is extremely different. It is initially insignificant and only becomes significant after the 5^{th} month and only for 4 months. It then stays insignificant until the 30^{th} month.

Figure 6: Unemployment rate VAR impulse responses[12]



4.3.2 Local Projection Estimation Method

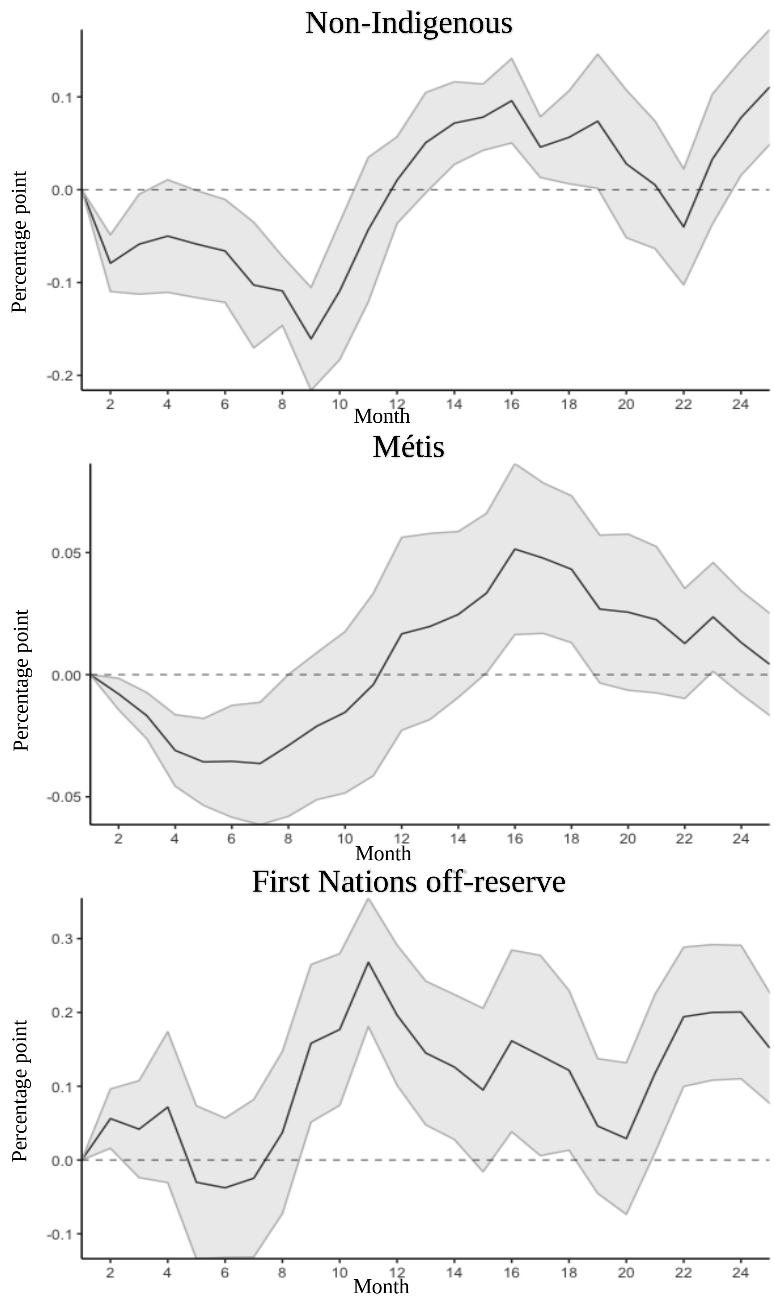
In their article, Champagne and Sekkel (2018) noted that single regression methods, such as Jordà's (2005) local projections, have become more popular for studying the impact of

[12] Impulse responses to a 100 basis-point contractionary monetary shock with a horizon of 30 months using a VAR analysis with 68% confidence intervals. The VAR model includes (monthly) non-Indigenous, Métis, and First Nations off-reserve unemployment rates, and the cumulative monetary policy shocks. We use 5 lags for each variable.

economic shocks, especially monetary policy shocks. They explained that the adaptable nature of local projections makes it possible to also evaluate the influence of monetary policy shocks on other macroeconomic factors, including the unemployment rate variables, which is the reason why this method is also considered in this thesis. Specifically, we estimate equation 13. The outcome variable of equation 13 (y) is the different year-on-year unemployment rate differences, and d_i is our measure of monetary policy shocks. We use the monetary policy shocks directly in the local projections, as opposed to the cumulated shocks used in the previous VAR analysis, as the LP method estimates directly the response to the monetary shock and therefore uses the level of the shock (Champagne and Sekkel (2018) also used this specification to estimate the aggregate unemployment response).

Figure 7 shows the impulse responses to a 100-basis-point contractionary monetary policy shock using the Local Projection Estimation method. The general trends for all three year-on-year unemployment rate differences are similar to the ones obtained from the VAR analysis. The non-Indigenous impulse response depicted in Figure 7 initially has no response to the contractionary shock, but then falls by 0.4% in the first 4 months. After the first 7 months the response begins slowly increasing by 1% during the following 9 months but does not stabilize itself afterwards. After 16 months, the response slowly begins decreasing to its initial state by the 24^{th} month.

Figure 7: Single equation approach[13]



[13] Impulse response to a 100-basis-point contractionary monetary policy shock using local projections model with a 68% confidence interval and a 25-month horizon. The local projections model includes (monthly) non-Indigenous, Métis, First Nations off-reserve unemployment rates, and monetary policy shocks. We use 5 lags for each variable.

When looking at the Métis community's response to a 100-basis-point contractionary monetary policy shock, Figure 7 shows no initial difference compared to the VAR results. The response decreases slowly by a little more than 0.1% during the first 2 months. Then it stabilizes for 4 months and falls by a further 0.1% over the next 3 months to then begin increasing rapidly by 0.3% in 7 months. It then stabilizes itself after the 18th month around an increased year-on-year unemployment rate difference of 0.05%.

The only variable which has a change in its impulse response when looking at the Local Projection Estimation model is the First Nations off-reserve year-on-year unemployment rate difference response. There is no initial response like the other variables but there is a slight increase of 0.05% in the first 2 months. It then stabilizes for the next two months before falling by 0.1% starting on the 4th month for only 1 month. The response then stabilizes itself once more for the following two months before increasing rapidly by 0.35% for 5 months. It then slowly decreases and stabilizes itself at an increased year-on-year unemployment rate difference of 0.1% starting on the 12th month.

For a comparison, we also estimated the LP impulse response for the year-on-year aggregate unemployment rate difference. The response is depicted in Appendix Figure 4, and although the initial response is similar, as it begins by decreasing, the response for the year-on-year aggregate unemployment rate difference differs between the other responses because it never reaches 0 and stabilizes around a decrease of 0.025%. This could denote a lack of sufficient control variables which could affect the response.

4.4 Remarks

Although the figures obtained from the Local Projection Estimation Method are not exact replicas of the VAR responses, the general shape of the responses are nonetheless consistent. In both methods, there is an initial fall in the year-on-year unemployment rate differences, which is consistent with Champagne and Sekkel's (2018) findings of the presence of a price puzzle. This is perceived in Figures 6 & 7 up until the first 5 or 8 months depending on the definition of unemployment. However, it is also consistent with the fact that a small sample size was analyzed and gives similar results as the replication of Champagne and Sekkel's data using a small sample size depicted in Figure 5.

We further test for a price puzzle by estimating the response of the inflation rate using the Local Projection Estimation method (equation 13). Inflation data was calculated using the Canadian Consumer Price Index available through Statistics Canada. The results, depicted in Appendix Figure 5, confirm the presence of a price puzzle. This suggests that the initial decreasing reaction of the year-on-year unemployment rate differences could be part of a larger empirical puzzle related to the price puzzle.

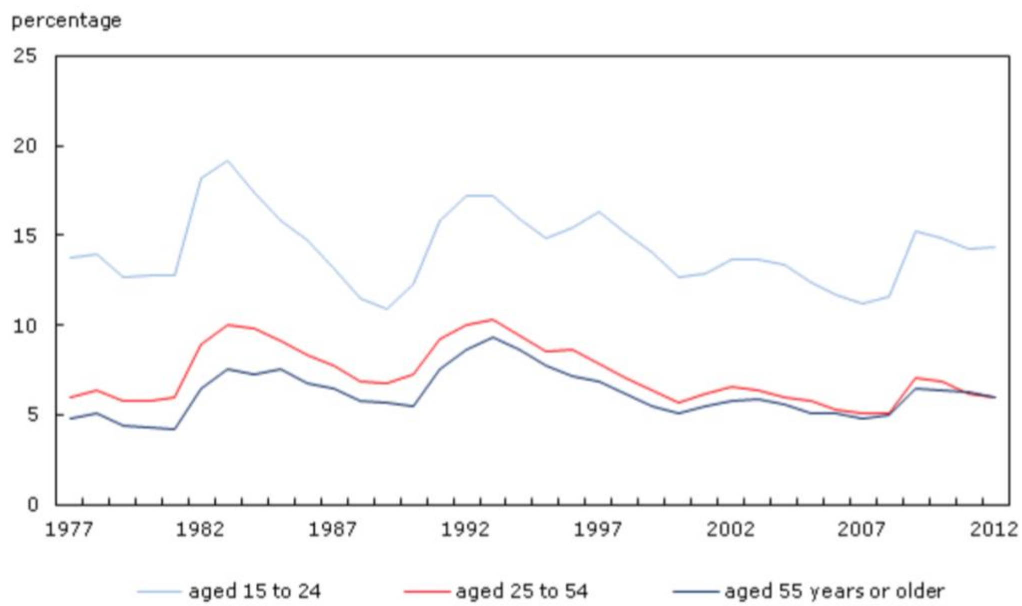
The only difference found between the responses of the different year-on-year unemployment rate differences is the delay of the year-on-year unemployment rate difference response in the First Nations off-reserve community compared to the other two variables. Unlike the response to the contractionary shock of the other two variables, the First Nations off-reserve response is initially insignificant for the first 5 months after which it becomes significant once more. In contrast, the responses of the other two variables are immediately significant and show the presence of a price/unemployment puzzle (henceforth, short-term puzzle) in the first 5 months.

However, although the rates of all three variables show the presence of a short-term puzzle, they do readjust and increase as macroeconomic theory would suggest. This is because a contractionary monetary policy shock aims to reduce inflation and stabilize the economy by increasing interest rates and making it more expensive to borrow. This affects two spheres of society: the consumers and businesses. Both of their spending capabilities decrease which then leads to a decrease in overall economic activity and potentially higher unemployment rates, as the decrease in spending leads businesses to decrease their production or investment which leads to a reduction in demand for workers and, at times, the layoff of workers. Additionally, as borrowing becomes more expensive, businesses are less likely to take on new projects or expand their operations, further reducing the demand for labour, which makes it more difficult for unemployed workers to find new employment opportunities. These outcomes lead to a theoretical increase in the unemployment rates. This is what is perceived after the first 5 to 8 months depending on the variable in the estimated impulse responses. However, the significance of the increase in all unemployment rates is short lived, and it is not until they have stabilized multiple months later that this significance reappears. The moment at which this happens is also the other difference between the three variables. While the non-Indigenous response becomes significant again around the 23rd month, the Métis response only becomes significant around the 25th month and the First Nations off-reserve response only becomes significant much later around the 32nd month. We turn now to a discussion of what could account for these differences.

Theory states that all three variables should react in a similar qualitative fashion to the shocks, and although all three do have the presence of a short-term price puzzle, their reaction over time is still different. While the Métis and the non-Indigenous communities' responses are significant in the first 5 months, the First Nations off-reserve community's response only becomes significant starting in the 5th month. The First Nations' off-reserve response is somewhat stable for the first 5 months before dropping quickly. Thus, other factors which are not considered in the VAR are affecting their year-on-year unemployment rate differences' response.

One of these factors could potentially be the average age group of each of the communities. The Canadian census showed that in 2016, young people made up a larger proportion of the Indigenous population than in the non-Indigenous population. In 2016, those aged 15 to 24 made up 17.5% of the First Nations population and 16% of the Métis population, while it was only 12.0% of the non-Indigenous population (Anderson, 2021). This difference in average age between the different communities had a direct impact on the average unemployment rates between them as well because data also showed that this same age group, 15 to 24, had a higher unemployment rate than any other age group, as depicted in Figure 8. A study by Leahy and Thaper (2019), which analyzed the relationship between monetary policy shocks and the employment levels of different age groups, discovered a different response depending on the proportion of each age group found within a certain population. This study found that monetary tightening has a weaker negative effect on individuals aged between 20-39, while it has a stronger impact on individuals aged between 40-64 years old. They explain that the reason for this difference in response is due to the type of employment between both age groups. The authors explain that middle-aged individuals amplify the effects of monetary policy because they are more likely to be entrepreneurs. The authors analyzed the response of small business employment to a monetary policy shock and found that it responds in a similar fashion as middle-aged individuals. They state that these effects are perceived through the aggregate and not the individual. In other words, what matters is the age composition of the community. Thus, because the Indigenous communities have a larger proportion of younger individuals that make up their population, the overall effectiveness of the monetary policy shocks should be dampened compared to the non-Indigenous community's response. Thus, this might explain the overall delayed reaction found in the two Indigenous responses compared to the non-Indigenous response. However, the fact that the year-on-year unemployment rate difference of the First Nations off-reserve increases by 1% once it has stabilized after the shock while the Métis year-on-year unemployment rate difference response is in line with the non-Indigenous response is contrary to this idea.

Figure 8: Unemployment rate by age[14]



[14] Sample: 1977 to 2012. Reprinted from Statistics Canada, CANSIM table 282-0002, Retrieved May 3, 2023, from https://www150.statcan.gc.ca/n1/pub/11-626-x/2013024/c-g/c-g01-eng.htm. Copyright 2015 Statistics Canada.

What could explain the difference between the results of this thesis and the study done by Leahy and Thaper (2019) is the type of employment that Indigenous individuals tend to have. Statistics Canada states that the main type of employment for Indigenous people is health care and social assistance, retail trade, public administration jobs, construction, and accommodation and food services. The U.S. Bureau of Labor Statistics Producer Price Index and certain studies (Bennani, 2022; Leahy and Thaper, 2019) show that some of these industries tend to be types of employments which are more affected by interest rates and could explain the reason for a greater response to a contractionary shock. However, as the type of jobs which employ Indigenous people are similar across Indigenous groups, the average age group and type of employment would not explain the difference between the First Nations' off-reserve and the Métis's responses.

A factor that was found to delay the effects of a monetary policy shock is the geographical emplacement of these communities. Trovato et al. (2011) found that the geographical isolation of individuals impacted their overall well-being and was an additional barrier to their possible employment. The 2017 Aboriginal Peoples Survey confirmed this concept by stating that the most commonly reported barrier to employment by all Indigenous groups was the shortage of jobs. This has a direct impact on the manageability of the unemployment rates of these communities by the Bank of Canada because these types of situations require aid from other institutions such as the Canadian government or financial institutions on its territory to resolve this type of issue. Alesia et al. (2017) confirmed this information and stated that 46% of Indigenous peoples lived in rural remote regions in Canada and that this affected their socioeconomic opportunities. Although they did not separate between First Nations and Métis, their data did state that 45% of First Nations lived in rural remote regions. These studies demonstrate that although the effects of a monetary policy change do affect the unemployment rates, other factors such as isolation or the lack of job opportunities will affect the effectiveness of these policies for certain communities and can also be further reasons for the differences in the responses to monetary policy shocks. While an increase in interest rates will lead to higher borrowing costs for businesses and consumers, it will eventually lead to the layoffs of employees, and it can also lead to the closing of businesses in isolated locations to cut back on the overall costs businesses have. Therefore, when the unemployment rates eventually readjust to this initial monetary policy shock, if the quantity of jobs available before this shock are not present in the geographical location of these communities after the shock, the individuals are incapable of obtaining employment and therefore, the unemployment rate never truly readjusts to its previous levels. The geographical location of the Indigenous communities could explain the lag in the impulse responses between the three variables because of the time difference it would take for the shocks to have an effect in these communities compared to the urban population, but further study on the subject would need to be undertaken to confirm this.

One factor which could also help explain the different responses is the educational level of each community. Education levels differ not only between the non-Indigenous and Indigenous communities, but also between each particular Indigenous community. The 2016 Census of Population done by Statistics Canada showed that throughout the ten provinces and the three territories, the Indigenous community's educational attainment was consistently lower than the non-Indigenous community as depicted in Figure 9. The 2017 Aboriginal Peoples Survey done by Statistics Canada went further into breaking down this disparity by obtaining the difference between the Métis community's education attainment and the First Nations off-reserve attainment. Table 2 shows that while 46% of the Métis community completed a postsecondary certificate diploma or degree in 2016, only 40% did so in the First Nations off-reserve community. It is also important to look at the share of the community which has less than a high school diploma. In this situation as well, the First Nations off-reserve is the community which has the lowest educational attainment. The share of their population with less than a high school diploma was 32% compared to 25% for the Métis community.

Figure 9: Educational attainment of Indigenous and non-Indigenous peoples by province and territory, 2016[15]

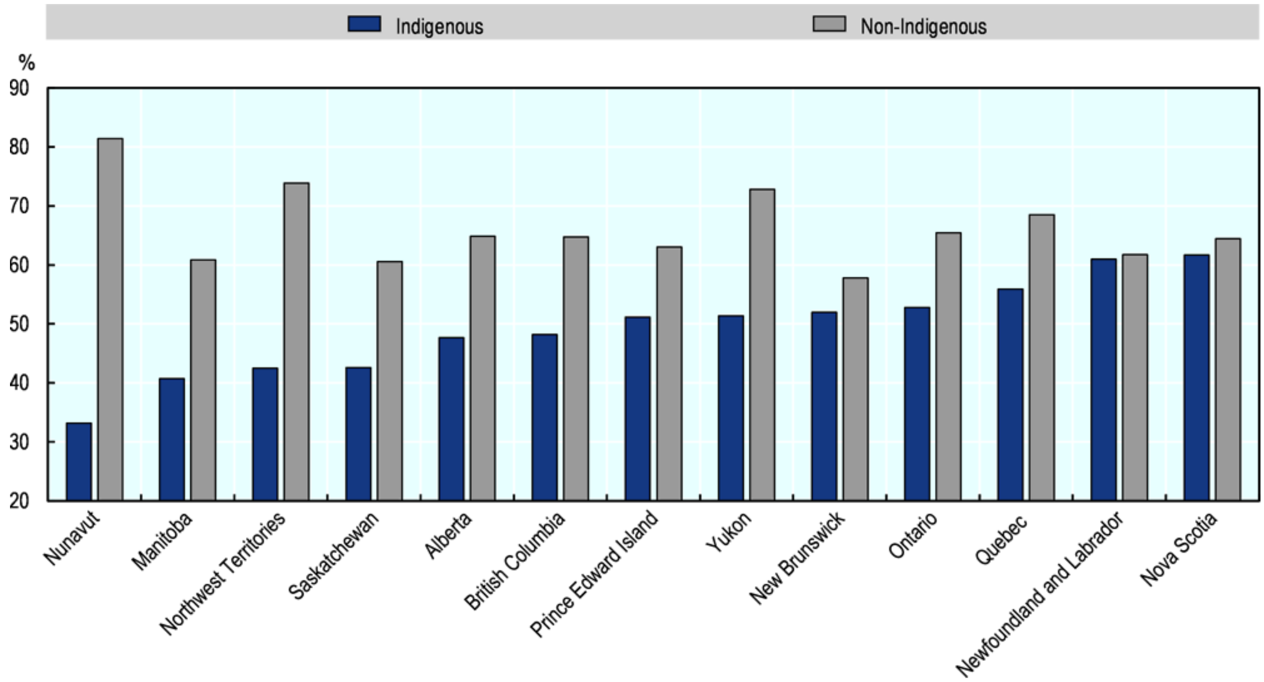


Table 2: Share of Indigenous peoples by group and highest educational attainment level, 2016[16]

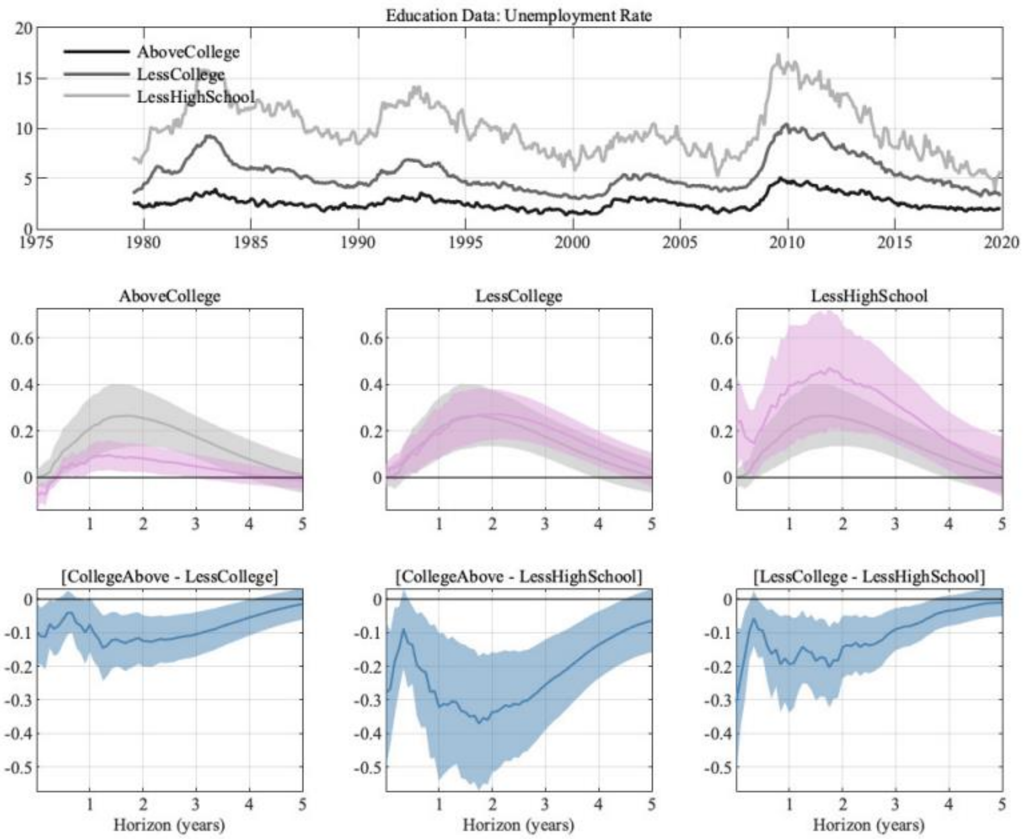
Persons ages 15 and over				
	% completion postsecondary certificate diploma or degree 2016	% completion postsecondary certificate diploma or degree 2006	% less than a high school diploma 2016	% less than a high school diploma 2006
Métis	46	40	25	34
First Nations (off reserve)	40	36	32	40
Inuit	29	26	52	61

The effect a monetary policy shock has on individuals with different educational levels was analyzed by Amir-Ahmadi et al. (2022). Their findings demonstrate a clear link between the effects

[15] Educational attainment rate refers to individuals aged 15 years and over with at least secondary education completed. *Source*: Statistics Canada, (2016[10]), *2016 Census of Population*.
[16] *Statistics Canada (2018[29]), Labour Market Experiences of Métis: Key Findings from the 2017 Aboriginal Peoples Survey*, https://www150.statcan.gc.ca/n1/pub/89-653-x/89-653-x2018002-eng.htm.

of monetary policy shocks and individuals' unemployment based on their educational levels. Figure 10 shows that the less education an individual has obtained, the more severe the reaction to a monetary policy shock will be. The gray line shows the aggregated unemployment rate response to a monetary policy shock while the pink shaded areas are the group-specific responses. This demonstrates that the more educated an individual is, the less sensitive their unemployment rate responses will be to a monetary shock. Gastwirth and Haber's (1976) findings also identified that minorities have greater difficulty in obtaining employment because of the lack of job opportunities in their geographical emplacement and the lack of skills necessary to obtain these jobs. Schembri (2022) also confirmed that this barrier was a hindrance to the Indigenous community in general. Although these studies did not look into the relationship between education, unemployment rates, and monetary policy shocks, they do look at the direct correlation between education levels and unemployment rates. This relationship has a direct impact on the effectiveness of monetary policy shocks, and similar to the previous elements mentioned, will require other institutions to work with the Bank of Canada to change this particular situation. Thus, with the previous notion that First Nations off-reserve individuals tend to live in rural areas, and they are statistically less probable of obtaining a post-secondary diploma and more probable of not obtaining a high school diploma as well, this could possibly explain the presence of a lag in the response to monetary policy shocks found in this community but not in the Métis community. However, since the Amir-Ahmadi et al.'s (2022) study only analyzed the severity of the response of individuals with different educational attainments to a monetary policy shock, further analysis would be necessary to confirm if this variable could also cause a lagged response between different communities to a monetary policy shock.

Figure 10: Response for different education levels[17]



5 Conclusion

In recent years, there has been a growing interest in understanding the differential impact of macroeconomic policies on various communities, particularly those that are historically disadvantaged. The Truth and Reconciliation Commission of Canada provided to the Canadian institutions recommended objectives of economic reconciliation to permit the restoration of prosperity within the Canadian Indigenous economy. One method to advance this prosperity is through the Bank of Canada's monetary policies. In this essay, we have analyzed the effects of a

[17] Impulse response of the unemployment rates of individuals with different educational attainement to a monetary policy shock. Error bands are 68% significance bands are computed using the delta method. Adapted from "What Does Monetary Policy Do To Different People?," by P. Amir-Ahmadi, C. Matthes, and M.-C. Wang, 2022, *Copyright 2022* P. Amir-Ahmadi, C. Matthes, and M.-C. Wang.

contractionary monetary policy shock on non-Indigenous, Métis, and First Nations off-reserve communities in Canada using a VAR analysis and a linear Local Projection Estimation Method.

Our analysis reveals that the effects of a contractionary monetary policy shock on non-Indigenous and the various Indigenous communities are not uniform. Specifically, we find that the shock has a greater long-term negative impact on First Nations off-reserve communities compared to non-Indigenous and Métis communities. Our analysis depicts an increase after 30 months of 1% in the First Nations off-reserve year-on-year unemployment rate difference after a contractionary shock compared to 0.5% for the non-Indigenous and Métis communities. We also found that the First Nations off-reserve had a 5-month delayed reaction to the shock compared to the other two communities which reacted immediately. Our findings are consistent with the existing literature, which suggests that First Nations off-reserve communities are more vulnerable to economic shocks due to their relatively lower educational attainments, types of employment, and geographical location.

It is worth noting that our analysis has several limitations that need to be addressed in future research. First, our analysis is based on a small sample, and it is unclear if the data becomes more or less significant with a larger dataset. Second, our analysis is based on data from Canada, and it is unclear whether our findings generalize to other countries. Third, our analysis does not take into account the potential spillover effects of the shock on other sectors of the economy, which could have important implications for both communities. Fourth, another important factor which could be analyzed further is the unemployment rate response between male/female individuals within the Indigenous communities compared to the non-Indigenous community. Despite these limitations, the differential impact of the contractionary monetary policy shock on non-Indigenous and Indigenous communities highlights the need for policymakers to take into account the heterogeneity of the Indigenous population when designing macroeconomic policies. Failure to do so can result in unintended consequences that exacerbate existing inequalities.

One potential policy response to the differential impact of the contractionary monetary policy shock would be to implicate other governmental institutions. In certain cases, the Canadian government could implement targeted fiscal policies that are designed to mitigate the negative impact on Indigenous communities. For example, policymakers could increase funding for programs that support Indigenous entrepreneurship and provide access to credit. Another potential response is to implement policies that are designed to increase the resilience of Indigenous communities to economic shocks. This could include investments in education and training programs that increase the human capital of Indigenous communities and make them more competitive in the labour market.

6 References

Abell, J. D. (1991). Distributional Effects of Monetary and Fiscal Policy: Impacts on Unemployment Rates Disaggregated by Race and Gender. *The American Journal of Economics and Sociology*, *50*(3), 269–284.

Aboriginal Peoples Survey. (2017). Statistics Canada. https://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&SDDS=3250

Alasia, A., Bédard, F., Bélanger, J., Guimond, E., & Penney, C. (2017). *Measuring remoteness and accessibility: A set of indices for Canadian communities* (No. 18-001–X). Statistics Canada.

Amir-Ahmadi, P., Matthes, C., & Wang, M.-C. (2022). *What Does Monetary Policy Do To Different People?*

Anderson, T. (2021). *Chapter 4: Indigenous Youth in Canada* (42-28-0001; Portrait of Youth in Canada: Data Report). Statistics Canada.

Bartscher, A. K., Kuhn, M., Schularick, M., & Wachtel, P. (2021). *Monetary Policy and Racial Inequality* (Staff Reports No. 959). Federal Reserve Bank of New York.

Bennani, H. (2023). Effect of monetary policy shocks on the racial unemployment rates in the US. *Economic Systems*, *47*(1).

Census of Population. (2016). Statistics Canada. http://dx.doi.org/10.1787/888933723967

Champagne, J., & Sekkel, R. (2018). Changes in monetary regimes and the identification of monetary policy shocks: Narrative evidence from Canada. *Journal of Monetary Economics*, *99*.

Chetty, R., Hendren, N., Jones, M. R., & Porter, S. R. (2020). Race and Economic Opportunity in the United States: An Intergenerational Perspective. *The Quarterly Journal of Economics*, *135*(2), 711–783.

Efron, B. (1979). Bootstrap Methods: Another Look at the Jackknife. *The Annals of Statistics*, *7*(1), 1–26.

Eichenbaum, M. (1992). Comments 'Interpreting the macroeconomic time series facts: The effects of monetary policy' by Christopher Sims. *European Economic Review*, *36*(5), 1001–1011.

Gastwirth, J. L., & Haber, S. E. (1976). Defining the labor market for equal employment standards. *Monthly Labor Review*, *99*(3), 32–36.

Gordon, C., & White, J. P. (2014). Indigenous Educational Attainment in Canada. *International Indigenous Policy Journal*, *5*(3).

Greider, W. (1987). *Secrets of the Temple*. Simon and Schuster Inc.

Hamilton, J. D. (1994). *Time Series Analysis*. Princeton University Press.

Jordà, Ò. (2005). Estimation and Inference of Impulse Responses by Local Projections. *The American Economic Review*, *95*(1), 161/182.

Leahy, J. V., & Thapar, A. (2019). *Demographic Effects on the Impact of Monetary Policy* (No. 26324; NBER Working Paper Series). National Bureau of Economic Research.

Lee, M., Macaluso, C., & Schwartzman, F. (2021). *Minority Unemployent, Inflation, and Monetary Policy* [Technical report]. Federal Reserve Bank of Richmond.

Nakajima, M. (2021). *Monetary Policy with Racial Inequality* [Technical report]. Federal Reserve Bank of Philadelphia.

Pennsylvania State University. (2023). *Introduction to Bootstrapping*. Elementary Statistics.

Plagborg-Moller, M., & Wolf, C. K. (2021). Local Projections and VARs Estimate the Same Impulse Responses. *Econometrica*, *89*(2), 955–980.

Primiceri, G. E. (2005). Time Varying Structural Vector Autoregressions and Monetary Policy. *The Review of Economic Studies*, *72*(3), 821–852.

Ramey, V. A. (2016). Chapter 2—Macroeconomic Shocks and Their Propagation. In *Handbook of Macroeconomics* (Vol. 2A, pp. 71–162). Elsevier. https://doi.org/10.1016/bs.hesmac.2016.03.003

Romer, C. D., & Romer, D. H. (2004). A New Measure of Monetary Shocks: Derivation and Implications. *American Economic Review*, *94*(4), 1055–1084.

Sanchez, G. R., Maxim, R., & Foxworth, R. (2021, November 10). The monthly jobs report ignores Native Americans. How are they faring economically? *The Avenue - Brookings*. https://www.brookings.edu/blog/the-avenue/2021/11/10/the-monthly-jobs-report-ignores-native-americans-how-are-they-faring-economically/#:~:text=Nearly%20a%20third%20(29%25),other%20racial%20and%20ethnic%20minorities.

Schembri, L. (2022, May 5). *Economic reconciliation: Supporting a return to Indigenous prosperity*. National Aboriginal Capital Corporations Association, Gatineau, Québec.

Sims, C. A. (1992). Interpreting the macroeconomic time series facts: The effects of moentary policy. *European Economic Review*, *36*(5), 975–1011.

Statistics Canada. (n.d.). *Table 14-10-0401-01 Labour force characteristics by detailed Indigenous group, three-month moving averages, monthly, unadjusted for seasonality* [Data set]. https://doi.org/10.25318/1410040101-eng

Stock, J. H., & Watson, M. W. (2001). Vector Autoregressions. *Journal of Economic Perspectives*, *15*(4), 101–115.

The U.S. Bureau of Labor Statistics. (2022). *Producer Price Index*. https://www.bls.gov/ppi/

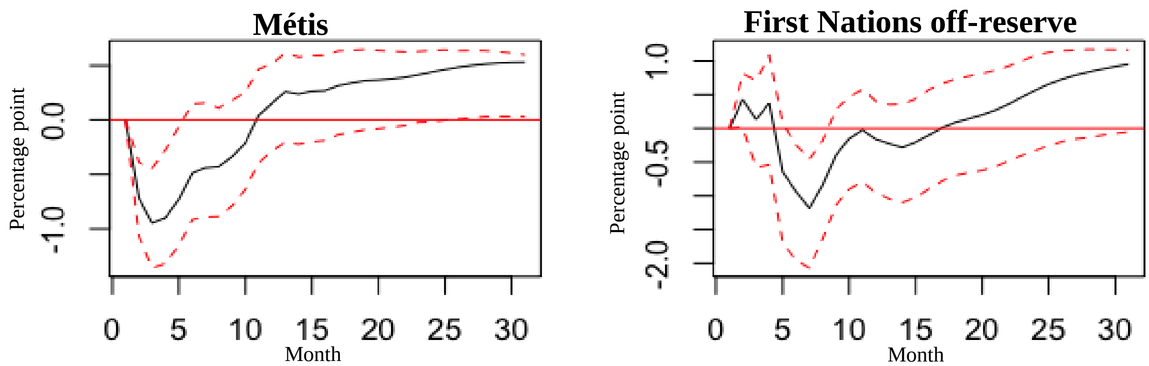
Trovato, F., Pedersen, A.-M., Price, J. A., & Lang, C. (2011). Economic Conditions of Indigenous Peoples in Canada. In *The Canadian Encyclopedia*.

Zavodny, M., & Zha, T. (2000). Monetary Policy and Racial Unemployment Rates. *Economic Review*, *85*(Q4), 1–16.

7 Appendix

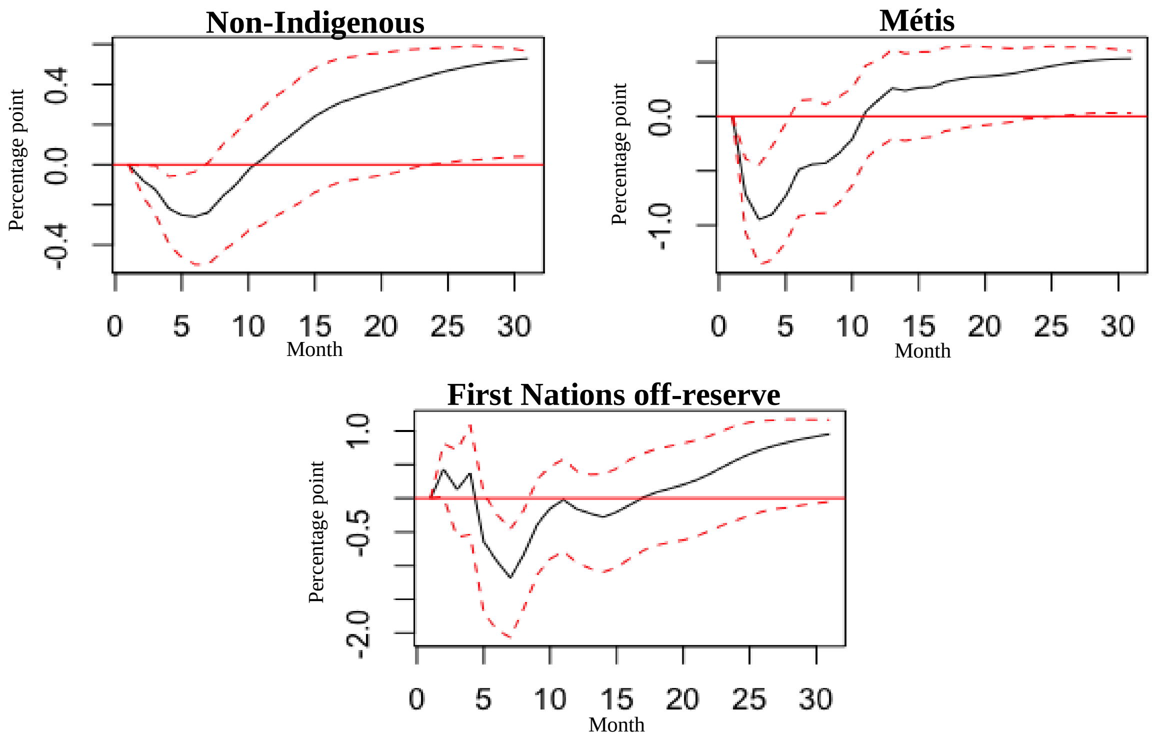
7.1 Figures

Appendix Figure 1: Alternate ordering of Métis and First Nations off-reserve variables[18]

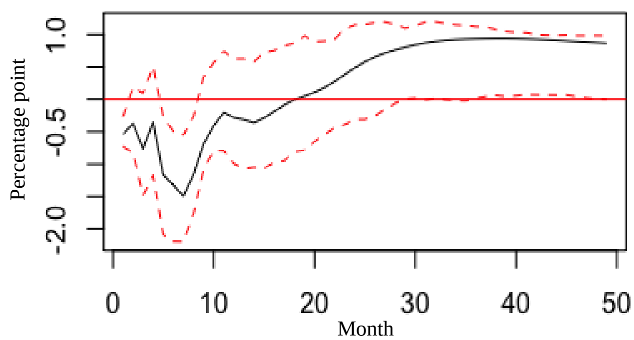


[18] Impulse responses to a 100 basis-point contractionary monetary shock with a horizon of 30 months using a VAR analysis with 68% confidence intervals. The VAR model includes (monthly) non-Indigenous, First Nations off-reserve, and Métis unemployment rates, and the cumulative monetary policy shocks. We use 5 lags for each variable.

Appendix Figure 2: Alternate ordering of the non-Indigenous variable[19]



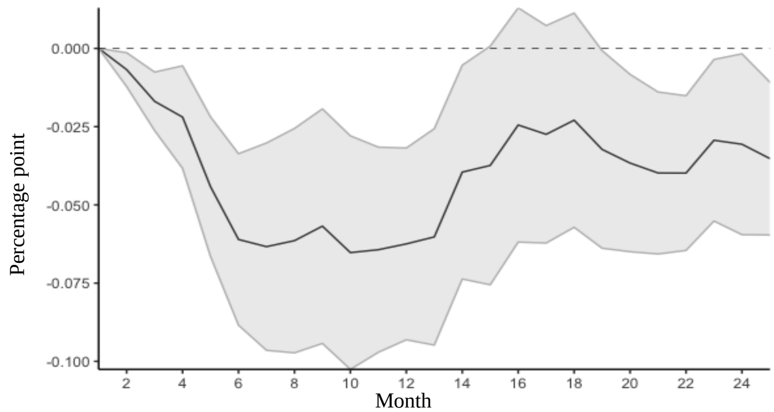
Appendix Figure 3: First Nations off-reserve unemployment rate[20]



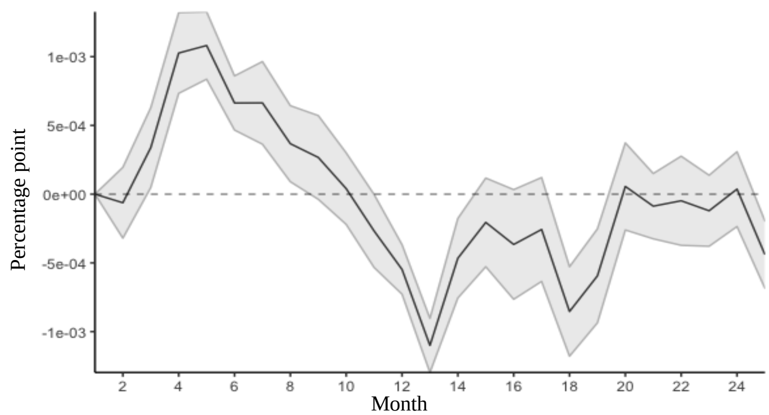
[19] Impulse responses to a 100 basis-point contractionary monetary shock with a horizon of 30 months using a VAR analysis with 68% confidence intervals. The VAR model includes (monthly) Métis, First Nations off-reserve, and non-Indigenous unemployment rates, and the cumulative monetary policy shocks. We use 5 lags for each variable.

[20] Impulse response to a 100 basis-point contractionary monetary shock with a horizon of 35 months using a VAR analysis with 68% confidence intervals. The VAR model includes (monthly) cumulative monetary policy shocks, non-Indigenous, Métis, and First Nations off-reserve unemployment rates. We use 5 lags for each variable.

Appendix Figure 4: Single Equation Aggregate Unemployment[21]



Appendix Figure 5: Single Equation Inflation Rate[22]



[21] Impulse response to a 100-basis-point contractionary monetary policy shock using local projections model with a 68% confidence interval and a 25-month horizon. The local projections model includes (monthly) the aggregate Canadian unemployment rate and the monetary policy shocks. We use 9 lags for each variable.

[22] Impulse response to a 100-basis-point contractionary monetary policy shock using local projections model with a 68% confidence interval and a 25-month horizon. The local projections model includes (monthly) non-Indigenous, Métis, First Nations off-reserve unemployment rates, inflation rate, and monetary policy shocks. We use 4 lags for each variable.

7.2 Manipulated Data

The data used to replicate Champagne and Sekkel's (2018) data consisted of the monthly Canadian real GDP, CPI, BPCI, and average bank rate which were all obtained in the author's supplementary data and were originally obtained by the authors from the Bank of Canada. The log of each of the original variables on real GDP, CPI, and BPCI were taken when trying to replicate the authors' results and the average bank rate was calculated by taking the average of the bank rate throughout the specific month and doing the same for every following month.

The data used in the data set throughout this thesis contained the aggregate unemployment rate and the unemployment rates of non-Indigenous, Métis, and First Nations off-reserve communities obtained from Statistics Canada's Labour Force Survey, monetary policy shocks obtained from Champagne and Sekkel (2018), and the inflation rate was obtained from calculations using the Canadian price index obtained from Statistics Canada. The manipulations undergone on some variables are mentioned below:

- Aggregate unemployment rate: seasonality was removed through differencing;
- Non-Indigenous unemployment rate: seasonality was removed through differencing;
- Métis unemployment rate: seasonality was removed through differencing;
- First Nations off-reserve unemployment rate: seasonality was removed through differencing;
- Monetary policy shocks: the shocks were a cumulated measure for the data set used in the VAR method and were left unmanipulated for the LP method.