Macroeconomic Effects of Government Spending Shocks: New Narrative Evidence from Canada*

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Abstract

This paper examines the macroeconomic effects of government spending shocks in Canada for the period of 1949 - 2012. We use the narrative record, mostly the budget speech, to identify the size, timing, and principal motivation for all planned major government spending changes. To achieve identification, we consider those changes that are unrelated to the contemporaneous movements in the economy. The estimation, using our newly constructed data series on news of future government spending changes or the government spending shocks, shows that the government spending multiplier for Canada ranges from 0.91 to 1.52.

JEL Classification: E62, H3.
Key Words: Government Spending Shocks, Government Spending Multiplier, Narrative Accounts, Canada.

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1 Introduction

Despite its importance for current macroeconomic policy making, there is a surprising lack of consensus over the effects of government spending changes. Moreover, there is little empirical evidence for countries other than the US. This partly reflects the difficulty of identifying government spending changes uncorrelated with, and uncontaminated by, other economic fluctuations.

This paper contributes to the literature by estimating the government spending multiplier for Canada for the period of 1949 - 2012. We use the narrative record, mostly the budget speech, to identify the size, timing, and principal motivation for all planned major government spending changes. To achieve identification, we consider those proposed changes that are unrelated to the contemporaneous movements in the economy, called exogenous government spending changes. This is similar to the narrative approach adopted to study the effects of tax changes, pioneered by Romer and Romer (2010). We then construct government spending shocks, using the exogenous government spending changes along the lines of Ramey (2011b).

The estimation using our new measure of government spending shocks shows that the implied government spending multiplier is 0.91 for Canada, when the elasticity of output with respect to government spending is calculated as the ratios of their peak responses to governments spending shocks. When calculated through cumulative responses over 2 and 5 years, the implied multipliers are 1 and 1.03, respectively. After controlling for tax and monetary policies, the government spending multiplier is 1.18, calculated by the peak responses. When the cumulative responses over 2 and 5 years are used, the implied multipliers are 1.52 and 1.17, respectively. These multipliers are larger than the ones estimated by Owyang et al. (2013) with military spending news series, ranging from 0.57 to 0.79. They are also larger than the ones estimated with the structural VAR approach, ranging from 0.29 to 0.54. We show that the multiplier estimates are likely to be complicated by various factors, for instance, different identification methods, different horizons of anticipation effects included, different types of government spending changes included, and etc..

In all specifications including estimation with our data series, ORZ(2013) military news series and the structural VAR approach, we find that consumption increases in response to a positive government spending shock in Canada. This is in stark contrast with the results in the US. For an increase in government spending in the US, the narrative approach suggests a drop in consumption, while the structural VAR approach finds consumption to increase. We argue that an increase in consumption in Canada can be rationalized by examining how government in Canada typically finances their expenditures. For instance, the largest spending increases associated with the Korean war were largely financed by cutting government expenditures elsewhere. This suggests that such spending increases would not induce the typical negative wealth effect found in the new classical models.

The recent literature has tackled the identification problem in two ways. One approach is the narrative approach. It mainly uses military spending news variables (Ramey and Shapiro (1998), Ramey (2011b), Barro and Redlick (2011), Owyang et al. (2013), Ramey and Zubairy (2014) and etc.). It provides multiplier estimates for the temporary, deficit-financed increase in government purchase. It finds overall expansionary effects of increases in government expenditure, but finds that consumption decreases in response to an increase in government expenditure. The other approach is the SVAR. Blanchard and Perotti (2002), Galí et al. (2007), Perotti et al. (2007), Mountford and Uhlig (2009), Auerbach and Gorodnichenko (2012) and numerous other studies estimate VARs subject to a variety of identification schemes, all of which basically rely on the exogeneity of movements of government spending changes. It generally finds expansionary effects of increases in government expenditure. In particular, consumption increases in response to an increase in government expenditure.

Similar to the Ramey and Shapiro (1998) and etc., our paper adopts the narrative approach. However, we use government documents, while the Ramey and Shapiro (1998) "war dates" are constructed from news sources. As a result, our measure of government spending shocks differs from the Ramey and Shapiro (1998) "war dates" in the following three aspects. The first aspect is the relative timing regarding the news on government spending changes. There are often speculations, discussions or news about the government spending changes before the budget speech. So arguably, the variables constructed from the news sources are better in capturing the anticipation effects, than those constructed from the government documents. Secondly, our measure includes all types of government spending changes and hence is a richer blend of different changes rather than consisting of only military spending changes. Our estimation results are more comparable with those estimated with the structural VAR approach. Thirdly, our measure is independent of any subjective decision making when it comes to assigning the present discounted values of exogenous changes in government spending. The date of announcement of changes in government spending is the date when the speech is made. Instead, Ramey and Shapiro (1998) rely on news sources to identify the size and timing of changes in military spending, which is rather subjective due to the wide range of dates in which news about changes in military spending appear.

There have been extensive debates over the effects of government spending changes. Recently, Ramey (2011a) reviews those studies for both aggregate and cross-locality estimates on a temporary deficit-financed government purchase increase in the US. Hall (2009) also focuses on the impact of government purchases, through both structural VAR and dynamic model estimations. Most of empirical research on estimating the effects of government spending changes has been done for the US. Owyang et al. (2013) extends military spending news data for Canada back to 1921. Crafts and Mills (2013) reports estimates of the fiscal multiplier for interwar Britain by constructing a defense-news variable. There are also studies of multiple countries, such as by Perotti (2005) on the OECD countries, Beetsma et al. (2008) and Beetsma and Giuliodori (2011) on the EU.

The paper is organized as following: section 2 describes the data and our methodology of constructing the narratives of exogenous changes in government spending. Section 3 provides the estimation results with our newly constructed data series. Section 4 compares the government spending multipliers identified and estimated with other methods. Section 5 examines the effects of government spending shocks on consumption. Section 6 provides the effects of announced and implemented government spending changes. Section 7 concludes.

2 Data

The section begins with a brief overview of the fiscal policy in Canada. Then, we provide detailed discussions on the narrative approach and how we construct the data series on the planned major government spending changes or the government spending shocks.

2.1 An Overview of the Fiscal Policy in Canada

Here, we briefly review the government budget in Canada, the process by which it is made and approved. The government budget in Canada consists of the revenue budget (government income) and the expenditure budget (government expenses). The government cannot simply collect and spend public money however it chooses. Rather, it must first get the permission in the Canadian Parliament. To do so, the government must follow two steps.

First, it must present its budgets for the next year to Parliament for review. This is usually done annually in early spring (February or March). The government presents its budgets to Parliament with a Budget Speech given by the Minister of Finance. When the media refer to the "federal budget", they are usually referring to the Budget Speech, which are also the main source of information for us to construct the data series on the government spending shocks. The finance minister, in the speech to the house of commons, reviews the current and projected state of the economy, presents the financial health of the government at the end of the previous fiscal year, and announces any planned changes in taxation or fiscal policy. There are usually three parts to the Finance Minister's budget address: 1) Details of the Revenue Budget. This includes economic projections for the Canadian economy, the total amount of monies the government expects to collect, and any changes to federal tax rates or structures; 2) A General Overview of Spending. Specifically, the total amount of monies the government expects to spend, as well as its spending priorities (health, education, defence, debt) over the next year (or few years) are identified. 3) Overall Financial State. The government outlines its overall financial position for the next year (or few years), and whether the government expects to record a deficit or a surplus. In addition to the details provided in the budget and Budget Speech documents, the President of the Treasury Board also provides Parliament with specifics concerning the government's spending plans through

what is known as a Tabling of the Estimates.

Second, following the Budget Speech and the tabling of the Estimates, Parliament reviews the federal government's budgets and votes on whether or not to support them. This is a very important vote for the government. Not only is the parliamentary budget vote necessary for the government to begin collecting and spending public monies for the upcoming year, but it is also a measure of the confidence the government enjoys. In the case of majority governments, there is generally little chance that the government will fall. In the case of minority governments, however, the situation can be much trickier. This happened to the government of Prime Minister Joe Clark in 1979, when his minority government of the Progressive Conservative party failed to have to its budget passed by the house of commons.

Budget secrecy in Canada is a long-standing tradition of keeping the contents of the budget hidden till the finance minister presents in the house. In a famous and extreme example of this secrecy, Prime Minister Louis St. Laurent required that his Finance Minister type the entire budget himself, so that not even the Minister's secretary would know its details before they were public. Governments pursued budget secrecy for many reasons. There was the worry that individuals would use inside information from the budget to profit from upcoming government decisions. Governments also used budget secrecy to undermine the ability of opposition parties to criticize the government in an effective manner. In recent years, and especially under Liberal Prime Ministers Jean Chrtien and Paul Martin, there has been less secrecy surrounding the federal budget process. Major budget initiatives are now revealed publicly in advance of their official presentation in the Finance Minister's Budget Speech. This stems from a desire to get feedback from the populace and financial markets, and to forewarn the Canadian population as a whole about any major changes in the government's financial policies, or shifts in savings or spending. A certain degree of secrecy, however, is still maintained; the government never divulges the full details of the budget until the document is formally presented to Parliament through the Finance Minister's budget speech.

In addition to the annual budget, government of Canada has also announced changes to its fiscal policy at other times. While typically the most important policy changes are reserved for the budget, at certain times the prevailing economic and political conditions necessitate the announcement of new measures outside the annual budget. For example, in 1950, after the Korean war broke out in June, the Canadian government announced through a financial statement. Over the years, these statements have been called different names including Financial Statement, Mini-Budget, Supplementary Budget, and Economic and Fiscal Update. These statements are put forward typically in the middle of the fiscal year. For the remainder of this paper, we will use the term *budget speeches* to refer to all the statements made by the finance minister that include information about proposed changes in government spending.

Prior to 1945, fiscal policy did not play a significant role in government action regarding

the economy. Following the end of the Second World War, the Canadian government, influenced by Keynesian economic principles, committed to maintaining high and stable levels of employment and output. The economy experienced high levels of real growth, rising personal disposable income, and strong levels of employment. The government sector became a much greater factor in the overall economy, due to increasing tax revenues and the growth of the state through the implementation of social welfare programs. Figure 1 presents the paths of real government spending per capita and government spending as percentage of GDP in Canada over the period of 1949 - 2012. Between 1949 and 1970, the government's share of GDP rose sharply, from 8.3 to 20.4 percent. In the 1970s, Canada faced both a recession and a large spike in oil prices, which resulted into a stagflation by the end of 1970s. To fight for inflation, government pushed for tight monetary and fiscal policies, which contributed to the 1981-82 recession. These called into question the traditional approaches to fiscal policy. Moreover, during this period there was increased concern over government deficits and debt. While the government had attempted to bring in some contractionary fiscal policies during the late 1970s, it had nevertheless run consecutive fiscal deficits since 1976, with particularly large increases in the 1982-85 period. This deficit spending was due, in large part, to rising costs associated with contributions to social-welfare programs. In addition, as the annual deficits mounted, the federal government was faced with rising debt charges. Beginning in the late 1980s, the government focused its economic policy on creating an environment for sustainable economic growth through the elimination of the deficit and the reduction of the debt. These advances were partially wiped out in the early 1990s, as Canada again went into recession, resulting in a decline in tax revenues. Beginning in 1993, however, the government's share of GDP declines from 24.1 percent to 18.1 percent in 2006. In 2008-09, the global economy entered into a severe recession, and like other major economies, the Canadian economy suffered a major decline. Central to the 2009 budget was a robust stimulus package, which involved a combination of personal income tax reductions, targeted tax credits, and new spending initiative to encourage demand in the Canadian economy. This resulted into an increase in the share of government spending to 22.3 percent in 2010.

2.2 Identification of Exogenous Government Spending Changes

The main source of information for constructing the government spending shocks are the budget speeches, which include announcement about changes in different parts of fiscal policy in Canada. There are other sources like the budget reports which contain detailed information on the government spending programs, but such sources are not available consistently for the entirety of our sample. Another reason for using the numbers quoted in the budget speeches rather than the budget reports is that we are constructing the variables to capture the *news* effect and that effect is through the information provided in the budget speech rather than in other documents that have much limited viewership.

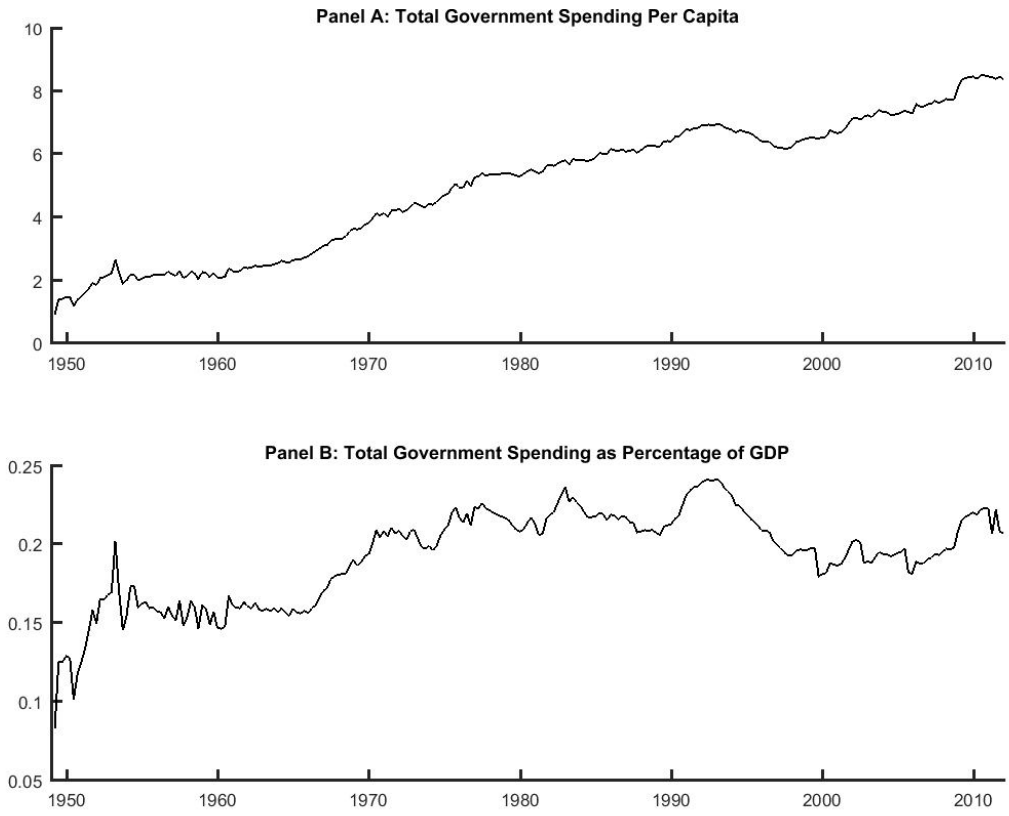


Figure 1: Total Government Spending in Canada 1949 - 2012

Notes: Panel A is total real government spending per capita in thousands of dollars in 2002. Panel B is the total government spending as percentage of GDP.

To construct the data series on the news about future government spending changes, we read through all of the budget speeches going back to 1949. We document the size, timing and principal motivations of each proposed government spending change. We then use the methodology employed by Romer and Romer (2010) and Cloyne (2013) to classify each spending change as exogenous or endogenous. An exogenous spending change is one which is not made in response to contemporary events of the economy, while endogenous changes are those which are taken in response to contemporary events of the economy.

Following Cloyne (2013), exogenous government spending changes could be driven by four different types of motivations. First, the government wants to improve the long-run performance of the economy. These changes can be implemented in times of recessions or booms. For example, the Canadian government spent an extra $ 300 million on job creation to improve the employability of workers from vulnerable communities in 1982. In 2000, the government provided $ 900 million to Canada Foundation for Innovation to help post-secondary institutions, research hospitals and not-for-profit organizations to modernize their laboratories, their equipment and their technologies. Second, the government spending changes are driven by the ideological reasons. In 1994, the government budget intended to build a responsible social security system that was fair, compassionate and affordable, and announced $ 800 million funds to renew and revitalize Canada's social security system. Third, the changes are either enforced upon the government through external bodies or fulfilment of agreements from the past. For example, additional funds were provided to provinces in 2001 for health care as a result of an agreement between the Prime Minister and the provinces from the previous year. Finally, government want to improve the general fiscal health of the economy by reducing inherited debts. For example, the Canadian government reduced grants to businesses and interest group in 1991 in an attempt to control the debt that the government was facing.

The motivations behind the endogenous government spending changes are of three different types. First, government conducts fiscal policy to offset effects of cyclical fluctuations by adjusting aggregate demand. For example, the government of Canada invested $600 million dollars in job creation programs in response to high unemployment due to the weakening economy in 1977. Second, government adjusts spending changes to offset effects of other shocks through supply-side policies. Examples would include spending by the government in 1981 on programs designed to help farmers and small businesses that were finding it difficult to operate at the prevailing high interest rates (which were in place to fight inflation resulting from the oil price increase in the preceding years). Finally, government wants to offset current deficit. An example would be the reduction in spending on regional development programs by the government by $90 million dollars in 1993.

Having collected all the information from the budget speeches, we proceed to the construction of the news variable that will be used in our analysis. We use the methodology of Ramey (2011b) to construct the news variable by calculating the present discounted value of

all announced government spending changes. We use the average yields on the 3-5 years Government of Canada Marketable bonds. To calculate the present discounted value, we need to differentiate government changes which are temporary or permanent. For the temporary changes, we simply use the number of years for which a particular change is announced to calculate the present discounted value. For the permanent change, we calculate the present discounted values in three ways. First, we assume the economy does not look beyond the current year for permanent changes since a new budget is announced every year. Second, we assume that the economy does not look beyond 5 years when forming its expectations and hence we calculate the present discounted values assuming that the permanent change would last for 5 years. Finally, we also construct a measure where we assume that the economy assumes the permanent changes to last forever and calculate the present discounted values accordingly. Our baseline variable includes the present discounted values of the permanent changes under the assumption that the economy does not look beyond one year when forming expectations regarding permanent changes.

We date each observation in the quarter when the budget speech is made. We follow Romer and Romer (2010) and Cloyne (2013) in assigning quarterly dates to the observations in the news series. If a speech is made in the second half of a quarter, we date it to the following quarter. We further divide the present discounted values by the nominal GDP of that year to construct a quarterly time series of news about changes in government spending. This series can be viewed as an approximation to the changes in expectations of the government spendings at the time of the speech, which we call "government spending shocks".

2.3 Properties of the Government Spending Shocks

We now discuss the properties of our news variables about exogenous government spending changes or the government spending shocks, shown in panel A of Figure 2. It is this variable that is used in the empirical analysis in the paper. In the early 1950's, there were large shocks caused by increase in military spending in response to the Korean war. These spikes in government spending that we record from the budget speeches are consistent with the increases in military spending recorded in the news about defense spending by Owyang et al. (2013). In the late 1960's and 1970's, the focus of the government of Canada was to improve the long-run position of the labor market by introducing programs designed at boosting employment. Examples of such measures would include spending by the government on industries like footwear and shipping with a view to expand employment opportunities within these industries and creation of new funds to aid provinces in establishing new job opportunities. The 1970's also saw modifications in the social security and pension programs along with other welfare programs designed to financially help the elderly and needy. For example, between 1972-1974, there were increases in pensions and also increase in allowances for or-

phans. The 1980's also saw continued investment on part of the government in programs designed to boost employment. The government also adopted some contractionary policies, like reduction in budgets of some government departments and reduction in subsidy to the VIA rail system, aiming at improving efficiency of the economy. The 1990's saw the government continue to spend on programs to boost employment in the economy and various other programs related to health, research, and infrastructure. Early 2000's saw Canada, like most other countries, boosted spending on defence and military related expenses in response to the 9/11 attacks. These included increased spending on Canadian armed forces, intelligence services, and on improving security of airports and airline. In addition to huge defense spending increases, Canada also increased spending on improvement of the environment including increased spending on programs for preservation of natural resources, climate change, and improving air quality. The government also continued to increase spending on health related programs in the 2000's.

As a comparison, panel B of Figure 2 shows the endogenous government spending changes. In the mid 1970's, the focus of the government was to boost employment and the overall economic state of the economy which was suffering from the first of the first oil price shocks of 1973. The late 1970's saw the government investing in projects like the Export Development Corporation and the Federal Business Development Bank with a goal to stimulate investment and increase cost competitiveness by encouraging new entries to the market. The second round of oil price shocks hit the world economy in 1979. Rising production costs, caused by increasing oil prices, led to a new phase of stagflation in the Canadian economy. A number of spending changes were adopted in response to these challenges. These included investment of over 8 billion dollars in the energy sector to meet energy demands and funds to assist businesses and farmers in getting loans at cheaper interest rates. It is this period the first big spikes in the news variable about endogenous changes can be seen. Another major spending changes that we observe took place in the 2008-2010 period which were in response to the global financial crisis of 2008.

Table 1 provides the summary statistics for the newly constructed news variable. The news variable about exogenous government spending changes has a mean value of 0.25 percent of GDP whereas the standard deviation is 1.6. There are a total of 53 quarters with non-zero values out of which 50 are positive and 3 are negative which shows that most observations in our variable represent news about future increases in government spending. The endogenous news variable has a mean of around 0.2 percent of GDP with a standard deviation of 1.3. There are a total of 31 non-zero values for the endogenous news variable with all but one of them being positive.

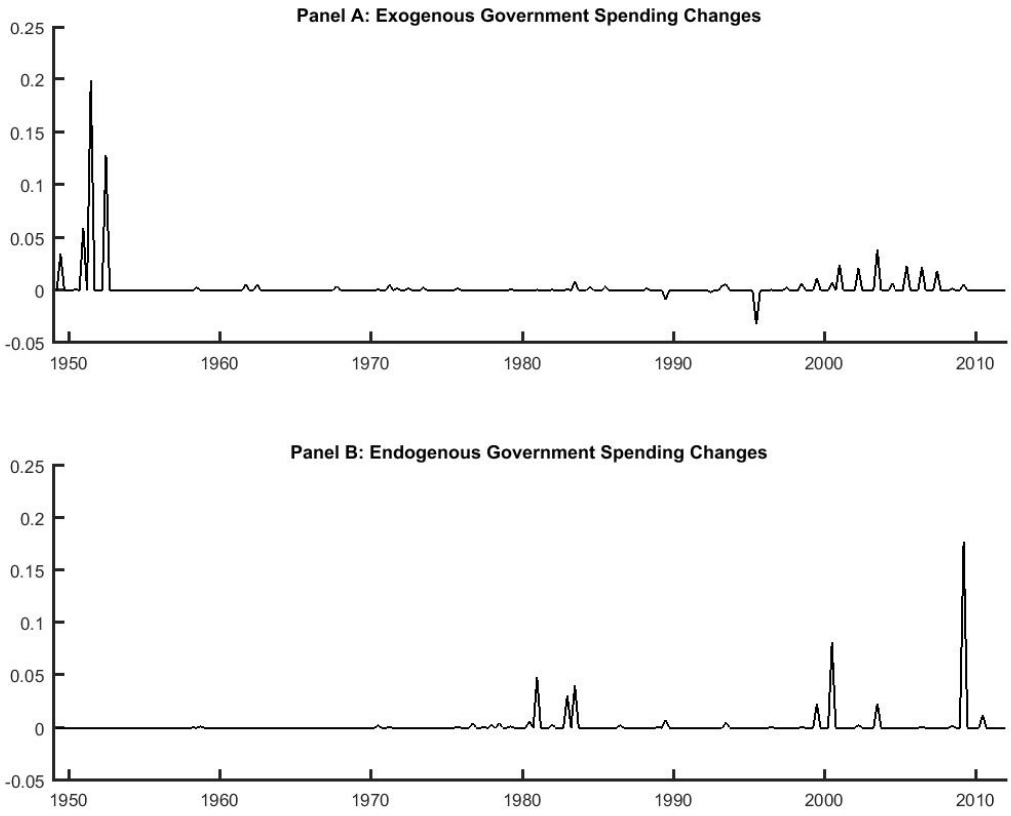


Figure 2: Government Spending Changes in Canada 1949 - 2012

Table 1: Summary Statistics

Variable	Mean	Standard Deviation	Non-Zero Values	Negative Values
Exogenous series	0.25	1.60	53	3
Endogenous series	0.19	1.31	31	0
All (exogenous + endogenous)	0.45	2.11	57	3

2.4 Testing the Predictability of the Government Spending Shocks

To test our newly constructed exogenous series for exogeneity, we follow Mertens and Ravn (2012) and Cloyne (2013) in testing whether the timing of the news of these exogenous government spending changes can be predicted on the basis of past information about other economic variables. For this purpose, we first define an indicator variable to capture the timing of announcement about each exogenous government spending change where the underlying latent process is our news variable. The indicator variable, ω_t, is defined as

$$\omega_t = \begin{cases} 1 & \text{if } news_t > 0 \\ 0 & \text{if } news_t = 0 \\ -1 & \text{if } news_t < 0 \end{cases}$$

We then test the exogeneity of our variable by performing an ordered probit regression of the indicator variable ω_t on a set of regressors that includes 4 lags of output, unemployment, inflation and interest rates. The results are summarized in Table 2. The p-value of the Likelihood Ratio statistic from this ordered probit is 0.72 implying that we cannot reject the null hypothesis that the variables did not have any forecasting power for the government spending changes. When we repeat the analysis with the endogenous news variable, we get a p-value of 0.0015 allowing us to reject the null hypothesis. Thus, this test suggests that our exogenous variable can not be predicted on the basis of past information and supports our claim of this series being exogenous.

Table 2: Test of Exogeneity and Test of Predictive Power

Dependent Variable	Test Statistic	p-value
Test of exogeneity:		
Exogenous series	12.39 (LR)	0.72
Endogenous series	38.02 (LR)	0.0015
Tests of predictive power:		
Government Spending	14.94 (F)	0.0000

We also test whether our exogenous news variable has predictive power for government spending and whether it is a relevant instrument for government spending. Following Ramey (2011b), we regress the growth rate of real government spending on contemporaneous and four lagged values of the exogenous news variable. The F-statistic from this regression comes out to be 14.94 which allows us to reject the null hypothesis that the exogenous news variable has no predictive power for government spending.

2.5 Other Macroeconomic Variables

Other macroeconomic variables used in the analysis shown in Table 3, including GDP, government spending and consumption are from statistics Canada. It provides quarterly data for these variables starting from 1961:1. For the years of 1949 - 1960, we take the quarterly GDP and government spending data from Owyang et al. (2013). We extrapolate consumption data in the early years using quarterly GDP data. Data of unemployment rate comes from Owyang et al. (2013) and Statistics Canada. Data on interest rates comes from Bank of Canada. The income tax revenues required to compute the average income tax rates are available at a quarterly frequency from Statistics Canada starting from 1961:1. For the period of 1949 - 1960, we construct the quarterly series by recording the annual income tax revenues from the government accounts in the budget speeches and then temporally disaggregate them into quarterly frequency.

Table 3: Data Sources

Varaible	Source
GDP	Statistics Canada - series V1992067 and Owyang et al. (2013)
Government Expenditure	Statistics Canada - series V1992049 and Owyang et al. (2013)
Unemployment Rate	Owyang et al. (2013) and Statistics Canada
Consumption	Statistics Canada - series V1992044
Income Tax Revenues	Statistics Canada - series V498317 and government budget accounts
Interest Rates - Bank Rate	Bank of Canada's "Selected Historical Interest Rates" - V122530
Interest Rates - Government of Canada Marketable 1-3 year Bonds	Bank of Canada's "Selected Historical Interest Rates" - V122558
Inflation	CPI data taken from Statistics Canada - Table 326-0020

3 Effects of the Government Spending Shocks

With the newly constructed data series on the government spending shocks, in this section, we investigate the effects of government spending changes on output or the government spending multipliers.

3.1 The Baseline

In the baseline specification, we estimate the following VAR:

$$X_t = A_0 + A_1 t + A_2 t^2 + B(L)X_{t-1} + \epsilon_t, \tag{1}$$

where X_t is a vector of variables to be included in the VAR. In the baseline model, we include log of real output, log of real government spending, and the government spending shocks. $B(L)$ is a lag polynomial with P lags. We follow Ramey (2011b) in choosing 4 as the lag length i.e. $P = 4$. Our sample period for the baseline results is 1949:1 - 2012:1.

Figure 3 provides the results for the baseline specification. The impulse responses describe the percent changes in government spending and output with one percentage point increase in the government spending shocks, along with 68% confidence interval. The left panel shows that a one percentage point increase in the announced government spending leads to an immediate increase in government spending of 0.5 percentage. It peaks 3 quarters after of the initial shock at 1.27 percentage, and gradually declines but remains significantly positive. The right panel in Figure 3 shows the response of output to a one percentage point increase in the announced government spending. It is of hump-shaped. Output increases initially, though insignificantly, and reaches the peak eight quarters after the initial shock at 0.22 percentage.

The ratio of percentage change in output and percentage change in government spending can either be calculated by dividing the peak response of output by the peak response of government spending or by dividing the integral under the impulse responses. To estimate the government spending multiplier - defined as the change in output when government spending increases by one dollar - we further need to multiply the ratio of percentage change in output and percentage change in government spending by the average of ratios of output and government spending over the sample period. The results are in Table 4.[1] It shows that the government spending multiplier is 0.91 for Canada when calculated using the peak responses, 1 when calculated through cumulative responses over two years, and 1.03 when calculated through cumulative responses over five years.

In the baseline specification, we construct the data series on the government spending shocks assuming that economy does not look beyond one year when forming expectations regarding permanent changes. We find that our results are quantitatively and qualitatively robust to how we include the present discounted values of permanent changes. This is partly due to the fact that the permanent government spending changes are much smaller in magnitudes compared with the temporary government spending changes.

3.2 Controlling for Tax and Monetary Policy

The baseline specification includes output, government spending and the data series on government spending shocks. We wonder if the results are sensitive to controlling for monetary and tax policy. To check the robustness, we incorporate the Canadian overnight rate and

[1]Note that this calculation depends on the ratio of nominal GDP and nominal government spending, which is 5.32 over the sample. This ratio was much higher for Canada in the earlier few years in our sample. The average ratio was 6.75 for the 1949-1960 period and 5 after the year 1960.

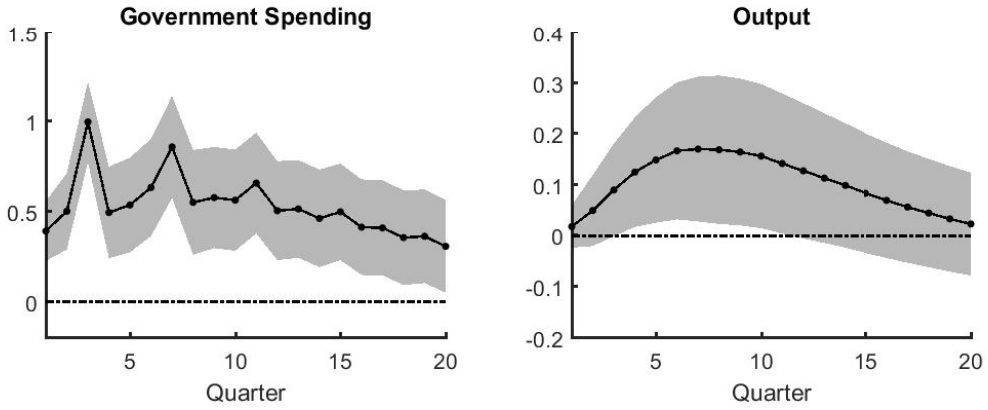


Figure 3: Macroeconomic Effects of Government Spending Shocks - Baseline Specification

average marginal income tax rate into the baseline model. The results are shown in Figure 4. The qualitative responses of government spending and output are very similar to the baseline case. The government spending peaks three quarters after the initial shock and is of a similar magnitude as in the baseline case. The responses of output reach the peak seven quarters after the shock and are larger than those in the baseline case. The government spending multiplier is 1.1 when calculated using the peak responses. When the cumulative responses through two and five years are used, the multipliers are 1.33 and 1.12, respectively.

Figure 4 also shows the response of interest rate and marginal average income tax rate to the government spending shocks. Interest rate rises, but the response remains insignificant for several quarters. The peak response of the interest rate is almost 0.1 percentage, taking place after 10 quarters of the initial shock, though insignificant. The increase in interest rate may reflect the Bank of Canada's inflation targeting preferences. As a result of expansionary fiscal policy, inflation might increase. The central bank might increase interest rate to control for inflation. It is well recognized that the impact of changes in government spending on the economy is closely related to how the government spendings are financed. Here, in response to an increase in government spending, the increases in taxes are small and insignificant.

4 A Comparison of Government Spending Multipliers

The recent literature has tackled the identification problem in two ways – the narrative approach and the structural VAR approach. In this section, we compare our results with the key papers in this two strands of literature in estimating the effects of government spending changes for Canada.

Table 4: Government Spending Multipliers

	Peak Responses	2-year Integral	5-year Integral
HL government spending shocks			
VAR	0.91	1	1.03
VAR controlling for fiscal policies	1.18	1.52	1.17
Jorda's method	1.07	1.21	1.89
ORZ(2013) military spending news series			
VAR	0.78	0.81	0.81
VAR controlling for fiscal policies	1.08	1.28	0.91
Jorda's method	1.13	1.13	1.38
Mixed government spending shocks			
VAR	1.03	1.09	1.01
VAR controlling for fiscal policies	1.26	1.51	1.09
Jorda's method	1.39	1.64	2.06
Structural VAR approach			
SVAR	0.29	0.37	0.35
SVAR controlling for fiscal policies	0.39	0.54	0.53

Notes: HL government spending shocks are the newly constructed data series on the news of exogenous government spending changes. ORZ(2013) military spending news series are the data series constructed by Owyang et al. (2013) using news sources on military spending changes. Mixed government spending shocks are the data series which incorporate ORZ(2013) military spending variables and HL non-military spending observations. Structural VAR approach is where the government spending shocks are identified by the structural VAR with recursive identification assumptions.

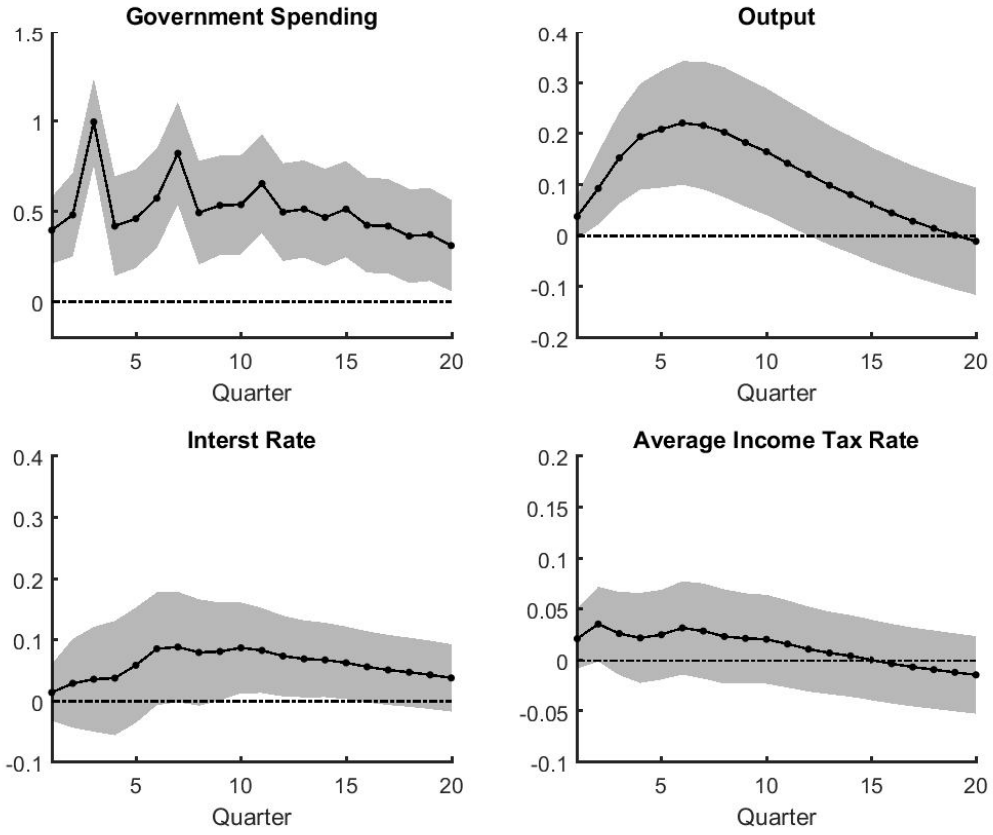


Figure 4: Macroeconomic Effects of Government Spending Shocks - Baseline Controlling for Tax and Monetary Policy

4.1 ORZ(2013) Military Spending News Shocks

Military spending changes or "war dates" are commonly used in the literature to estimate government spending multipliers (See Ramey and Shapiro (1998), Ramey (2011b), Owyang et al. (2013), Ramey and Zubairy (2014) and etc.). It provides multiplier estimates for the temporary, deficit-financed increase in government purchase, which closely mirrors the textbook definition of government spending multiplier. Owyang et al. (2013) (henceforce, called ORZ(2013) for simplicity) examines the government spending multipliers in Canada, using the expected present value of government spending in response to military events. Though our paper also adopts narrative approach, there are some important differences. First, we rely upon the budget speeches made by the minister of Finance, whereas ORZ(2013) uses newspaper sources to gather information about changes in military spending. Ramey (2011b) points out that relying upon government sources can be problematic since they are either not released in a timely fashion or understate the cost of certain military actions. This may not be too problematic for Canada, due to the budget secrecy which ensures that there is little knowledge of announcements about government spending changes. Second, ORZ(2013) uses subjective assumptions regarding the dating of announcements.[2] We do not

[2]ORZ(2013) is a short paper and we could not find detailed accounts on how the variables are constructed for Canada. However, Ramey (2011b) and its companion paper present detailed accounts on different pieces of news that lead up to the construction of every particular observation in the US. However, the dating

need to make these assumptions, as we rely upon the budget speeches. The dates of these speeches are when the respective observation are included in the data.

ORZ(2013) investigates whether the government spending multipliers are greater during periods of slack, and extend the series back in time to include World war II and the Great Depression, which have potentially rich sources of information on economic fluctuations. Here, in order to compare with our results, we restrict the sample size to be from 1949Q1 to 2011Q4. In both data series, the largest changes in government spending is driven by the news on Korean war during the period of 1950-1953. These are also the only observations for ORZ(2013) series after the second world war. In our data series, there are a total of 15 quarters with news about military spending changes and 3 out of them are negative. Apart from the huge increases in military and defence spending in the early 1950's, there were other changes in the 1980's and then in the early 2000's in response to the 9/11 attacks.

We estimate the impulse responses with the baseline VAR method using ORZ(2013) data series, and the results are shown in Figure 5. Qualitatively, the responses using ORZ(2013) data series look similar with those using our data series. Both government spending and output display hump-shaped responses. Government spending reaches the peak 4 quarters after the shock, and output reaches the peak 7 quarters after the shock. In contrast, in our estimation results, government spending reaches the peak 3 quarters after the shock and output reaches the peak 6 quarters after the shock. The implied multipliers estimated with ORZ(2013) data series is 0.78 when calculated with the peak response and 0.81 when calculated with either 2-year integral or 5-year integral. The multipliers are larger than those in ORZ(2013), where they look at a longer sample period from 1921 to 2012, with the government spending multiplier estimated to be between 0.57 and 0.79. When we control for monetary and fiscal policies, the responses remain qualitatively similar (figures are omitted) and the multiplier is 1.08 when calculated with the peak response, 1.28 calculated with 2-year integral and 0.91 calculated with 5-year integral.

Moreover, we follow the econometric methods in ORZ(2013) to calculate impulse responses using Jorda's local projection technique, which does not impose the implicit dynamic restrictions involved in VARs. We estimate a set of regressions for each horizon h as follows:

$$z_{t+h} = \alpha_0 + \alpha_1 t + \alpha_2 t^2 + \psi(L) y_{t-1} + \phi(L) g_{t-1} + \beta_h s_t + \epsilon_t,$$

where y and g are the logs of output and government spending, s is the military government

of each observation varies and other dates for the same observation can be argued for. For example, in the measure of Ramey (2011b), there is an increase in military spending of around 26 billion dollars each year for 5 years announced in 1991 in response to the invasion of Kuwait by Saddam Hussein. The present discounted value of this change is dated to the fourth quarter of 1991. However, the news items included in the companion paper show that the actual invasion and the first news about the US involvement in the war were in the third quarter of 1991. Thus it can be argued that the present discounted value of this change should be dated to the third quarter of 1991.

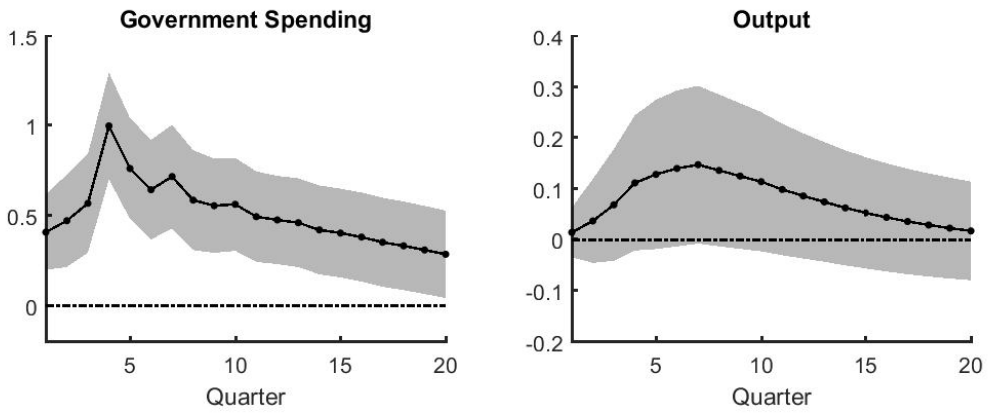


Figure 5: Macroeconomics Effects of ORZ(2013) Military Spending News Shocks

spending shocks or the change in the expected present value of government military and defense spending. We include a quadratic time trend. ORZ(2013) points out that using VAR methods to obtain multipliers can lead to biases as it uses the sample average of Y/G to convert the percent changes to dollar changes, since the ratio of Y/G varies greatly over years. Thus, following ORZ(2013), here we define our dependent variables z as $(Y_{t+h} - Y_{t-1})/Y_{t-1}$ and $(G_{t+h} - G_{t-1})/Y_{t-1}$. By doing so, it converts the percent changes to dollar changes using the value of Y/G at each point in time rather than the average over the entire sample. Figure 6 shows the responses of government spending and output estimated with Jorda's projection method. Panel A is the impulse responses from our data series, while Panel B is those from ORZ(2013) data series. Qualitatively, the responses look similar to each other. With our data series, the implied government spending multipliers, reported in Table 4 are between 1.07 and 1.89, while with ORZ(2013) data series, the multipliers are between 1.13 and 1.38. We also note that the multipliers estimated with Jorda's method are larger than those with the VAR method.

4.2 The Structural VAR Approach

Blanchard and Perotti (2002) have perhaps the most careful and comprehensive approach to estimate fiscal shocks using VARs. To identify shocks, they first incorporate institutional information on taxes, transfers, and spending to set parameters, and then estimate the VAR. The key to identification is the observation that it typically takes longer than a quarter for discretionary fiscal policy to respond to shocks in the economy. Perotti (2005) applies the structural VAR methodology developed in Blanchard and Perotti (2002) to study the effects of fiscal policy in five OECD countries, including Canada. Here, we adopts the structural VAR, essentially relying on Choleski ordering to identify fiscal shocks, in which government sending is ordered before the other variable.

Figure 7 provides the estimated IRFs using the structural VAR approach with two variables - government spending and output. Following a positive government spending shock,

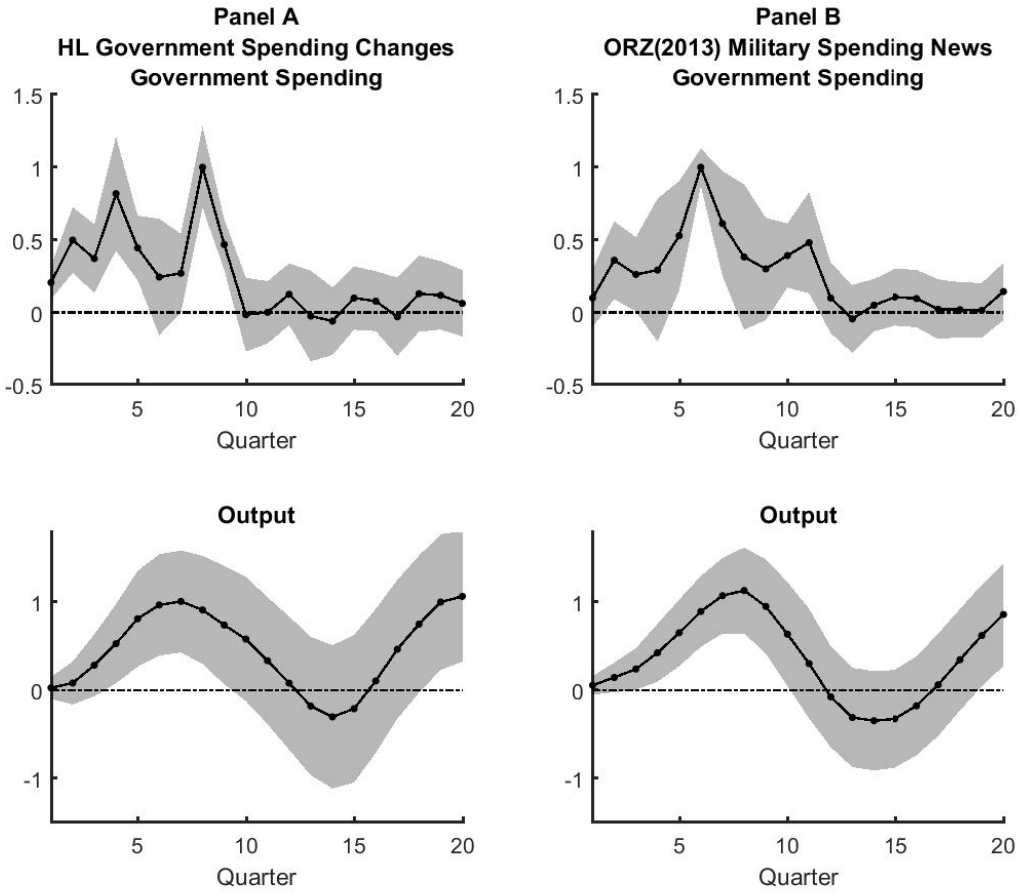


Figure 6: Macroeconomics Effects of Government Spending Changes using Jorda's Projection Method

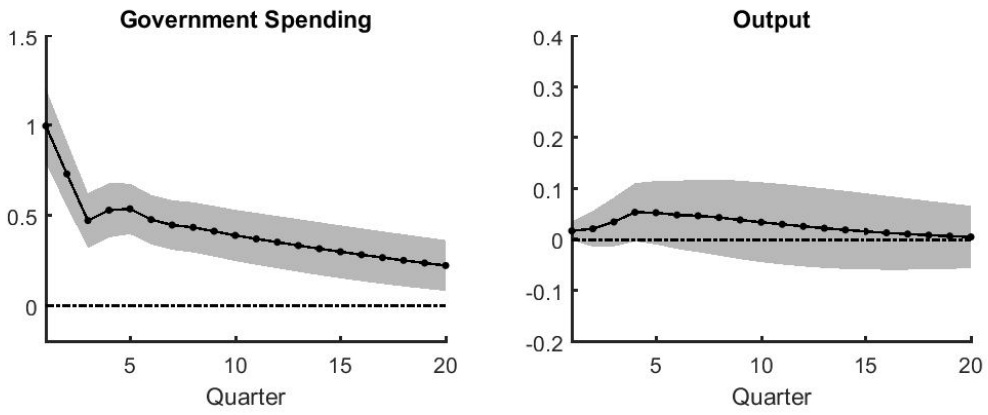


Figure 7: Macroeconomics Effects of Government Spending Changes Estimated with the SVAR Approach

government spending declines steadily. Output rises and reaches the peak 4 quarters after the shock, and then declines gradually. This is similar to the findings in Perotti (2005), who examines the period of 1961Q1 to 2001Q4 for Canada. The impulse responses estimated with four variables - government spending, output, tax and interest rate are similar to those estimated with two variables and the implied multipliers are relatively larger.

In response to a positive government spending shock, both government spending and output increase. However, the overall shape of the impulse responses and the implied government spending multipliers do differ across different identification and estimation methods. The VAR methods with narrative approaches using either HL government spending shocks or ORZ(2013) military news variables, generate hump-shaped responses for both government spending and output. In contrast, in the structural VAR estimation, government spending rises immediately after the shock and then declines gradually. The output response is of hump-shaped, though it peaks much earlier, compared with those estimated with the narrative shock series. Moreover, the implied multipliers estimated with the structural VAR approach, in the rage of 0.29 to 0.54, are much smaller than those with the narrative approaches.

4.3 A Comparison

Across various identification and estimation methods, one thing to note is that the difference in quarters it takes for government spending and output to peak after the shock. This might indicate that to what extent each method is able to capture the anticipation effects. This is exactly the point in (Ramey, 2011a), who thinks that the key difference between the structural VAR approach and the narrative approach is the timing. The narrative approach using the news sources is better in capturing the anticipation effects than the structural VAR approach. Our empirical evidence using Canadian data confirms that the narrative approaches are better in capturing the anticipation effects than the structural VAR approach.

This probably explains that why the government spending multipliers estimated with the structural VAR approach are much smaller. In particular, the narrative approach with ORZ(2013) military news series is the best, as it takes longest for both government spending and output to peak after the shock. This is consistent with how our narrative accounts differ from their construction of news of military spending changes. They do not rely on government documents. Instead, they resort to various news, which are more likely to precede the government documents. One would expect with their news of military spending, it takes longer for the government spending to respond.

As pointed out by Barro and Redlick (2011) and many others, government spending multipliers estimated with military war dates are not particularly interesting when we want to evaluate the impact of various government funded program and projects. However, Barro and Redlick (2011) also points out that it is hard to be optimistic about using the macroeconomic time series to isolate multipliers for nondefense spending for two reasons. One is that compared with the military and defense spending due to the Korean war, the variation in non-defense spending is small. So, it is very unlikely that there is enough information in the variation of non-defense spending to gauge an accurate estimate of the non-defense multiplier. The other reason is that the changes in nondefense spending are likely to be endogenous, that is, correlated with changes in output. Fluctuations in the overall economy likely induce governments to spend more or less on goods services. We try to overcome these difficulties by carefully reading the government documents and construct the exogenous government spending changes mainly based on the principle motivations of the proposed changes. Even though we can not accurately estimate the effects of nondefense spending changes only due to their small variations, we can provide estimates for the effects of both defense and nondefense spending changes, and then compare those with the estimates for the defense spending. At least, we can tell how the estimation results change once we incorporate the nondefense spending changes. The structural VAR approach which includes total government spending in a large macro-econometric model also provides the results on the effects of both defense and nondefense spending changes.

It is hard to pin down even theoretically whether the total government spending multipliers or the nondefense spending multipliers should be larger or smaller than the military spending multipliers. Military spending are temporary and hence may have smaller multipliers. But some government funded programs are also short-lived. The impact of military spending is to have negative wealth effect on the economy. In contrast, many government programs are proposed and implemented to improve long-run economic performance or redistributive purpose, which may have positive effect on the economy. Baxter and King (1993) argue that an increase in government investment has a much stronger impact on the economy than a pure rise in government purchase of goods and services. Comparing with the baseline results, we note that the estimates of the multipliers with our complete data series on government spending changes (0.91-1.03) are larger than the multipliers estimated with

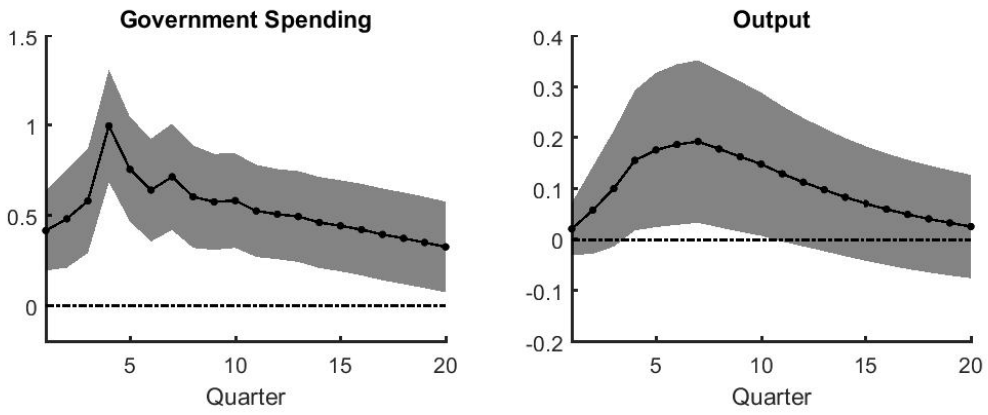


Figure 8: Macroeconomics Effects of Government Spending Changes Estimated with the ORZ&HL Mixed Shocks

our data series on military and defense spending changes only (0.66-0.76). This is likely due to the fact that the complete data series on government spending changes include various other types of government spending changes which likely lead to higher output. In contrast, military spending changes are often thought to have only negative wealth effect on the economy. This potentially explains that why the multipliers estimated with the HL shocks series are larger than those with ORZ(2013) military news series.

In addition, we combine the HL shocks series with the ORZ(2013) series, in the way that we replace the Korean war related government changes in HL shocks series with those in the ORZ(2013) series. The new series on the government spending shocks is called the ORZ&HL mixed shocks. This data series is the best in capturing the anticipation effects as it incorporates observations about the Korean war from the ORZ(2013) series. It also provides estimated effects of both defense and nondefense government spending changes as it incorporate all the non-Korean war government changes from the HL shock series. Figure 8 provides the estimated IRFs. Qualitatively, the responses look similar with those using the narrative approaches with either the HL shocks or the ORZ(2013) shocks. Both government spending and output display hump-shaped responses. Government spending reaches the peak 4 quarters after the shock, and output reaches the peak 7 quarters after the shock. The implied multipliers are the largest across all identification and estimation methos, which lies in the range of 1.01 to 2.06. It is likely due to the fact that the shocks series is better in capturing the anticipation effects and incorporating the effects of defense and non-defense spending changes.

5 Responses of Consumption

In this section, we asses how changes in government spending affect consumption. The responses of consumption have been at the centre of the debate about the effects and mechanisms of government spending shocks. The empirical estimates ranges from being negative, almost zero and positive. With military war dates, in response to an increase in government spending, consumption declines, shown in Ramey and Shapiro (1998), Burnside et al. (2004) and Ramey (2011b). Fall in consumption when government spending rises is in line with the neoclassical model (see Baxter and King (1993) for example), where an increase in government spending financed by lump-sum taxes leads to negative wealth effects and hence a decline in consumption. In Barro and Redlick (2011), the estimated effects from the current defense spending variables on nondurable consumer spending differ insignificantly from 0. The papers mostly using the structural VAR identification including Blanchard and Perotti (2002), Fatas and Mihov (2001), and Mountford and Uhlig (2009), Galí et al. (2007) and others find positive innovations in government spending are followed by strong and persistent increase in consumption. This can not be matched by several variations to a standard real business cycle model with plausible parameter values, shown in Fatas and Mihov (2001). Galí et al. (2007) extend the standard New Keynesian model to allow for the presence of rule-of-thumb consumers and show that how the interaction of the latter with sticky prices and deficit financing can account for the fact that consumption rises in response to an increase in government spending. However, Ramey (2011b) stresses that the response of consumption is an empirical question. The key difference in structural VAR and the Ramey-Shapiro narrative approach is the timing, which explains the different estimation results on consumption responses. Thus, both macroeconomic theories and empirical estimates, mostly using the US data, can not agree on the exact effects of government spending shocks on consumption. Here, with our newly constructed data series on government spending shocks, we can provide additional evidence for Canada. We further compare our estimates with those estimated with ORZ(2013) military news variables and the structural VAR approach.

We augment the vector of endogenous variables in VAR with consumption. Consumption, shown in Figure 9, shows no response upon the arrival of the news about government spending changes, starts to increase significantly after three quarters of the initial shock and continues to stay significantly positive for most horizons. The hump-shaped responses mirror the movement of output after the shock.

The response of tax policy or how government purchases is financed might explain the difference in consumption responses between Canada and the US. Ramey (2011) shows that average tax rates increase by upto 10 percentage points and the effect is significant where we find smaller and insignificant effects. In our case, we do not observe the government to raise taxes when it increased expenditure substantially. For example, in the US, the Revenue act

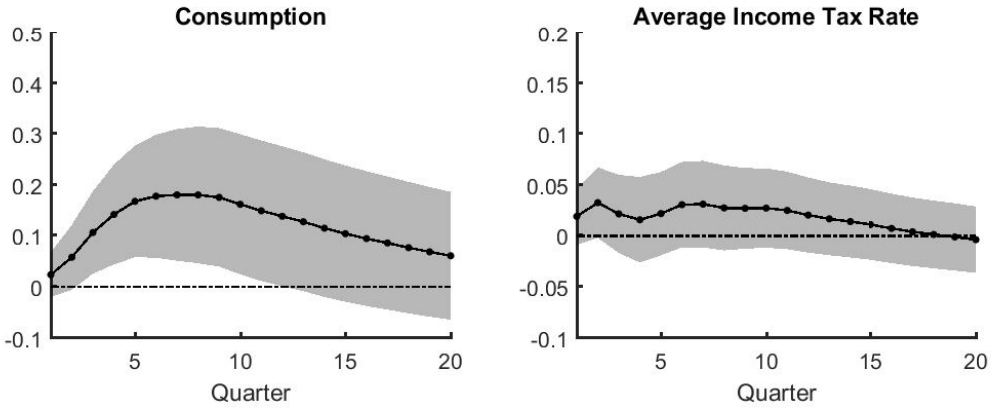


Figure 9: Responses of Consumption Estimated with HL shocks

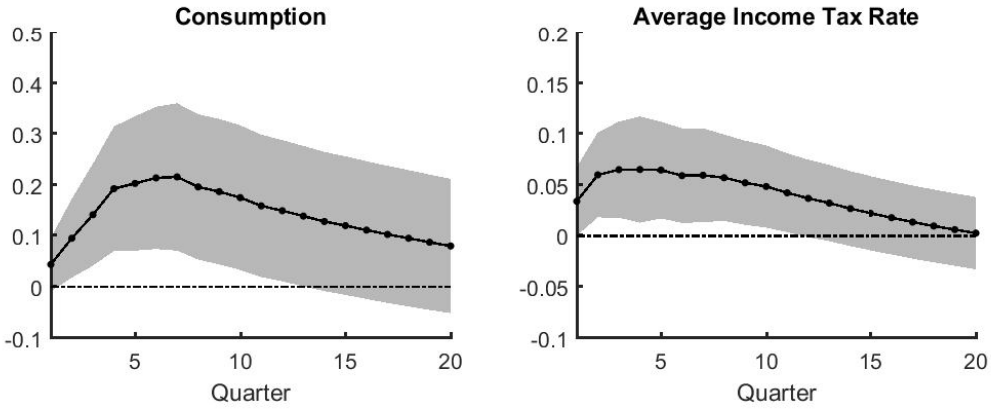


Figure 10: Responses of Consumption Estimated with ORZ(2013) shocks

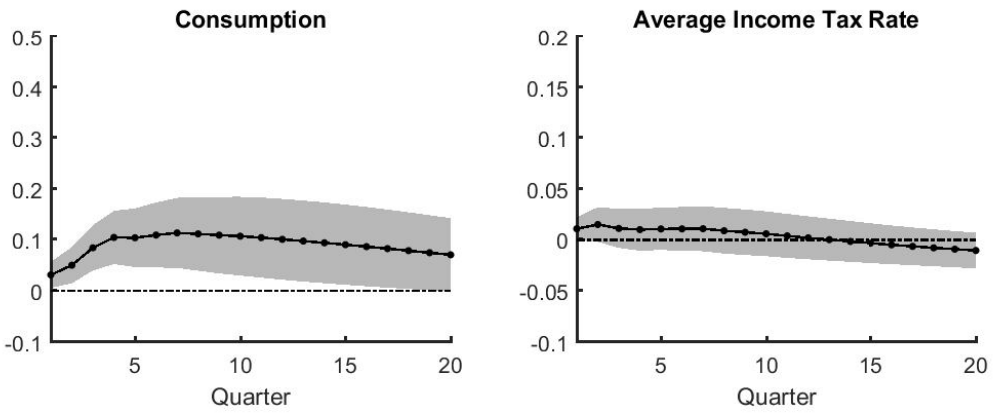


Figure 11: Responses of Consumption Estimated with the structural VAR approach

of 1950 was enacted to finance the war time expenditure associated with the Korean war which increased tax rates on individuals and corporations.[3] In Canada, however, there were no substantial accompanying increases in taxes when military expenditure increased in the early 1950s. In the budget speech of September 1950, when it was announced that Canada would be increasing military spending, it was made clear that the intention of the government was not to have any effect on personal consumption expenditure. The government increased the tax rate on profits of corporations and commodity tax on alcohol by small amounts but the main channel through which the government was able to finance the expenditure was a reduction in its own spending on construction projects. While there was a defense surcharge imposed on individuals a year later, it was made clear that the government did not want to disturb private consumption in order to finance the increased defense spending. Our results earlier showed that indeed there doesn't seem to be any large and significant effect of a news about government spending for Canada, whereas Ramey (2011b) showed that average tax rates significantly increase by up to 10 percent.

6 Effects of Announced and Implemented Government Spending Changes

It is well-known issue that the the predictive power of the news variables for government spending changes rests on the large military spending changes associated with the Korean War and two world wars. Though our data series incorporate both defense and non-defense spendings, the predicative power of the shocks comes from the Korean war. If we test the predictive power of the shocks by excluding the early 1950's observations by regressing the growth rate of actual government spending on the shocks, we get low F-statistic showing that the variable is not very informative for government spending. The impulse response of government spending (not shown) is insignificant at most horizons. The response of

[3]See Romer et al. (2009) for detail.

output (not shown) is positive and significant. But, the low predictive power for government spending means that we cannot calculate the government spending multiplier with any degree of confidence using the baseline methodology.

The way Ramey (2011b) gets around the weak predictive nature of her news variable in the post Korean war period is to construct an alternate measure of news about future government spending based on the survey of professional forecasts. However, no such measure is available for Canada. Instead, we introduce a different methodology. We construct a new variable consisting of announced and implemented government spending changes. This variable draws from the information that we collect to construct our exogenous new variable. We isolate those government spending changes that are announced and implemented in the same year. We ignore any changes that are announced in the previous years. If a change is to be implemented over a number of years then we only take the part of it that is implemented in the same year. We call these the announced and implemented government spending changes. We then assume that these changes have the same implementation dates as their announcement dates.

we also try to document the implementation dates. However, unlike tax changes, government spending changes do not have a particular implementation date. While the implementation date is not important for the construction of our news variable, later in the paper we construct a measure of implemented government spending changes in a particular year and we assume the announcement date to be the implementation date for those changes. We return to the discussion of limitations of this assumption later in the paper.

In this section, we examine how our results change when we remove the large spending increases of the early 1950's caused by the Korean war. We construct a measure of unanticipated government spending changes by isolating out those spending changes that are announced and implemented in the same year. We do this exercise to check whether the government spending multiplier is sensitive to the large military spending increases of the early 1950's. We cannot use our news variable since it loses its predictive power once the early 1950's is removed. We assume that the unanticipated changes are implemented in the same quarter when they are announced. We acknowledge that our assumption is somewhat restrictive. Ideally, we would want to find out the implementation date of each spending change. However, unlike tax changes, government spending changes often do not have a specific start date. By assigning the announcement dates as the implementation dates, we are ignoring potentially important announcement effects associated with government spending changes. Ramey (2011b) discusses that there are often long lags between the decision to increase defense spending and the actual increase in spending because of various administrative steps involved. While acknowledging the restrictiveness of this assumption, we argue that the bias induced by this assumption in our results should be minimal. We, however, believe that the bias in the our results because of our assumption that spending changes are implemented in the same quarter when they are announced is small. That is because of

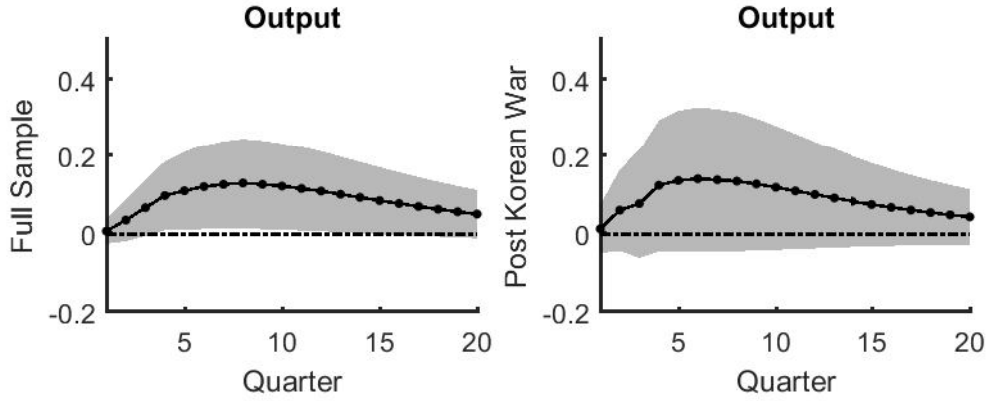
four reasons. First, we have already omitted all the spending changes that have anticipation lags more than 3 quarters i.e. the changes that are announced and implemented in different years. The budgets are usually presented in the first quarter of the fiscal year or in the last few weeks before the beginning of the year. Out timing methodology means that such measures are also dated in the first quarter of the year. Thus, we are assuming that announced government spending changes are implemented in the first quarter of the fiscal year. Other midyear announcements about spending changes in form of mini-budgets or financial statements are about imminent changes so our assumption works well with them. Second, our baseline results have shown that the anticipation effects are not very important since we do not observe output responding to news about spending change: the increase in government spending happens before output starts to increase. Third, Ramey (2011b) correctly argues that defense spending changes are always such that there is a lag between announcement about spending change and the implementation of it since a lot of time is needed to, for example, analyze the type of weapons needed, the amount of funding required, and choice of providers. In our case, however, it is reasonable to assume that the implementation lag is not very long since the work required before implementation is done by Finance ministry prior to making the announcements. Finally, while we will comment on the estimated sizes of government spending multipliers, it is important to remember that this exercise to find out if the government spending multiplier has changed over time or not.

Our variable of interest in this part of the analysis would be announced and implemented changes in government spending as a fraction of previous quarter's government spending. We run a two variable VAR with log of output and our measure of exogenous percentage change in government spending. Note that the response of output to an exogenous shock to government spending will be the elasticity of output with respect to government spending which we will multiply with the average ratio of nominal GDP and nominal government spending to calculate the government spending multiplier.

The response of output is shown in Figure 12. The left panel shows the response of output for the entire sample whereas the right panel shows the response of output for the period of 1953:3 - 2012:1.[4] The two output responses look very similar. For the entire sample, the peak response of output is 0.13 percentage (which is also the elasticity of output with respect to government spending) and takes place 8 quarters after the initial shock. For the post Korean war sample, the peak response of output is 0.14 percentage which takes place after 6 quarters of the initial shock. The estimates for the post-Korean war sample are less precisely estimated however. The estimated government spending multiplier with the peak response as the implied elasticity of output with respect to government spending. Our estimations show that the multiplier using this measure of exogenous unanticipated changes

[4]The last big increase in military spending in our sample takes place in 1952:2. Hence, we start our *post Korean war* sample in 1953:3 so that there is no effect of this last change on the variables in our analysis. Our results do not change if we consider the post-Korean war period to begin in 1954 or later as well.

Figure 12: Macroeconomic Effects of Government Spending Shocks - Full Sample and Post Korean War Sample



in government spending is around 0.7 for the entire sample and 0.75 for the post-Korean war sample. Thus, this shows that the multiplier largely remains the same for Canada for the post WWII period regardless of whether the large military spending increases of the early 1950's are included in the sample or not.

Thus, based on our analysis of this section, it can be argued that the government spending multiplier has not changed over time for Canada. This result is different from Ramey (2011b) who found that for the US, the government spending multiplier for the entire sample is greater than that for the post Korean-war period. We can also conclude that the implied multiplier for permanent government spending changes is bigger than that for temporary changes but the estimation of the multiplier for permanent changes is less precise.

7 Conclusion

In this paper, we construct a novel measure of news about exogenous government spending changes for the post war period in Canada. Previous studies have typically used military spending as an instrument for overall government spending, whereas we use all exogenous government spending changes. Our results show that government spending multiplier for Canada is around 0.91 to 1.52, which is higher than those estimates by the narrative approach with war dates and the structural VAR approach. Our methodology of constructing unanticipated spending changes is a useful tool to study the government spending multipliers for those countries that have experienced large increases in military spending or for periods when such increases are absent. Finally, an important takeaway from our study is that it is important to study how government spending changes are financed. The effect of spending on consumption crucially depends upon the source of financing of spending in-

creases. If a new program is not draining resources from the economy then negative effects on consumption, as predicted by the new classical model, should not be expected.

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