The Unpromising Future of Quebec's Monetary Sovereignty: A Structural Vector Autoregressive Analysis and a Labour Mobility Approach

Grégoire Maillard

August 2022

Abstract

On October 30th, 1995, Quebec held a referendum for independence, during which 49.42% of the Quebecois voters expressed their desires for the independence of the province. However, the question of Quebec's monetary sovereignty has never been decisively answered, even among the sovereigntist movement. Thus, this study aims to determine if Quebec would be more thriving with its own currency or if it should continue to use the Canadian Dollar in the context of independence. Two mainstays of the theory of optimum currency areas are investigated. Despite a relative lack of benefits from labour mobility, a SVAR approach shows that Quebec is facing symmetric shocks with the other Canadian provinces. This study therefore determines that the Canadian dollar is the best option for Quebec.

Keywords: Optimum Currency Area, Quebec, SVAR, Interprovincial Labour Mobility

1 Introduction

"Remain within Canada, it is to renounce in the participation of the elaboration of our destiny"[1] wrote Jacques Parizeau, the premier of Quebec from 1994 to 1996. An independent Quebec left to its own fate is probably what most of the sovereigntist leaders daydreamed about on the dawn of the 1995 independence referendum. On October 30th, residents of Quebec were called to vote in what may have been the most important referendum of their province: to decide whether Quebec should become sovereign or not. 4,757,509 people voted, and the Parti Québécois, representing the sovereigntist camp, lost its battle by a margin of 54,288 votes. Afterwards, commentators enumerated various reasons to explain the defeat of the sovereigntists' camp; among them, the blurred vision of what the economy of an independent Quebec would look like and the fear of not using the Canadian dollar as a national currency anymore (Grady 1992). Regarding this latter point, the Parti Québécois, the main sovereigntist party of the province, has not been consistent. At the time of the referendum, most political leaders remained vague on the question of a Quebecois currency, whereas some internal notes encouraged the adoption of a provincial currency (Proulx 1995) (Lasonde 1995). On the other hand, some later leaders, such as Pauline Marois, premier of Quebec from 2012 to 2014, declared that an independent Quebec should keep the Canadian dollar as a national currency (Robillard 2014). Alternatively, Bernard Landy, premier of Quebec from 2001 to 2003, campaigned to abandon the Canadian dollar in favor of the American dollar.

This divergence of opinions on the monetary debate makes sense, as no clear answer can be established due to the various and unknown exogenous factors that would determine the success or failure of the different scenarios (Montmarquette 1979). Being part of a monetary union, as in sharing a common exchange rate and sometimes a same currency, involves advantages and disadvantages for all the members of the union. Benefits of sharing a common currency can be summarized with the following mechanisms: a reduction in transaction costs (including information costs), the elimination of currency risk, and a decrease in the ability of speculators to disrupt the conduct of monetary policies (Tavlas 1993). Meanwhile, important socio-economic costs can also be induced through monetary integration. The biggest sacrifice is the loss of monetary independence, implying a loss of flexibility (Krugman 2013). Individual members of the union cannot decide for itself the level of inflation, and are thus unable to decrease the short-run unemployment level if needed or

1. Translated by the author from the following quote: "Rester dans le Canada, c'est cela qui est un repli sur soi-même. C'est renoncer à participer à l'élaboration de son propre destin." (Parizeau 2009)

take advantage of changing the level of the exchange rate to benefit from a more advantageous net exports level. Thus, Quebec is only taking advantage of the Canadian dollar if the net benefits of being part of this monetary union are positive.

A geographical area where the benefits overtake the costs is called an optimum currency area (OCA), a concept developed by Robert Mundell in the early 1960s and since continuously studied and elaborated by economists around the world. Considering Quebec's special features with regard to its history and its linguistic differences in contrast to the other Canadian provinces, I wonder if it is beneficial for Quebec to share a common currency with the rest of Canada. It brings me to the following research question:

Should Quebec seek monetary sovereignty? In other words, does it make sense for an independent Quebec to use the Canadian dollar, or would it be better off having its own currency?

To answer this question, I explore if Quebec can be considered as a member of an OCA. To do so, I investigate two of the main criteria developed by most economists on OCAs. First, I determine if Quebec is facing symmetric or asymmetric shocks with the other Canadian provinces. To do so, I perform a structural vector autoregressive model of macroeconomic variables for each Canadian province, observe the resulting impulse response functions for each province, and compute the level of correlation between them. Second, I make observations regarding the level of interprovincial migrations and observe if the labour mobility criterion is respected by applying Eichengreen's migration model (1993). Finally, advantages and disadvantages from accepting its status-quo or acquiring monetary sovereignty are weighed to sketch what would be the most desirable future for Quebec's economic interests.

This paper aims to contribute to the literature on monetary integration by studying a geographical area for which there is a lack of research and by covering two criteria from the theory of optimum currency areas when, usually, the empirical literature would limit itself to only one. Furthermore, conclusions drawn from this study could support possible political decisions with statistical evidence if the question of Quebec's independence were to be asked again.

The rest of this study is organized as follows: Section 2 explains the theory of the optimum currency areas and provides a literature review on its empirical applications; Section 3 presents the first criterion regarding the symmetry of shocks; Section 4 examines the second criterion concerning labour mobility; Section 5 adds comments to the discussion and covers briefly other OCA criteria; finally, Section 6 concludes the paper by reviewing my findings and determining the most desirable political decision regarding Quebec's monetary sovereignty.

2 Literature Review

In this section, I explain the various facets of the theory of Optimum Currency Areas (OCAs) by gathering different seminal papers that shaped this concept over time. I then review the literature regarding its various empirical applications.

2.1 Theory

Robert Mundell (1961) introduced the concept of OCAs by giving a non-exhaustive list of characteristics a geographical region should have so that having a single central bank and a common currency, or a fixed exchange rate system, would be considered optimal. In his work, Mundell demonstrated that a country with "sticky" wages and a low mobility of its factors of production needed to be able to adjust its economy through the appreciation or the depreciation of its currency to restore external competitiveness after its economy is disturbed, and so needed a flexible exchange rate (Tavlas 1993). On the other hand, a country with flexible wages and factors of production with high mobility would not need a flexible exchange rate and would thus benefit from taking part in a monetary union. Additionally, Mundell emphasized the potential harm caused by monetary integration if some required characteristics were not met. More specifically, countries which do not share symmetrical shocks cannot form an OCA because they would need different monetary policies, which is not possible when sharing a common currency, thus inducing severe costs among members.

The two following decades saw the completion of the theory by different authors who provided theoretical papers on the costs and benefits of monetary integration. Not long after Mundell's paper, Ronald McKinnon (1963) added to the theory on OCA the concept of openness of the economy. More precisely, McKinnon argues that an economy which tends to be more open will experience better price stability and improved external balance. Peter Kenen (1969) elaborated further, asserting

that diversification, in terms of production and consumer preferences, is a key factor to the success of a monetary union. According to him, a more diversified economy relies less on exchange rate adjustment to address external imbalance. Thus, an increase in production diversification would lead to an increase in monetary integration benefits. Additionally, other economists suggested different key characteristics for which the relevancy varies depending on the context. Among them, a greater financial integration (Ingram 1962), the establishment of fiscal integration (Kenen 1969), and a lower and more similar level of inflation (Fleming 1971) can be some of the conditions for a group of countries to achieve higher benefits from monetary integration. Furthermore, countries sharing a common currency gain from an increase in microeconomic efficiency and from an increase in macroeconomic stability, and thus in credibility (Emerson, Gros, and Italianer 1992).

Even though most of the seminal papers on OCAs emphasized the benefits induced from sharing a common currency, contributions in the 1970s recalled the various costs implied by monetary integration. Max Corden (1972) showed that losing national monetary sovereignty creates significant costs due to the state's inability to react to a decline in exports by unilaterally devaluing its currency. Corden specifically highlighted the necessity for the different members of an OCA to experience symmetrical shocks in order to fully benefit from monetary integration. Additionally, Yoshihide Ishiyama (1975) pointed out that different social preferences regarding wages and inflation can outweigh the benefits of a monetary union.

The practical interest in OCAs specifically arose in the mid-1980s when the idea of an Economic and Monetary Union (EMU) in Europe started to become a major question across the continent. However, the literature at the time was mostly, if not only, theoretical and no clear answer could be derived from it. This led to a new wave of studies which mainly focused on empirical applications.

2.2 Empirical applications

The numerous criteria that determine the desirability of sharing a common currency and the uniqueness of each situation makes it challenging to test all of them, and thus explains the absence of a universal OCA index more than sixty years after the theory's introduction. Consequently, most of the empirical literature focuses on the measurement of the symmetry of shocks and on the degree of labour mobility between the members of an existing or a potential monetary union. Therefore, this paper focuses its statistical analysis on these two criteria.

Relative to the measurement and the assessment of the symmetry of shocks across countries, Blanchard and Quah (1988) were the first to specify a structural vector autoregressive (SVAR) model in order to break down the measurement of disturbances into two categories: supply disturbances, which have a permanent effect on output, and demand disturbances, which have a temporary effect on output. This paper had a significant influence on the subsequent literature because, in comparison to previous papers using vector autoregressive (VAR) models, SVAR models, by identifying transitory and permanent shocks, allow economical interpretations of the results and avoid spurious interpretations (Bruneau and De Bandt 1998). Afterwards, Bayoumi and Eichengreen (Bayoumi and Eichengreen 1997) used a variant of the methodology from Blanchard and Quah to study the degree of symmetry, and asymmetry, of supply and demand shocks between multiple countries who aspired to share a common currency in Europe. Since then, this methodology has been the most applied in the monetary integration literature. Even though most of the first studies concerned the future of an EMU, the relatively simple reproduction of the methodology allowed scholars to study other geographic regions, such as Sub-Saharan Africa (Bayoumi and Ostry 1997), West Africa (Harvey and Cushing 2015), Eastern and Southern Africa (Buigut and Valev 2006), East Asia (Ling 2001), South Asia (Gauchan and Sarin 2018), and other members of the MERCOSUR (Eichengreen 1998).

Despite the significant number of empirical studies produced in the last decades, only a few papers have studied the concept of OCAs for North America. Notably, a study from the Federal Reserve Bank of Chicago observed the business cycles between different regions in the United States (US) composed by different group of states given their geographical locations and economic coherence (Kouparitsas 1999). Using a SVAR approach, the results demonstrated that all of the different American regions are experiencing highly correlated business cycles due to similar sources of shocks, suggesting that the US is satisfying this major OCA criterion. Few studies have been published regarding Canada. Among them, the Bank of Canada published a review of the literature on OCAs (Lafrance and St-Amant 1999). In this paper, different measurements relative to OCA criteria were performed, such as the correlation of supply shocks between different sets of provinces across Canada, presenting a relative strong correlation between supply shocks in the US and in Canada at a later period. A more recent study from Chaban and Voss (2016) used a method which assesses the predictability of regional inflation rates at medium term horizons to quantify the costs arising from monetary policies in terms of inflation. The study showed that, besides Alberta, Canadian provinces

do not experience significant costs from regional inflation due to common monetary policy. Finally, only one study regarding Quebec's membership in an OCA has been conducted (Price 1995). The author used a multivariate cointegration and a vector error-correction model (VECM) to determine if the use of the Canadian dollar was the best currency for the province at a time when the 1995 independence referendum was imminent. Since then, no study has been conducted with more recent data nor with a different statistical approach.

Nevertheless, the SVAR approach has been criticized by different scholars. For example, Tavlas (1994) contrasted the positive comments from most of the literature and underlined some limits of the method, such as its inability to account for future changes in the structure of the economy. Tavlas also explained that the validity of the results relies on the identifying assumptions that are made, which cause spurious results in the case of invalid premises. In response, alternative methodologies have been developed but remain uncommon. For instance, Artis and Zhang (2002) investigated the degree of homogeneity within multiple countries using a cluster analysis, and Enders and Hum (1994) suggested the generalized-purchasing power parity model, which is based on the convergence of key indicators.

The literature on labour mobility in the determination of an OCA offers different methods. Lafrance and St-Armant (1999) gathered multiple methodologies from the empirical literature. The existing literature usually limits itself to qualitative analysis, comparisons of descriptive statistics, and ordinary least squares regressions. For example, Eichengreen (1993) used a linear regression model to assess the correlation between regional and national unemployment, real exchange rate, and real price of energy, allowing him to look at the intensity of responsiveness from intranational migration to regional market disturbances. This regression model is a variant of previous models used in the past, such as Pissarides and McMaster's (1990) concerning the United Kingdom (UK) and Schioppa's (1991) concerning Italy. Through his study, Eichengreen was able to assert that the migration in response to regional market disturbances is greater in the US than in the United Kingdom and Italy, and was thus able to compare the degree of labour mobility between different regions within different countries. More recent studies have used contemporary econometric tools, but, despite dealing with labour mobility, end by computing slightly different results than a degree of labour mobility. For example, Obstfeld and Peri (1998) use a VAR approach in order to observe the impact of regional shocks in the European and the American labour markets. Results from the

study give the speed of recovery following shocks between the different regions of study, and allow us to observe the impact of labour mobility on the speed of adjustment. However, this kind of model assumes a full adjustment over time and fails to predict long-term responses and innovations.

Consequently, this present study intends to update the literature on monetary integration regarding Quebec by using recent data and by providing new approaches from what has been done previously.

3 First Criterion: Symmetry of Shocks

In this section, I investigate if Quebec is facing symmetric or asymmetric shocks with the other Canadian provinces by using a SVAR approach. Resulting outcomes allow me to observe if this major OCA criterion is respected.

3.1 Intuition

According to the theory established by Mundell (1961), Canadian provinces must face positively correlated macroeconomic shocks in order to constitute an OCA. If this criterion is not respected, provinces would need different monetary policies in order to address their individual shocks. However, this would be impossible if they continue to share the same central bank, thus possibly incurring significant costs.

3.2 Methodology

To investigate the degree of symmetry or asymmetry towards shocks, this section uses the SVAR approach developed by Blanchard and Quah (1988) to identify supply and demand disturbances on macroeconomic variables, and a methodology popularized by Bayoumi and Eichengreen (1992) to measure the correlation of the disturbances between different members of a monetary union. To apply this procedure, I follow the steps described by Bruneau and De Brandt (1998) to avoid bias and to produce relevant results.

First, I need to determine which macroeconomic variables to include in the model. In the literature, the two relevant macroeconomic variables usually chosen are the real gross domestic product (GDP) and the consumer price index (CPI). I would usually consider the CPI a relevant indicator

because it may reflect different preferences regarding inflation or different monetary policies within a group of countries. However, in the case of this study, all the provinces share the same central bank, implying that they all shared the same monetary policies for most of their history, meaning their CPIs are likely overly correlated. In order to avoid any bias in my study, the two variables that I chose are real GDP and the unemployment rate, similar to Blanchard and Quah's (1988) seminal paper. More variables could be incorporated in the model, but it would increase the amount of estimation error in the model without increasing its predictive power. Selected variables are ranked from the most exogenous to the most endogenous. Knowing that I consider real GDP and unemployment rate, I make the following assumptions: both variables can be affected by demand and supply shocks, and demand shocks have no long-run effect on the growth of real GDP. These assumptions will be helpful when applying long-run restrictions to the model.

I can now construct my different SVAR models. For every Canadian province, I consider a vector ΔX_t to be made up of the growth in real GDP Δy_t and the change in the unemployment rate Δu_t. Time-series are transformed in order to respect the stationarity properties by computing the log-difference for all of them. To ensure stationarity, I perform Augmented Dickey-Fuller (ADF) tests to reject the null hypothesis of the presence of unit root for every time-series. The values of the tests are available in Appendix B. I can now express a vector of the form:

$$\Delta X_t = A(L)\epsilon_t \tag{1}$$

or,

$$\begin{bmatrix} \Delta y_t \\ \Delta u_t \end{bmatrix} = \begin{bmatrix} a_{11}(L) & a_{12}(L) \\ a_{21}(L) & a_{22}(L) \end{bmatrix} \begin{bmatrix} \epsilon_{s,t} \\ \epsilon_{d,t} \end{bmatrix} \tag{2}$$

where $a_{ij}(L)$ are polynomials which display the effects of the disturbances on the growth of real GDP and on the change of the unemployment rate over time, forming the matrix A with a number L of lag(s). ϵ_t is a vector of serially uncorrelated demand and supply disturbances. The number of lags for each SVAR model is determined using a Akaike Information Criterion test. For every province, the optimum number of lags is two.

Using stationary time-series variables allows me to apply a long-run constraint. The long-run constraint of each SVAR model is expressed by the matrix C as follows:

$$C = \begin{bmatrix} . & 0 \\ . & . \end{bmatrix} \tag{3}$$

This constraint means, as assumed previously, that demand shocks have no long-term effect on the growth of real GDP. I now consider that the model is correctly identified. SVAR models are estimated, and impulse response functions (IRF) for the two different sources of disturbances are produced. IRFs are composed of two series of shocks for each province. From these series, I can pair every Canadian province with each other and compute coefficients of correlation for each pair and for each shock. The correlation matrices allow me to have an overview of the symmetry and asymmetry of shocks between Quebec and the other Canadian provinces. If Quebec has positive and statistically significant coefficients of correlation with the other provinces, it will suggest that the *Belle Province* is part of an OCA and that monetary sovereignty would not be the most desirable scenario.

3.3 Data

In this section, I use annual data for the ten Canadian provinces covering the period from 1985 to 2020, the most recent year available. The measure of real GDP and of unemployment rate for each Canadian province have respectively been extracted from Table 36-10-0222-01 (2022) and Table 14-10-0023-01 (2022) made available by Statistics Canada. Descriptive statistics and plots of these variables can be found in Appendix C and Appendix D.

3.4 Results

Table 1 and Table 2 respectively report the correlation matrices of supply and demand disturbances from the results generated by the IRFs. The graphical representations of the IRFs can be found in Appendix E. A Pearson correlation statistic is performed and is displayed within the matrices by asterisks in order to assess a certain level of confidence for every result. In comparison to demand shocks, supply shocks are considered to be more permanent (Ling 2001). Consequently, the first correlation matrix can be considered more noteworthy than the second one.

Table 1: Correlation Matrix of Supply Shocks Generated by IRFs.

Provinces	AB	BC	MB	NB	NL	NS	ON	PEI	QC	SK
AB	-									
BC	0.989**	-								
MB	0.851**	0.877**	-							
NB	0.709**	0.636**	0.547**	-						
NL	0.708**	0.638**	0.685**	0.577**	-					
NS	0.978**	0.969**	0.889**	0.758**	0.726**	-				
ON	0.964**	0.960**	0.831**	0.794**	0.596**	0.961**	-			
PEI	0.907**	0.904**	0.936**	0.720**	0.784**	0.959**	0.894**	-		
QC	0.976**	0.980**	0.882**	0.586**	0.720**	0.956**	0.915**	0.898**	-	
SK	0.907**	0.889**	0.815**	0.550**	0.828**	0.886**	0.817**	0.860**	0.939**	-

Note: Symbols * and ** denote statistical significance at the 5% and 1% levels, respectively. The list of province abbreviations can be found in Appendix A.

Table 2: Correlation Matrix of Demand Shocks Generated by IRFs.

Provinces	AB	BC	MB	NB	NL	NS	ON	PEI	QC	SK
AB	-									
BC	0.965**	-								
MB	0.540**	0.643**	-							
NB	0.987**	0.985**	0.613**	-						
NL	0.977**	0.975**	0.579**	0.981**	-					
NS	0.987**	0.924**	0.501*	0.957**	0.957**	-				
ON	0.920**	0.909**	0.672**	0.921**	0.927**	0.931**	-			
PEI	0.853**	0.947**	0.792**	0.901**	0.893**	0.804**	0.887**	-		
QC	0.999**	0.972**	0.545**	0.991**	0.977**	0.981**	0.915**	0.860**	-	
SK	0.958**	0.997**	0.675**	0.980**	0.971**	0.921**	0.929**	0.963**	0.962**	-

Note: Symbols * and ** denote statistical significance at the 5% and 1% levels, respectively. The list of province abbreviations can be found in Appendix A.

Overall, one can notice that, for both sources of disturbances, the ten Canadian provinces are highly positively correlated with each other, meaning they react to disturbances symmetrically. The important levels of correlation in comparison to what can usually be found in the literature can be explained by the geographical proximity of the provinces and by the already existing high level of economic, monetary, and political integration among them. In respect to Table 1, we can see that Newfoundland and Labrador seems to be the province that is the most different from the other ones, which can be explained by significant differences in the structure of its economy. Indeed, descriptive statistics show that this province had and still has a relatively high unemployment rate. In respect to Table 2, Manitoba is the province that reacts the least symmetrically with the other provinces to demand shocks. However, for both kind of shocks, Quebec faces highly symmetrical shocks with the other Canadian provinces. Thus, Quebec is respecting this first major OCA criterion.

4 Second Criterion: Labour Mobility

In this section, I investigate the degree of labour mobility in Quebec in comparison to other Canadian provinces by adapting the migration model used by Eichengreen (1993) and by providing qualitative observations. Resulting outcomes allow me to observe if Quebec is respecting this other major OCA's criterion.

Out of the 10 Canadian provinces, 4 provinces count for more than 86% of Canada's total population: Ontario (38.8%), Quebec, (22.5%). British-Columbia (13.6%), and Alberta (11.6%) (Statistics Canada 2021a). In order to produce legible graphs and to consider provinces for which the degree of labour mobility is consequential, I will only consider these four major provinces in the rest of this section.

4.1 Intuition

The degree of labour mobility within an OCA is at the heart of the theory developed by Mundell (1961). When an area faces asymmetric shocks, the sub-areas reallocate their factors of production across the OCA in order to attenuate negative shocks for some regions while fully taking advantage of the positive disturbances in the other sub-areas. Consequently, the existence of this mechanism reduces the need to adjust the exchange rate (Mongelli 2002). For instance, some disturbances can cause an increase in the economic activity for a region while increasing the unemployment rate for

another, so the reallocation of unemployed workers would be mutually beneficial for the two regions, resulting as an increase in the overall welfare. Therefore, the higher the degree of labour mobility, the less OCA members need to adjust their exchange rates, and thus can favorably share a common currency (Tavlas 1993).

4.2 Observation

In most of the literature on labour mobility, scholars observe that the US enjoys a high labour mobility and can be considered an OCA (Bonin and Eichhorst 2008) while the labour mobility within the Eurozone is much lower and its success as an OCA is sometimes disputed. Canada's labour mobility is often considered to be lower than that of the US, but higher than Europe's (Krugman 2013). Consequently, and only in respect to this criterion, the Canadian dollar can be considered as more efficient for the Canadian provinces than the Euro for the members of the Eurozone.

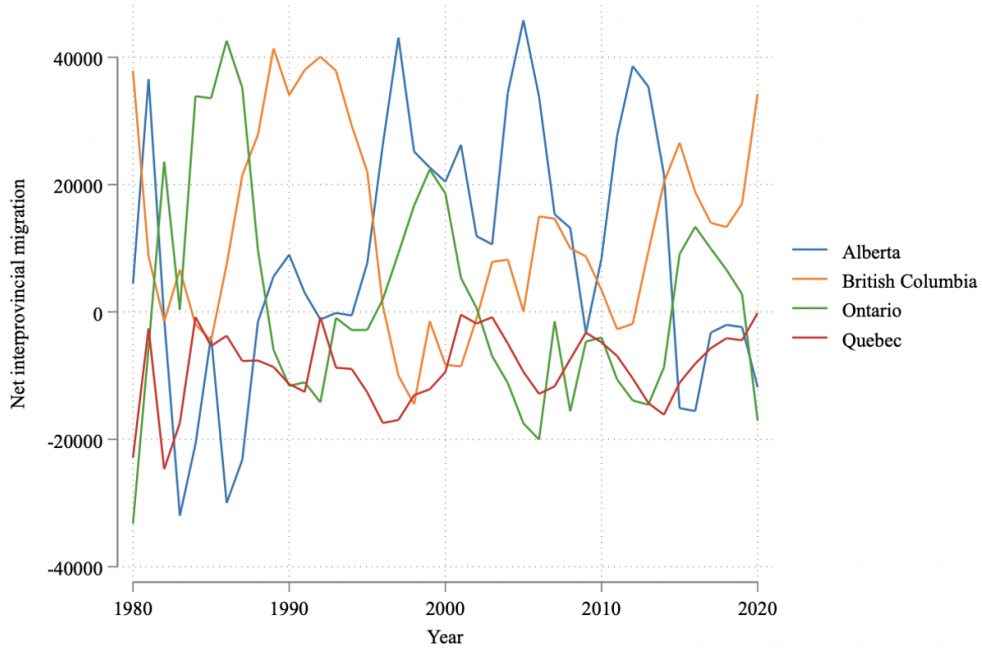

Figure 1: Net Interprovincial Migration over Time

In Figure 1, Alberta, British Columbia, and Ontario's net interprovincial migration fluctuate between positive and negative values over time. However, Quebec's net interprovincial migration is always negative, meaning that there are always more people leaving Quebec for another Canadian province than people leaving Canadian provinces for Quebec (Statistics Canada 2022b). This has always been the case since Statistics Canada started gathering data on interprovincial migration in 1971. As Figure 2 (Statistics Canada 2022d) suggests, it makes sense considering that Quebec had a higher unemployment rate than other provinces for most of this period; Quebec's workers would therefore migrate to other provinces with greater economic activity, such as Ontario or Alberta. However, we can observe that, over the last decade, Quebec had an unemployment rate close or even below the national level, but it is not reflected by the net interprovincial migration, which remains largely negative. This potentially implies that Quebec would not benefit from labour mobility in Canada when facing better economic conditions, possibly resulting in labour shortage and consequently a loss of potential productivity and economic growth (Dodier 2019).

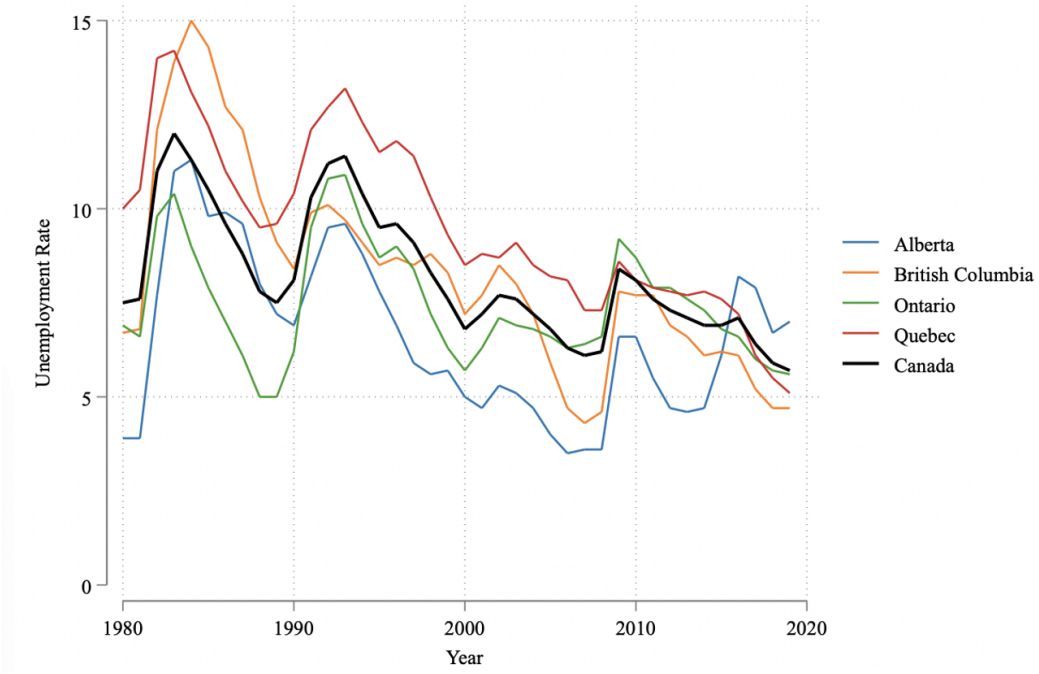

Figure 2: Unemployment Rate over Time

The absence of net positive interprovincial migration in the case of Quebec could be explained by linguistic and cultural differences. Indeed, Figure 3 (Statistics Canada 2020) shows that the non-French speaking population represents the majority of the net negative interprovincial migration in Quebec, even though the non-French population in Quebec only represents about 20% of its total population. Among other factors, linguistic and cultural differences can represent barriers to labour mobility (Zimmermann 2009) and could disadvantage the province in the context of an OCA.

This observation supports the idea that Quebec has a lower degree of labour mobility in contrast to the other Canadian provinces and thus is not completely benefiting from the advantages offered by the Canadian dollar currency areas. However, it needs to be corroborated by statistical analysis.

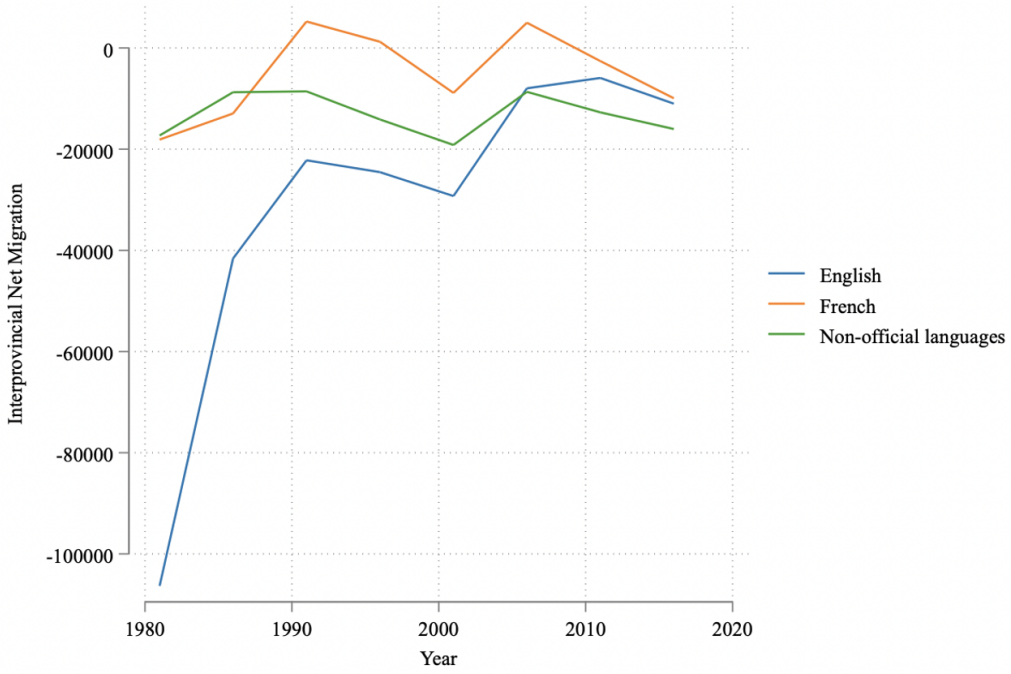

Figure 3: Quebec's Net Interprovincial Migration by Mother Tongue over Time

4.3 Methodology

To investigate the degree of labour mobility of Quebec, Ontario, British Columbia, and Alberta within Canada using statistics, this section uses a methodology developed by Eichengreen (1993), inspired by methods initiated by Branson and Love (1988), and Pissarides and McMaster (1990). In his analysis, Eichengreen begins by analyzing the incidence of shocks to regional labour markets using an ordinary least squares (OLS) regression model. Then, the author explores the migratory response following labour market shocks, employing once again an OLS regression model. This section applies the same methodology and adapts the models to the Canadian context.

First, I regress each province's unemployment rate on the national unemployment rate, on the real exchange rate between the Canadian Dollar and the American Dollar, and on the real price of energy within the province. Regressions are estimated using OLS and take the following form:

$$\begin{aligned} \textit{provincial unemployment} \;=\; \textit{constant} \;+\; \alpha_1 \;\times \textit{national unemployment} \\ +\; \alpha_2 \;\times\; \textit{exchange rate}\; \frac{CAD}{USD} \;+\; \alpha_3 \;\times\; \textit{real energy price} \;+\; \epsilon \end{aligned} \tag{4}$$

where provincial and national unemployment in thousands of people is expressed in logarithms. The exchange rate between the Canadian dollar and the American dollar is the only one taken into account in these regressions, given that the US is the principal trade partner with Canada, representing more than 70% of its total exports in 2020 (Statistics Canada 2021b). The real price of energy is extracted from the CPI. The estimated coefficients are predicted to behave as follows: the coefficient on the national unemployment α_1 should be greater than 1 for provinces where the cyclical sensitivity of provincial unemployment exceeds the cyclical sensitivity of national unemployment and be less than 1 for provinces where the cyclical sensitivity of national unemployment exceeds the cyclical sensitivity of provincial unemployment. Furthermore, the coefficient on the real exchange rate α_2 between the Canadian dollar and the American dollar should be positive for provinces where the production of non-traded goods dominates, and negative for provinces specializing in traded goods. Additionally, it is expected that the coefficient for the real price of energy α_3 is positive for energy-using provinces, and negative for energy-producing provinces which, in this case, only concerns Alberta. Overall interpretation of the size, the sign, and the significance of these coefficients allow me to observe and compare the consequences of shocks on labour market for each province. Eichengreen performed this methodology for Italy, Britain, and the United States. Values

of Eichengreens's past studies allow me to assess the coherence of my results and can be used as a benchmark when comparing estimated values for the different Canadian provinces.

Second, I regress each province's net interprovincial migration on its relative wage and on its relative unemployment. Regressions are estimated using OLS and take the following form:

$$\begin{aligned} net\ interprovincial\ migration\ =\ constant\ +\ \beta_1\ \times\ relative\ wage \\ +\ \beta_2\ \times\ unemployment\ ratio\ +\ \epsilon \end{aligned} \tag{5}$$

where the net interprovincial migration is expressed in share of the population. The relative wage of a province is expressed in logarithms and is the expression of the real GDP per capita of the province in question divided by the real GDP per capita at the national level. The unemployment ratio is the unemployment rate of the province divided by the unemployment rate at the national level. In Eichengreen's methodology, both explanatory variables are entered with one lag. However, the author used monthly data whereas I use annual data; consequently, I do not apply any lag on my explanatory variables. Additionally, the log of relative wages is entered in its first-difference form. The estimated coefficients are predicted to behave as follows: interprovincial migration will increase with the log of the relative wage coefficient β_1 and will decrease with the unemployment ratio β_2. Results drawn from this second regression allow me to observe if the provinces react similarly to economic conditions in respect to interprovincial migration, and thus determine if they enjoy similar labour mobility.

4.4 Data

For the first regression of this section, I use monthly data for covering the period from 1980 to 2021. The measure of unemployment and of the real price of energy have respectively been extracted from Table 14-10-0017-01 (2022) and Table 18-10-0004-01 (2022) made available by Statistics Canada. The exchange rate's historical data between the Canadian dollar the American dollar have been extracted from OFX's website (2022). For the second regression of this section, I use annual data covering the period from 1981 to 2020. The measure of net interprovincial migration, real GDP, unemployment rate, and the Canadian population have respectively been extracted from Table 17-10-0021-01 (2022), Table 36-10-0222-01 (2022), Table 14-10-0023-01 (2022), and Table 17-10-0005-01 (2022) made available by Statistics Canada.

4.5 Results

Table 3 displays results from the first regression, where provincial unemployment is regressed on national unemployment, on exchange rate, and on the real price of energy. In Eichengreen (1993) study, the elasticity of provincial unemployment with respect to the national unemployment for the US, UK, and Italy's regions varies from 0.816 to 1.228. The range of my results is 0.709 to 1.573, which is consistent with Eichengreen's results, and shows that Canadian provinces experience a wider range of elasticity of provincial unemployment with respect to the national unemployment than the US, UK, and Italy. Quebec undergoes the lowest cyclical sensitivity, which can be explained by its different regional characteristics. Concerning the size and the sign of coefficients on the CAD/USD exchange rate, we see that this variable plays a significant role in determining the provincial unemployment, and the results are consistent with Eichengreen's previous study. Provinces with a positive coefficient were predicted to rely on services and public administration, which is the case for Ontario and Quebec, whereas provinces with a negative coefficient were predicted to rely on traded goods, which is the case for Alberta and British Columbia, who mainly rely on oil, gas, forestry, and mining. Finally, energy-using regions and energy-producing regions should have had a positive and negative sign, respectively, on their last coefficients, but this was not seen in my results. I can see that, when the real price of energy increases, the provincial unemployment should increase in energy-using provinces due to a raise in cost of production (everything else remaining constant) whereas the provincial unemployment should increase in energy-producing provinces due to a raise in revenue. Nevertheless, the low size of the coefficients and the low significance of this coefficient in past studies should not bring much concern for this possible anomaly.

Table 3: Covariate of regional unemployment in different Canadian provinces, 1980-2021.

Province	Constant	National Unemployment	CAD/USD Exchange Rate	Real Energy Price	Coefficient of Determination
Alberta	-6.287***	1.573***	-1.059***	0.005***	0.615
British-Columbia	-2.359***	1.091***	-0.488***	-0.001	0.739
Ontario	-2.498***	1.152***	0.310***	0.001***	0.903
Quebec	0.941***	0.709***	0.483***	-0.005***	0.814

Note: Symbols *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively. The dependent variable is the log of provincial unemployment.

Thus, this first regression on the incidence of shocks to regional labour markets shows that Quebec experiences a significantly low cyclical sensitivity in comparison to the other major Canadian provinces. Its provincial unemployment rate relies relatively significantly on the exchange rate it shares with the US, like Ontario but unlike Alberta and British Columbia. Its reaction to a change in the real price of energy is the diametric opposite of Alberta's, but the very small size of the coefficient does not draw any momentous conclusion. Overall, Quebec's labour market reacts relatively differently to economic shocks in comparison to the other major Canadian provinces. The next regression allows us to observe if the *Belle Province* copes with its differences through the mechanism of labour mobility.

Table 4: Eichengreen's basic migration model for different Canadian provinces, 1982-2020.

Variables	Alberta	British Columbia	Ontario	Quebec
Provincial relative wage in logs	0.049	-0.082	2.009***	-0.317
Provincial relative unemployment rate	-0.262***	-0.085*	-0.366***	-0.095***
Constant	0.244***	0.123**	0.351***	0.076**

Note: Symbols *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively. The dependent variable is interprovincial migration in share of the population.

Table 4 shows the second regression, where interprovincial migration in share of the population is regressed on the provincial relative wage and the provincial relative unemployment rate. Each province has a different constant which allows different fixed effects specific to the province (Pissarides and McMaster 1990). The interprovincial migration was predicted to increase with the relative wage and decrease with the relative unemployment rate. Ontario responds perfectly to these predictions with coefficients that all denote a powerful statistical significance. The size of the coefficients is coherent with Eichengreen's paper (1993). With lower coefficients, Alberta also reacts in accordance with what is expected. Alternatively, British Columbia performs poorly in Eichengreen's basic migration model, regarding both the size and significance of its coefficients. It is the only province for which interprovincial labour mobility does not seem to be caused by economic disturbances. Lastly, we can observe that Quebec's migratory response is relatively different from Ontario and Alberta. Its interprovincial migration decreases by only 0.095% when its provincial relative unemployment rate increases by 1%, whereas it decreases by 0.262% in Alberta and by 0.366% in Ontario. This can be explained by the fact that, in most of the observations, Quebec

had a higher unemployment rate than Alberta and Ontario's. Furthermore, Quebec's interprovincial migration decreases by 0.317% when the provincial relative increases by 1%, instead of increasing, such as in Ontario, where it increases by 2.009%, or Alberta, where it increases by 0.049%. However, this coefficient is not statistically significant.

Overall, this section shows that Quebec's labour market reacts relatively differently to economic shocks in comparison to Alberta, British Columbia, and Ontario. More specifically, Quebec experiences a significantly low elasticity of provincial unemployment with respect to the national unemployment in comparison to the other provinces of study. Moreover, the basic migration model shows that interprovincial migration following economic disturbances does not seem to manifest a high degree of labour mobility between the province and the rest of Canada as the negative impact of relative provincial wage on interprovincial migration in Quebec seems to indicate.

5 Discussion and Supplemental Observations

In this section, I discuss the results obtained in the last two sections and briefly cover additional criteria of the theory on OCA.

5.1 Symmetry of shocks and low level of labour mobility

Mundell's seminal study (1961) established that the two major criteria for a province to enjoy the advantages of a monetary union are the symmetry of macroeconomic shocks between provinces and the labour mobility within this union.

Through the application of a SVAR methodology, section 3 proves that Quebec is facing highly symmetrical shocks with the other Canadian provinces. Because Quebec's individual shocks are similar to other provinces' individual shocks, common monetary policies can be applied without inducing major negative shocks to Quebec. The evaluation of this first criterion implies that Quebec would not specifically benefit from having its own currency because a hypothetical central bank in Quebec would not act differently than the Bank of Canada, while inducing transaction costs when trading with other Canadian provinces. Section 4 shows that Quebec's labour market answers differently to economic shocks in comparison to Alberta, British Columbia, and Ontario. Indeed, Quebec experiences a significantly low elasticity of provincial unemployment with respect to the national un-

employment in comparison to these other provinces. Moreover, the basic migration model shows that interprovincial migration following economic disturbances does not seem to manifest a high degree of labour mobility between Quebec and the rest of Canada. OCA theory suggests that a high degree of labour mobility allows members of a monetary union to not adjust their exchange rates between. In this study, it is implied that Quebec should adjust its exchange rate because of its low degree of labour mobility with the other provinces. However, it is not possible when sharing a common currency, necessitating the creation of its own currency to avoid a high provincial unemployment rate.

The two criteria previously studied bring this study to two different conclusions regarding on whether Quebec should have its own currency or not. However, it seems that the first criterion, and so the first conclusion, overtakes the second one. As a matter of fact, in OCA theory, the degree of labour mobility of a member can be considered as a mechanism of adjustment when different members of a common currency area share are confronted to asymmetrical shocks. But in the case of a member sharing a symmetrical shock with the other members, such as Quebec with the other Canadian provinces, this mechanism is less relevant because there is less of a need to adjust exchange rates following economic shocks. Consequently, Quebec's symmetry of shocks and Quebec's low level of labour mobility put together brings me to the conclusion that the province should keep the Canadian dollar as a provincial currency and should not seek for monetary sovereignty.

As demonstrated in the literature review, a member of a common currency is part of an OCA when multiple criteria are met. The different following subsections aim to briefly cover additional criteria in order to have an overview of the context before starting the conclusion and to see if they corroborate each other.

5.2 Interprovincial trade intensity

A criterion that should be considered when evaluating if a member of a monetary union should continue sharing a common currency with the other members, or would benefit from having its own currency, is the intensity of trade it has with the other members. In the case of Quebec, the idea is that, the more it trades with the other Canadian provinces and will continue to trade with them, the more Quebec will benefit from the microeconomic costs savings induced by trading with a shared currency.

Figure 4 depicts the change in interprovincial trade in Quebec from 2010 to 2018 (Statistics Canada 2022a). Despite a negative change from 2013 to 2015 regarding either the interprovincial imports or exports, Quebec's interprovincial trade is mostly increasing. Moreover, changes in international exports and imports in Quebec follow a similar trend, and the proportion it takes in its economy is similar to Ontario and British Columbia's proportions.

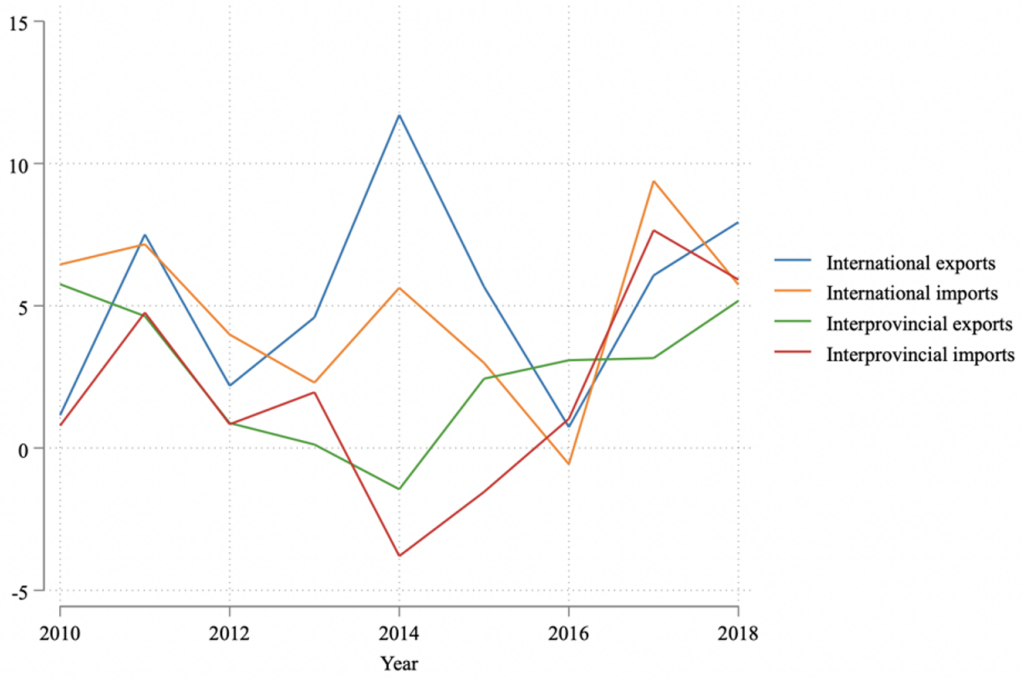

Figure 4: Change in Interprovincial and International Trade in Quebec over Time in Percentage

5.3 Fiscal integration

Among the different existing OCA criteria, Ingram (1962) demonstrated the importance of a high degree of fiscal integration. The intuition is that a great fiscal integration allows a monetary union to address internal imbalances through transfers from provinces, presenting a surplus to those exhibiting a deficit through the central government budget in order to harmonize the advantages and the disadvantages of the union.

In Canada, there are four major federal transfers to provinces allowing this kind of adjustment: the Canada Health Transfer, the Canada Social Transfer, Equalization, and Territorial Formula Financing. In respect to Quebec, Table 5 demonstrates that Quebec benefits from the federal government transfers and that these transfers continuously increase over time. It also shows that Quebec still benefits from the central government's support in bigger proportion than other provinces and thus possibly mitigates any disadvantages caused by the Canadian dollar. We can see the adjustment mechanism at play especially when having a deeper look at the equalization payments. In 2022, the allocation per capita in Quebec is 3.177$. To compare, in Alberta, Ontario, New Brunswick, and Yukon, it is respectively 1.592$, 1.592$, 3.565$, and 28.487$ (Government of Canada. 2019).

Table 5: Federal Support to Quebec in billions of Canadian dollars

	2015	2016	2017	2018	2019	2020	2021	2022
Total of the Transfers	21.35	21.37	22.64	23.67	25.55	26.08	26.30	27.39
Per Capita Allocation (in dollars)	2.47	2.57	2.73	2.83	3.01	3.04	3.06	3.18

Note : Total of the transfers is the sum of the following transfers: Canada Health Transfer, Canada Social Transfer, and Equalization Payments (Government of Canada. 2017).

Fiscal integration acting as an adjustment mechanism benefits Quebec. In the case where Quebec would be independent and with its own currency, these federal transfers would likely stop. This suggests that, in order for Quebec to be better off with its own currency, it would have to generate benefits superior or equal to the total of the federal transfers the province would have received if it remained part of Canada.

5.4 The question of the size

Finally, the size of an economy, induced by its population and its GDP, can be another criterion to assess the desirability of taking part or staying outside a common currency area. Theoretically, the smaller the size of the economy, the more open the economy needs to be, and thus the more inclined to take part of a monetary union it will be (Tavlas 1993). Furthermore, it will take more time for a small country's currency to be trusted by other states because it would take more time to prove that this small economy is capable of overcoming different economic shocks (Montmarquette 1979).

In 2021, Quebec had a population of about 8.5 million people and a GDP close to 378 billion USD. In comparison, Iceland, with a population of 375 thousand people and a GDP of $21 billion USD, has its own currency and successfully faced important economic shocks, such as the effects of the subprime mortgage crisis or the European sovereign debt crisis. Greece, on the other hand, with a population of 11 million and a GDP of $188 billion USD, is a member of the Eurozone, but the adoption of this shared currency generated a loss in competitiveness for the Greek economy and a rise in its current account imbalances (Treichel and Yifu 2013). Each country and each currency union has its own characteristics, but the example of Iceland and Greece shows that it is possible for an economy of the size of Quebec to lose from sharing a currency and win from having its own currency. However, it seems that Quebec is facing a better integration with the other members of its monetary union than Greece, and the province is 22 times bigger in terms of population and 18 times bigger in terms of GDP than Iceland, implying that the comparison may not hold in these circumstances and that no clear direction should be drawn from this argument on whether Quebec should have its own currency or not.

5.5 Overview and limits

Overall, Quebec experiences symmetric shocks with the other Canadian provinces despite a lower degree of labour mobility. Additionally, Quebec's interprovincial trade is increasing, implying a larger incentive to share the same currency, and that the interprovincial transfers can compensate for any possible loss induced by the Canadian dollar. All these different criteria considered, advantages for Quebec to share a common currency with the other Canadian provinces appear to overtake the disadvantages, suggesting that Quebec should not seek monetary sovereignty.

Nevertheless, this study encounters different limits which may mitigate some results. Indeed, in section 3, the SVAR application used the two following variables: GDP and the unemployment rate. However, other variables could have been used, such as inflation instead of the unemployment rate. The use of different variables could have led to a different conclusion regarding the symmetry of the shocks and thus the necessity to stay with the Canadian dollar. Furthermore, section 4 reproduces Eichengreen's methodology (1993). I made the choice to follow this seminal paper because it allowed me to easily produce understandable results. However, more recent methodologies also exist and use more advanced statistical techniques usually believed to be more accurate. The application of these newer methods to this present case could also lead to different results, possibly resulting

in a different conclusion. Finally, due to the various and unknown exogenous factors that would determine the success or the failure of a Quebec currency, it is actually impossible to predict for sure which scenario would ensure Quebec the best economic outcome (Montmarquette 1979).

6 Conclusion

This study aimed to determine if Quebec would be better off with its own currency or if the province could be considered as a member of an OCA within Canada's monetary union. To do so, two main criteria from the theory on OCAs have been investigated. To assess the symmetry of shocks between Quebec and the other Canadian provinces, a SVAR model was created. Results generated by the impulse responses functions allowed me to observe that Quebec faces symmetric shocks with the rest of the country. The application of Eichengreen's basic migration model shows that Quebec is facing a relatively low degree of labour mobility in comparison to Alberta, British Columbia, and Ontario. Additionally, considering the high level of fiscal integration in Quebec, a relatively great intensity of trade of Quebec with the other provinces, and the size of its economy, this study estimates that the advantages of being part of the Canadian monetary union surpasses the disadvantages, meaning Quebec is part of an OCA. The most desirable future for Quebec's economic interests would be to not seek monetary sovereignty and to keep the Canadian dollar as its currency.

Future studies could complete this work by performing the same methodology with other countries in order to use these new results as a benchmark with the present study and possibly draw new conclusions from it. Furthermore, different variables could be tested and used in the SVAR models, and more recent methodologies could be applied in order to observe the level of labour mobility within Canada. Finally, one could investigate the possibility of adopting the American dollar and observe if this currency could perform better than the Canadian dollar for Quebec's economy.

References

Artis, M. J., and W. Zhang. 2002. "Membership of EMU: A fuzzy clustering analysis of alternative criteria." *Journal of economic integration,* 54–79. https://doi.org/10.11130/jei.2002.17.1.54.

Bayoumi, T., and B. Eichengreen. 1992. "Shocking Aspects of European Monetary Unification." *NBER Working Paper* 3949. https://doi.org/10.3386/w3949.

———. 1997. "Ever closer to heaven? An optimum-currency-area index for European countries." *European economic review* 41 (3-5): 761–770. https://doi.org/10.1016/S0014-2921(97)00035-4.

Bayoumi, T., and J. D. Ostry. 1997. "Macroeconomic shocks and trade flows within Sub-Saharan Africa: implications for optimum currency arrangements." *Journal of African economies* 6 (3): 412–444. https://doi.org/10.1093/oxfordjournals.jae.a020935.

Blanchard, O. J., and D. Quah. 1988. "The dynamic effects of aggregate demand and supply disturbances." *NBER Working Paper,* https://doi.org/10.3386/w2737.

Bonin, H., and W. Eichhorst. 2008. *Geographic Mobility in the European Union: Optimising its Economic and Social Benefits.* 19. http://ftp.iza.org/report_pdfs/iza_report_19.pdf.

Branson, W., and J. Love. 1988. "U.S. Manufacturing and the Real Exchange Rate. In Misalignment of Exchange Rates: Effects on Trade and Industry." *University of Chicago Press.,* 241–270. https://doi.org/10.3386/w2435.

Bruneau, C., and O. De Bandt. 1998. *La modélisation Var structurel: application à la politique monétaire en France. Économie et prévision.* 1. https://doi.org/10.3406/ecop.1999.5948.

Buigut, S. K., and N. T. Valev. 2006. "Eastern and Southern Africa monetary integration: A structural vector autoregression analysis." *Review of Development Economics* 10 (4): 586–603. https://doi.org/10.1111/j.1467-9361.2006.00333.x.

Chaban, M., and G. M. Voss. 2016. "Is Canada an optimal currency area? An inflation targeting perspective." *Canadian Journal of Economics* 49 (2): 738–771. https://doi.org/10.1111/caje.12212.

Corden, W. M. 1972. *Monetary integration.* 93. Princeton University.

Dodier, D. 2019. "Alarme provinciale: Grande pénurie de main-d'oeuvre!" *Vecteur Environnement* 52 (1): 36–37.

Eichengreen, B. 1993. "Labor markets and European monetary unification. Policy issues in the operation of currency unions," 130–162.

———. 1998. "Does Mercosur need a single currency, National Bureau of Economic Research.," https://doi.org/10.3386/w6821.

Emerson, M., D. Gros, and A. Italianer. 1992. "One market, one money: an evaluation of the potential benefits and costs of forming an economic and monetary union." *Oxford University Press.*

Enders, W., and S. Hum. 1994. "Theory and tests of generalized purchasing-power parity: Common trends and real exchange rates in the Pacific Rim." *Review of International Economics* 2 (2): 179–190.

Fleming, J. M. 1971. "On exchange rate unification." *The economic Journal* 81 (323): 467–488. https://doi.org/10.2307/2229844.

Gauchan, B., and V. Sarin. 2018. "Is South Asia an Optimum Currency Area?" *Journal of Economic Integration* 33 (3): 572–603. http://www.jstor.org/stable/26484512.

Government of Canada. 2017. "Major Federal Transfers." https://www.canada.ca/en/department-finance/programs/federal-transfers/major-federal-transfers.html#Quebec.

———. 2019. "Federal transfers to provinces and territories." https://www.canada.ca/en/department-finance/programs/federal-transfers.html.

Grady, P. 1992. "Québec souverain et dollar canadien. Cité Libre." 20 (5). http://global-economics.ca/Que.dollarcanadien.pdf..

Harvey, S. K., and M. J. Cushing. 2015. "Is West African Monetary Zone (WAMZ) a common currency area." *Review of Development Finance* 5 (1): 53–63. https://doi.org/10.1016/j.rdf.2015.05.001.

Ingram, J. C. 1962. "Regional Payments Mechanisms: The Case of Puerto Rico." *Canadian Journal of Economics and Political Science* 30 (3): 463–465. https://doi.org/10.2307/139723.

Ishiyama, Y. 1975. "The theory of optimum currency areas: a survey." *Staff Papers* 22 (2): 344–383. https://doi.org/10.5089/9781451947458.024.

Kenen, P. 1969. "The Theory of Optimum Currency Areas: An Eclectic View," 41–60. https://doi.org/10.1515/9780691196602-012.

Kouparitsas, M. A. 1999. "Is the United States an Optimal Currency Area?" *Chicago Fed Letter* 146:1–3. https://doi.org/10.2139/ssrn.295566.

Krugman, P. 2013. "Revenge of the Optimum Currency Area." *NBER Macroeconomics Annual* 27:439–448. https://doi.org/10.1086/669188.

Lafrance, R., and P. St-Amant. 1999. *Optimal currency areas: A review of the recent literature.* https://doi.org/10.34989/swp-1999-16.

Lasonde, N. 1995. "Une Monnaie québécoise, un atout. Mémoire à l'attention de la Commission régionale sur la souveraineté.," no. 458849, https://www.bibliotheque.assnat.qc.ca/DepotNumerique_v2/AffichageNotice.aspx?idn=38369.

Ling, H. Y. P. 2001. "Optimum Currency Areas in East Asia: A Structural VAR Approach." *ASEAN Economic Bulletin* 18 (2): 206–217. http://www.jstor.org/stable/25773667.

McKinnon, R. I. 1963. "Optimum currency areas." *The American economic review* 53 (4): 717–725. http://www.jstor.org/stable/1811021.

Mongelli, F. P. 2002. "New views on the optimum currency area theory: What is EMU telling us.," 10.2139/ssrn.357400.

Montmarquette, C. 1979. *Économie du Québec et choix politiques.* Les Presses de l'Université du Québec. https://doi.org/10.7202/600935ar.

Mundell, R. A. 1961. "A theory of optimum currency areas." *The American economic review* 51 (4): 657–665. http://www.jstor.org/stable/1812792.

Obstfeld, M., and G. Peri. 1998. "Regional non-adjustment and fiscal policy." *Economic Policy* 13 (26): 206–259. https://doi.org/10.1111/1468-0327.00032.

OFX. 2022. "Table CAD to USD historical exchange rates." https://www.ofx.com/en-au/forex-news/historical-exchange-rates/cad/usd/.

Parizeau, J. 2009. *Souveraineté du Québec : Hier, aujourd'hui et demain.* Michel Brule.

Pissarides, C. A., and I. McMaster. 1990. "Regional migration, wages and unemployment: empirical evidence and implications for policy." *Oxford economic papers* 42 (4): 812–831. https://doi.org/10.1093/oxfordjournals.oep.a041980.

Price, M. J. 1995. "A study of Quebec as an optimum currency area. Master's thesis." https://spectrum.library.concordia.ca/id/eprint/4693.

Proulx, C. 1995. "La Monnaie du Québec, mémoire à l'intention de la Commission sur l'avenir du Québec.," no. 445450, https://www.bibliotheque.assnat.qc.ca/DepotNumerique_v2/AffichageNotice.aspx?idn=37275.

Robillard, A. 2014. "Indépendance : Marois conserverait le dollar canadien et une frontière ouverte." https://www.ledevoir.com/politique/quebec/402400/quebec-independant-pauline-marois.

Schioppa, F. P. 1991. "Mismatch and labor mobility." *Cambridge University Press.,* https://doi.org/10.1017/CBO9780511599316.

Statistics Canada. 2020. "Table 15-10-0006-01. Interprovincial Migration by Mother Tongue for Interprovincial Migrants Aged 5 Years and Over, Provinces and Territories, 1971 to 2016." https://doi.org/10.25318/1510000601-eng.

———. 2021a. "Annual Demographic Estimates: Canada, Provinces and Territories." https://www150.statcan.gc.ca/n1/pub/91-215-x/2021001/sec1-eng.htm.

———. 2021b. "Table 12-10-0011-01. Merchandise trade: Canada's 10 principal trading partners – Balance of payments basis, current dollars)." https://www150.statcan.gc.ca/n1/daily-quotidien/210414/t001a-eng.htm.

———. 2022a. "Table 12-10-0088-01. Interprovincial and international trade flows, basic prices, summary level (x 1,000,000)." https://doi.org/10.25318/1210008801-eng.

———. 2022b. "Table 14-10-0023-01. Labour force characteristics by industry, annual (x 1,000)." https://doi.org/10.25318/1410002301-eng.

———. 2022c. "Table 17-10-0005-01. Population estimates on July 1st, by age and sex." https://doi.org/10.25318/1710000501-eng.

———. 2022d. "Table 17-10-0021-01. Estimates of the components of interprovincial migration, annual." https://doi.org/10.25318/1710002101-eng.

———. 2022e. "Table 18-10-0004-01. Consumer Price Index, monthly, not seasonally adjusted." https://doi.org/10.25318/1810000401-eng.

Statistics Canada. 2022f. "Table 36-10-0222-01. Gross domestic product, expenditure-based, provincial and territorial, annual (x 1,000,000)." https://doi.org/10.25318/3610022201-eng.

Tavlas, G. S. 1993. "The Theory of Optimum Currency Areas Revisited, Finance and Development." 30 (2). https://doi.org/10.5089/9781451952568.022.

———. 1994. "The theory of monetary integration." *Open economies review* 5 (2): 211–230. https://doi.org/10.1007/BF01000489.

Treichel, V., and J. Yifu. 2013. "The Crisis in the Euro Zone: Did the Euro Contribute to the Evolution of the Crisis?" *Policy Research Working Papers,* https://doi.org/10.1596/1813-9450-6127.

Zimmermann, K. F. 2009. "Labor mobility and the integration of European labor markets.," https://doi.org/10.2139/ssrn.1431312.

Appendices

A List of Acronyms and Abbreviations

AB	Alberta
ADF	Augmented Dickey-Fuller
BC	British Columbia
EMU	Economic and Monetary Union
IRF	Impulse Response Function
MERCOSUR	Mercado Común del Sur
MB	Manitoba
NB	New Brunswick
NL	Newfoundland and Labrador
NS	Nova Scotia
OCA	Optimum Currency Area
OLS	Ordinary Least Squares
ON	Ontario
PEI	Prince Edward Island
QC	Quebec
SK	Saskatchewan
SVAR	Structural Vector Autoregressions
USA	United States of America
VAR	Vector Autoregressions

B Augmented Dickey-Fuller Tests

Table 6: Augmented Dickey-Fuller Tests Results for the Time-Series Variables Used in Section 3

Time-Series (Log-Differentiated)	Test-Statistic Value	Level of Confidence
GDP AB	-2.535	95%
GDP BC	-2.056	95%
GDP MB	-1.624	90%
GDP NB	-2.969	99%
GDP NL	-3.685	99%
GDP NS	-2.018	95%
GDP ON	-2.283	95%
GDP PEI	-1.864	90%
GDP QC	-2.253	95%
GDP SK	-3.989	99%
UR AB	-4.225	99%
UR BC	-3.219	99%
UR MB	-2.709	99%
UR NB	-4.070	99%
UR NL	-4.702	99%
UR NS	-3.896	99%
UR ON	-3.347	99%
UR PEI	-3.556	99%
UR QC	-3.019	99%
UR SK	-4.180	99%

Note: ADF test-statistics value are compared to critical values to evaluate their level of confidence on rejecting the null hypothesis that there is a unit root. A value inferior to -1.61, -1.95, and -2.62 means respectively a level of confidence of 90%, 95%, and 99%. For example, the ADF test-statistic value of the log-difference of the time-series GDP AB is minus 2.535 which allows us to reject the null hypothesis with a level of confidence of 95% and thus assume that variable is stationary.

C Descriptive Statistics

Table 7: Descriptive Statistics of the non-transformed variables used in Section 3

Variables	Observations	Mean	Std. Dev.	Minimum	Maximum
Growth Domestic Product AB	26	272.237	56.37	177.278	350.033
Growth Domestic Product BC	26	204.778	40.158	143.402	275.034
Growth Domestic Product MB	26	54.066	9.255	38.795	68.273
Growth Domestic Product NB	26	30.054	3.09	23.762	33.844
Growth Domestic Product NL	26	29.396	5.224	19.682	34.929
Growth Domestic Product NS	26	35.577	4.111	27.365	41.7
Growth Domestic Product ON	26	638.799	99.532	447.735	803.088
Growth Domestic Product PEI	26	5.211	.755	3.918	6.57
Growth Domestic Product QC	26	330.046	46.141	246.253	407.954
Growth Domestic Product SK	26	71.33	11.037	53.426	87.728
Unemployment Rate AB	26	5.823	1.748	3.5	11.4
Unemployment Rate BC	26	6.904	1.509	4.3	8.9
Unemployment Rate MB	26	5.531	.898	4.2	8
Unemployment Rate NB	26	9.85	1.26	7.6	12.6
Unemployment Rate NL	26	15.012	2	11.9	18.9
Unemployment Rate NS	26	9.273	1.309	7.4	12.4
Unemployment Rate ON	26	7.2	1.152	5.6	9.6
Unemployment Rate PEI	26	11.627	1.663	8.8	15.3
Unemployment Rate QC	26	8.35	1.629	5.1	11.8
Unemployment Rate SK	26	5.488	.977	3.9	8.4

Note : Data have extracted from Statistics Canada.

D Time Series Plots

The time-series variables plotted below have all been transformed by computing their logarithm and taking their first difference.

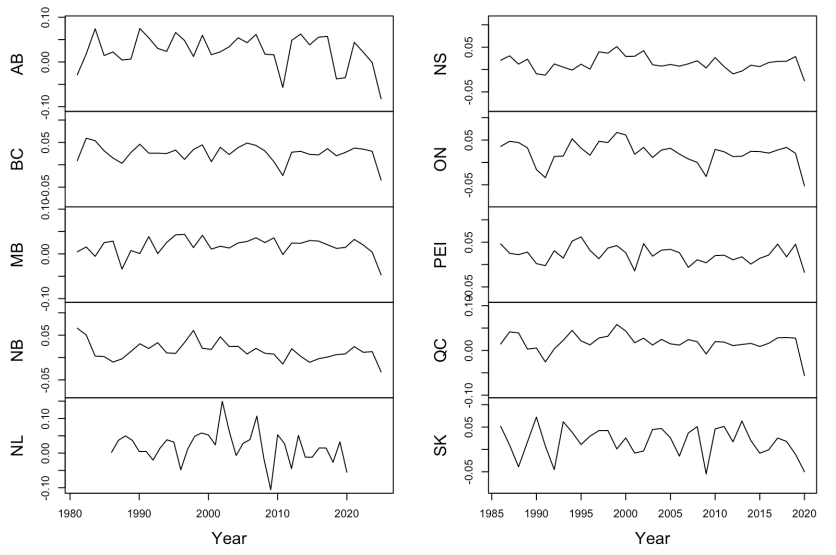

Figure 5: Change in Growth Rate across Canadian Provinces over Time

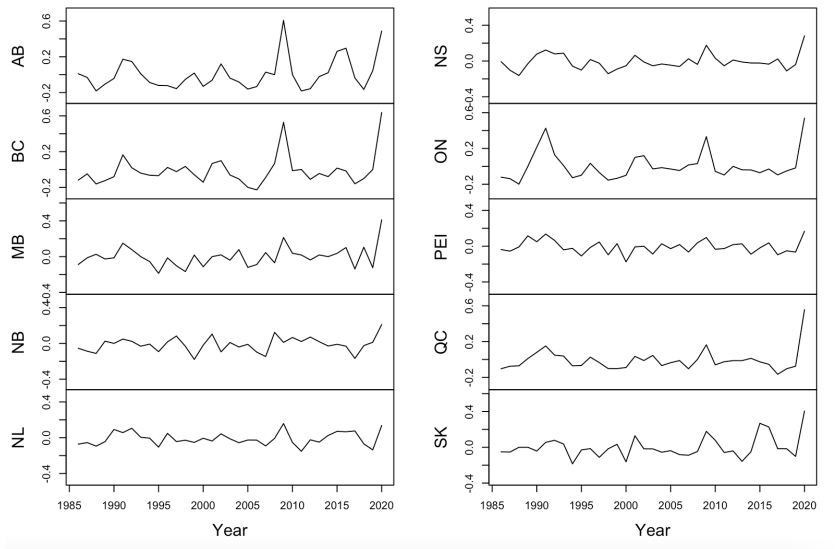

Figure 6: Change in Unemployment Rate across Canadian Provinces over Time

E Impulse Response Functions

Here is displayed the output and unemployment responses over time after a demand shock or a supply shock for every Canadian province. Values at lag 0 and lag 1 are missing from the plots.

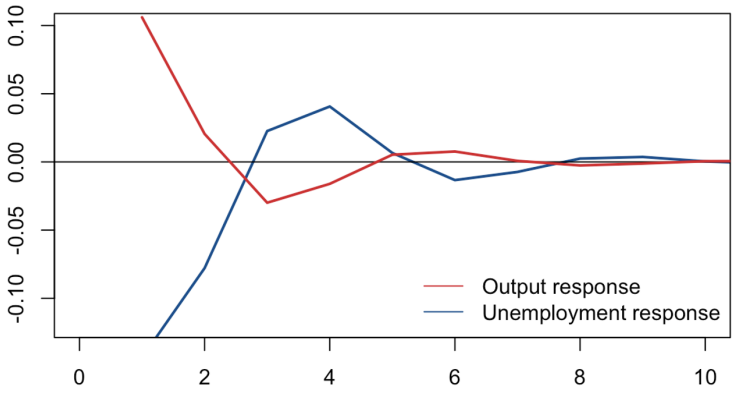

Figure 7: Demand Shock for Alberta

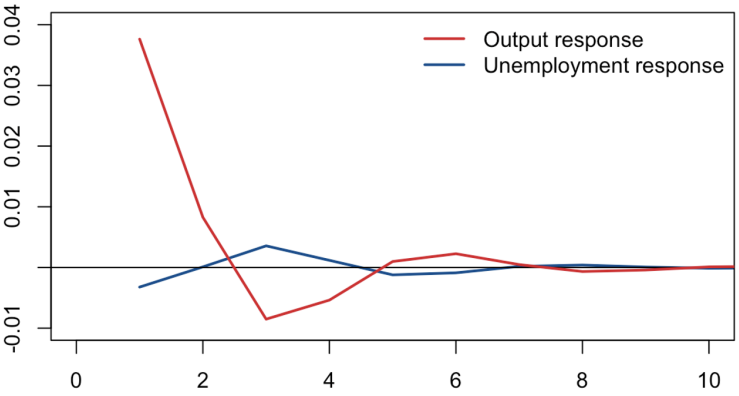

Figure 8: Supply Shock for Alberta

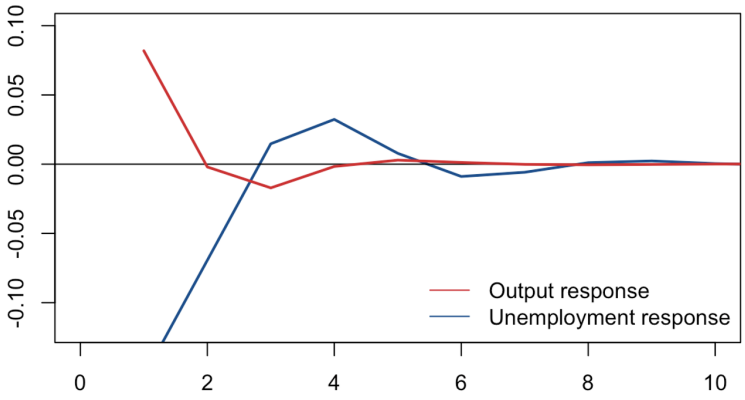

Figure 9: Demand Shock for British Columbia

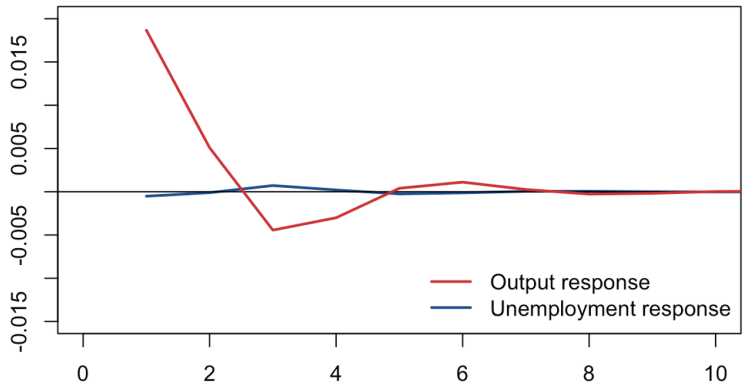

Figure 10: Supply Shock for British Columbia

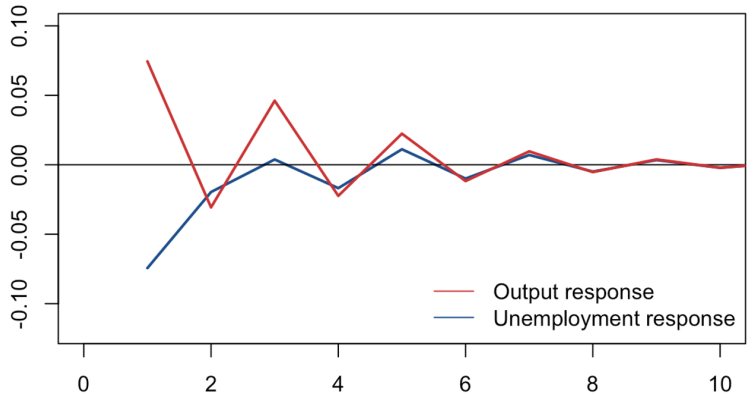

Figure 11: Demand Shock for Manitoba

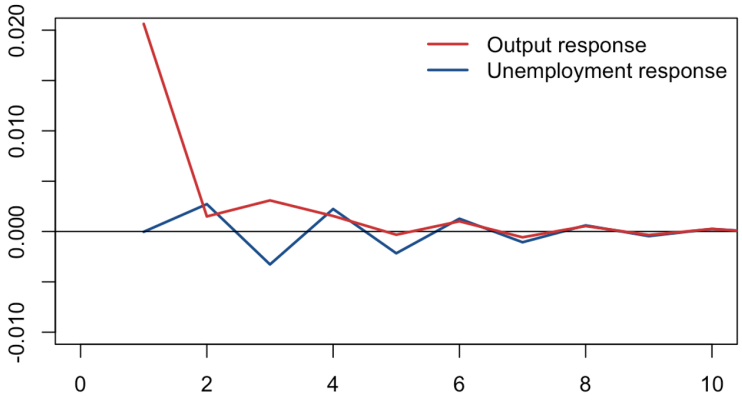

Figure 12: Supply Shock for Manitoba

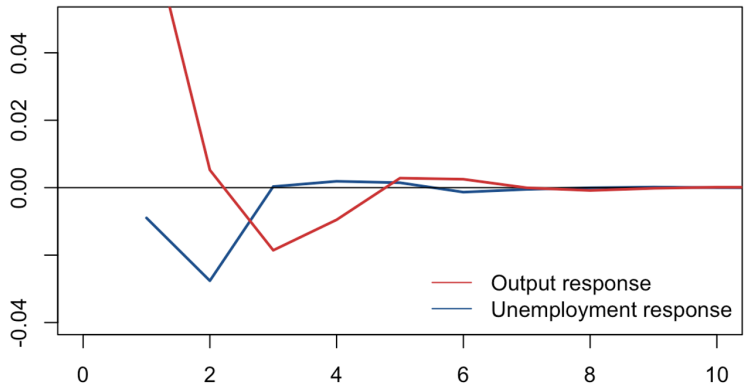

Figure 13: Demand Shock for New Brunswick

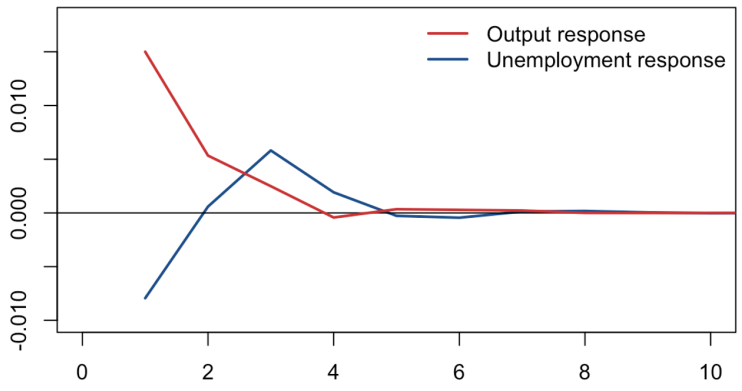

Figure 14: Supply Shock for New Brunswick

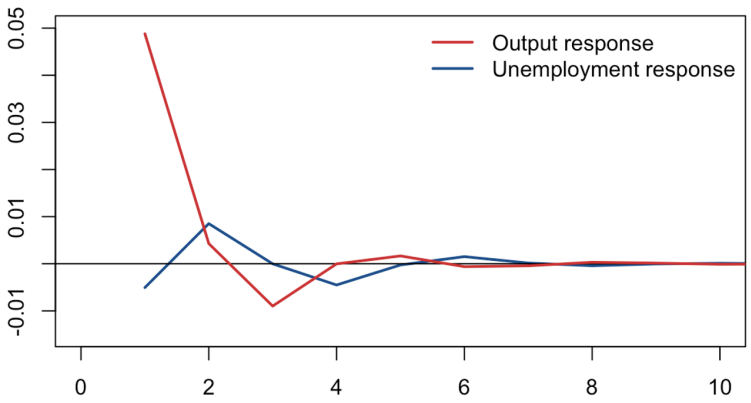

Figure 15: Demand Shock for Newfoundland and Labrador

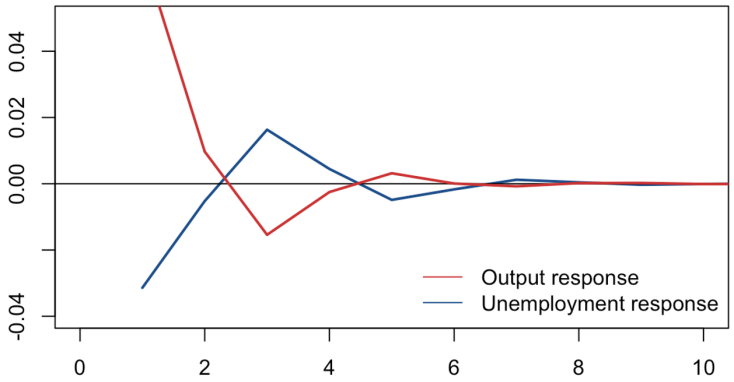

Figure 16: Supply Shock for Newfoundland and Labrador

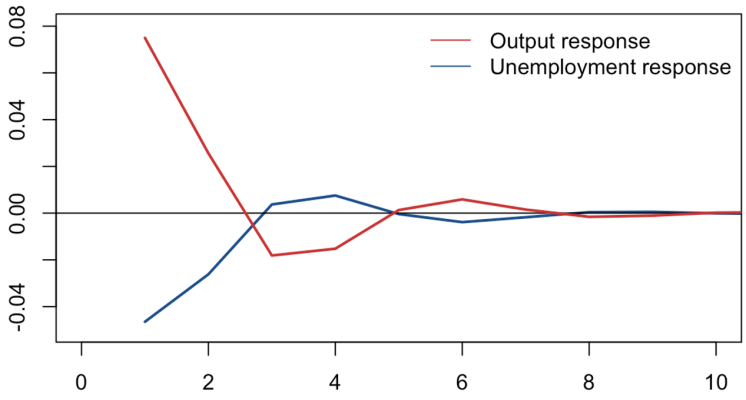

Figure 17: Demand Shock for Nova Scotia

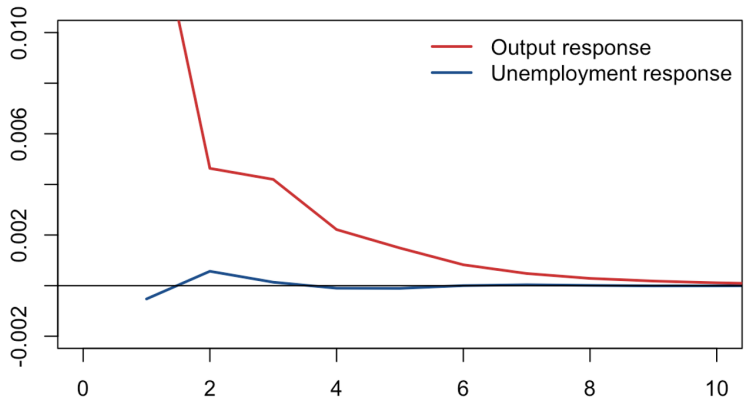

Figure 18: Supply Shock for Nova Scotia

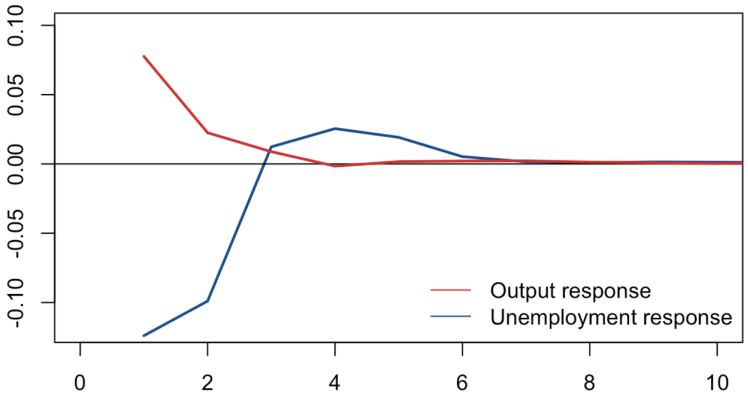

Figure 19: Demand Shock for Ontario

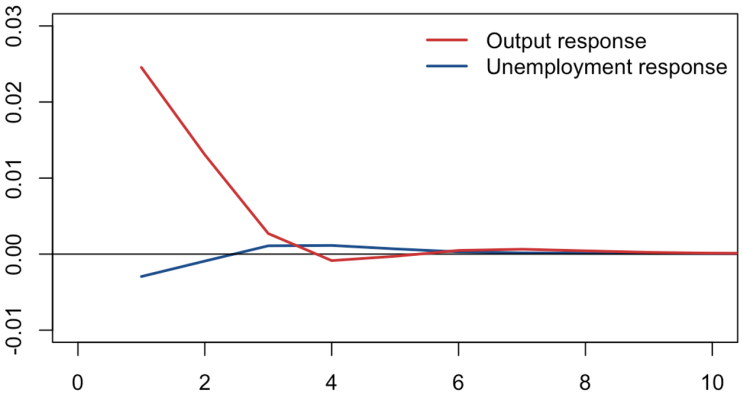

Figure 20: Supply Shock for Ontario

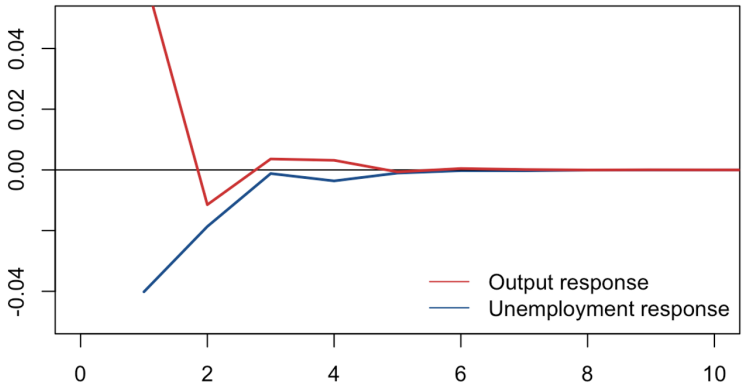

Figure 21: Demand Shock for Prince Edward Island

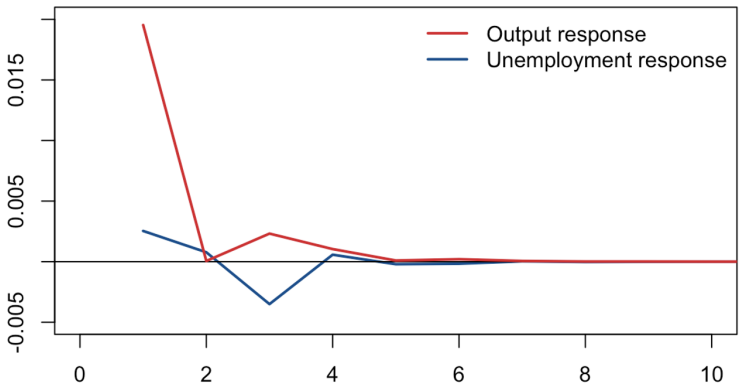

Figure 22: Supply Shock for Prince Edward Island

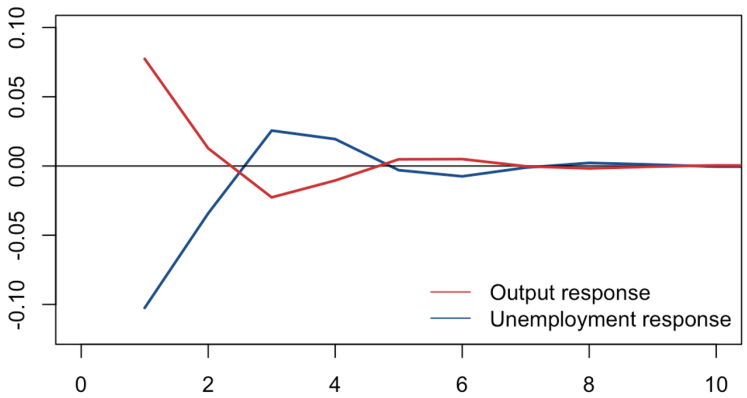

Figure 23: Demand Shock for Quebec

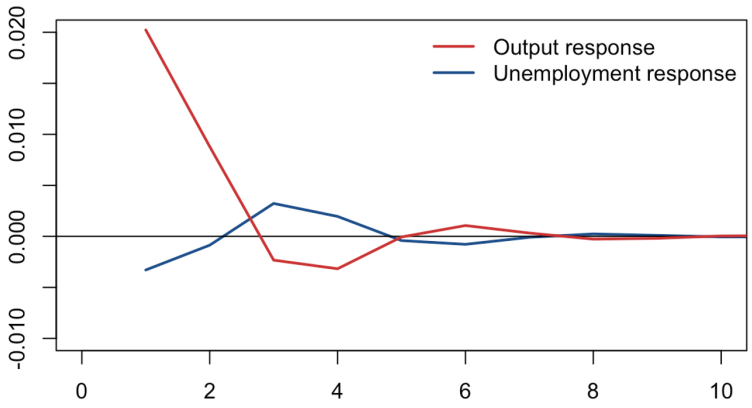

Figure 24: Supply Shock for Quebec

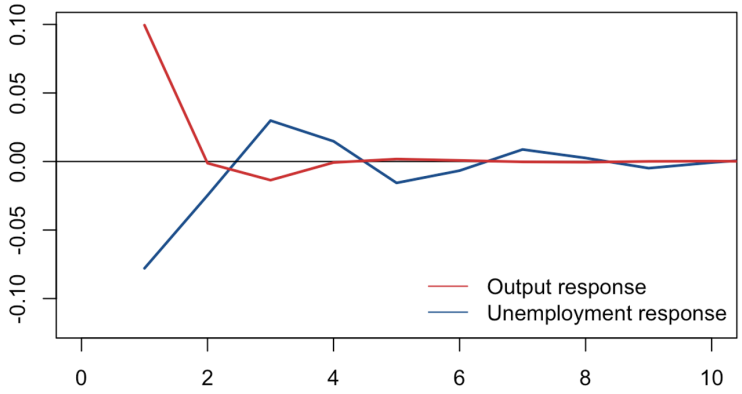

Figure 25: Demand Shock for Saskatchewan

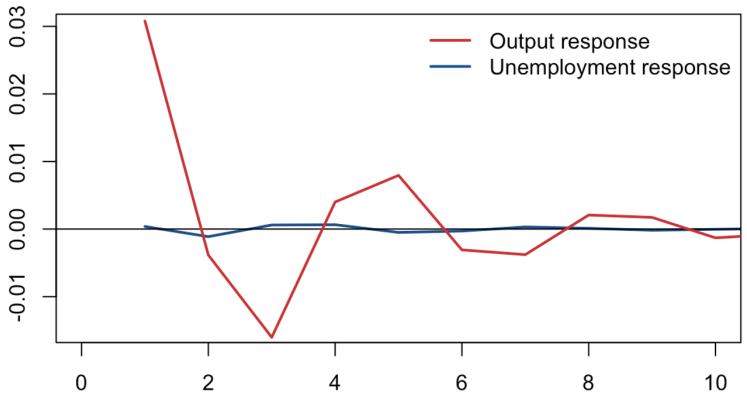

Figure 26: Supply Shock for Saskatchewan