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

Syed M. Hussain † Lin Liu ‡

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Abstract

This paper examines the macroeconomic effects of government spending shocks in Canada for the period of 1949 - 2012. We construct a novel measure of news about exogenous government spending changes identified through the narrative approach. We use government documents, mostly the budget speech, to identify the size, timing, and principal motivation for all planned major federal government spending changes. To achieve identification, we consider those changes that are unrelated to the contemporaneous movements in the economy. The implied government spending multiplier estimates using our exogenous government spending news series are between 1.08 and 1.69.

JEL Classification: E62, H3.

Key Words: Government Spending Shocks, Government Spending Multiplier, Narrative Accounts, Canada.

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†Department of Economics, James Madison University, Harrisonburg, VA, USA, Email: hussa2sm@jmu.edu

‡Department of Economics, University of Liverpool, Liverpool, UK, Email: lin.liu@liverpool.ac.uk

1 Introduction

The great recession of 2008 and COVID-19 induced economic crisis of 2020 forced governments worldwide into providing their economies with various stimulus plans. These plans have highlighted the importance of our understanding regarding their macroeconomic effects. However, despite their 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. The problem that arises in the study of government spending changes is that of simultaneity - while there is no doubt that government spending changes affect GDP, but at the same time, GDP itself can cause changes in government spending. This identification problem has been mainly tackled by two different approaches in the literature - the structural vector autoregression (SVAR) approach (Blanchard and Perotti, 2002) and the narrative approach (Ramey and Shapiro, 1998; Ramey, 2011b).

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 speeches, 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 a new measures of news about 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 1.08 for Canada, when the elasticity of output with respect to government spending is calculated as the ratios of their peak responses to

shock to news about government spending. When calculated through cumulative responses over 2 and 4 years, the implied multipliers are 1.48 and 1.26, respectively. These multipliers are larger than the ones estimated by Owyang et al. (2013) with military spending news series for Canada, ranging from 0.57 to 0.79. They are also larger than the ones estimated with the structural VAR approach, ranging from 0.40 to 0.55.

We also address the issue of the news variable losing its predictive power for government spending once large defense spending changes are removed. Ramey (2011b) noted that their news variable loses its explanatory power for government spending when the observations associated with WWII and Korean War are removed. We find a similar problem with our news variable: it loses its explanatory power for government spending if we remove the observations corresponding to the large defense spending increases associated with the Korean War. This limits our ability to use to this variable to study only those sample periods that include the Korean War years.

To get around this problem, we construct a measure of announced and implemented government spending changes. This includes all those measures that were to be implemented in the same year as they were announced. If a spending change were to be implemented over a number of years then we only include the part that would be in implemented in the same year. We then assign these spending changes to the quarter when the budgets were approved. For midyear announcements about spending changes, we use the announcement dates as implementation dates. While acknowledging that this assumption may result in some bias in our results, we argue that the bias would be small because 1) we omit the observations that are announced in one year and implemented in a future year, 2) we do not find strong evidence of anticipation effects when using our news variable: government spending starts increasing significantly in the same quarter when the announcement is made and increase in output lags increase in government spending, and 3) it is plausible to believe that the finance ministry makes preparations to implement spending changes for upcoming

changes before announcing them.

We normalize our measure of announced and implemented spending changes by lagged GDP and use this variable to estimate the government spending multiplier. The estimated multiplier comes out to be 0.92 which is close to other estimates that we get. We also estimate the multiplier using annual data on announced and implemented changes since the anticipation effects are less problematic in annual data. The multiplier that we estimate comes out to be 0.94 which is very close to the estimate from the quarterly data. We also find some evidence that austerity measures of the mid 1980s's and 1990's had smaller contractionary effects than the expansionary effects of spending increases. The use of announced and implemented spending changes in our analysis is a significant contribution of our paper. This is because most countries have not experienced the likes of military spending increases that US and Canada have. Furthermore, even with these countries, we have to stretch the sample back to the 1950's to seek identification in the empirical analysis. The analysis using announced and implemented spending changes do not have such requirements and can easily be replicated for other countries.

One important difference between the results from the studies involving SVAR and narrative approaches is the effect of spending changes on consumption. Studies like Blanchard and Perotti (2002), Galí et al. (2007), Perotti et al. (2007), Mountford and Uhlig (2009), Auerbach and Gorodnichenko (2012) that use the SVAR approach generally find an expansionary effect of spending changes on consumption. On the other hand, studies like Ramey and Shapiro (1998), Ramey (2011b), Barro and Redlick (2011), and others that use the military spending news variable find contractionary effects of spending increases on consumption. Our results are in line with previous studies using the narrative approach: we find that spending increases in Canada result in consumption decreasing. However, unlike the SVAR studies for the US, we find that SVAR approach for Canada also gives a negative response of consumption to spending increases. However, the response estimated from the

SVAR approach comes out to be much smaller and insignificant.

There have been extensive debates over the effects of government spending changes. Ramey (2011a) reviewed 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. Our paper is similar to those studies that use the narrative approach to estimate the government spending multiplier.[1] Some of the studies using this approach are Ramey (2011b), Ramey and Shapiro (1998), and Barro and Redlick (2011). There are also papers focusing on the asymmetric nature of the government spending multiplier, including Ramey and Zubairy (2018) , Owyang et al. (2013), Barnichon and Mathhes (2017) and etc.

The literature studying the macroeconomic effects of government spending changes for countries other than the US is rather sparse. Crafts and Mills (2013) report 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. Owyang et al. (2013) extend military spending news data for Canada back to 1921. Alesina et al. (2017) and Guajardo et al. (2014) use the narrative record to identify episodes of fiscal consolidation - including both government spending decreases and tax increases - for OECD countries and find strong contractionary effects of such changes. Methodologically, our study is similar to both of these but we focus on a much larger sample, both in terms of time and in terms of types of government spending changes. Compared to Owyang et al. (2013), the main advantage of our approach is that it is replicable for other countries that have not experienced large military build-ups. Also, our approach of using announced and implemented spending changes gets

[1]The narrative approach has also been used to identify other economic variables. For example, Romer and Romer (2010), Mertens and Ravn (2013), Cloyne (2013a), Hayo and Uhl (2014), and Hussain and Liu (2018) use the narrative approach to study the macroeconomic effects of tax changes. Romer and Romer (2016) use the narrative approach to study macroeconomic effects of transfer payments for the US.

around the potential problem of the news shock series being a weak instrument for overall spending.

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 announced and implemented government spending changes. Section 6 provides the effects of government spending changes on other economic variables. Section 7 concludes.

2 Data

The appendix of this paper describes a biref overview of the fiscal policy in Canada, including a brief summary of how the government spending policy of the federal government has evolved over time. Here, we provide detailed description of the narrative approach and how we construct the data series on the planned major government spending changes or the government spending shocks.

2.1 Identification of Exogenous Government Spending Changes

The main source of information for constructing our series of government spending shocks is the budget speech. Budget speeches include announcements 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 our goal is

to gather data on variables that would allow us to capture the *news* effect of government spending changed. And this effect is generally captured through the information provided in the budget speech rather than in other documents that have much limited viewership.

However, we do consult the budget reports and other budget documents when the budget speech does not contain some of the information. This was especially true for the last few years in our sample where the budget speeches would only mention the major new spending initiatives without mentioning their sizes or other details. For these years, we rely upon the budget reports to gather the missing information for the spending changes.

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 (2013b) 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 (2013b), we classify exogenous government spending changes into four categories. First, *long-run* changes are those through which the government tries to improve the long-run performance of the economy. These changes can be implemented in times of recessions or booms. We find such changes spread out throughout our sample. For example, in 1985, the Canadian government spent $1.8 billion on training and employment programs whose aim was to help in the career development of Canadian workers. Similarly, In 2000, the government provided $ 500 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 can be driven by the *ideological* reasons. Such changes were also spread throughout our sample. For example, 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, *deficit consolidation* changes are the ones through which a government aim to improve the general fiscal health of the economy by reducing inherited debts. For example, between 1986 and 1995, there were a number of spending cuts (mostly in form of reduced department funding, reduced foreign aid, and reduced subsidies) enacted by the government in order to address the growing debt of the economy. Finally, *military spending* changes are increases or decreasesx in military spending. There were periods of increase in military spending, for example in 1950s because of the Korean war and in 2001 because of the increased terrorist threats in the aftermath of the 9/11 events, and decreases in military spending, for example in the early 1990's because of the end of the cold war.

We classify endogenous spending changes into two categories. First, *demand management* spending changes are generally undertaken to offset effects of cyclical fluctuations by adjusting aggregate demand. For example, in 2009, the government enacted a number of spending increases in infrastructure development and other programs in order to create jobs and mute the effects of the recession. This category also includes some spending cuts enacted by the government in 1993 in response to current deficit created by lower tax revenues in the previous year. Second, government can use *supply stimulus* spending change to counter 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).[2]

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

[2]While we classify exogenous and endogenous spending changes into different categories; in this paper we do not study the effects of these categories separately.

discounted value of all announced government spending changes. We use the average yields on the 1-3 years Government of Canada Marketable bonds for the calculation of the present discounted values.

To calculate the present discounted value, we need information on whether the announced government spending changes were intended to be temporary or permanent. For the temporary changes, we simply use the number of years for which a particular change was announced. For the permanent changes, 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. In this paper, we use the second of these measures where we assumed that permanent spending changes have a lifetime of 5 years. The results remain largely unchanged if we use the other two measures.

We date each observation in the quarter when the budget speech is made. We follow Romer and Romer (2010) and Cloyne (2013b) 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 annualized nominal GDP of the previous quarter 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" or the "exogenous news series".

2.2 Properties of the Government Spending Shocks

We now discuss the properties of our newly constructed news variable about exogenous government spending changes shown in panel A of Figure 1. It is this variable that is used in the empirical analysis in the paper. In the early 1950's, there were large increases in spending 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 orphans.

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 subsidies, aimed 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 to middle 1990's were also marked by decrease in spending motivated by concerns about the debt of the economy. 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 1 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 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 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 0.26 percent of GDP whereas the standard deviation is 1.68. There are a total of 48 quarters with non-zero values out of which 39 are positive and 9 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 0.07 percent of GDP with a standard deviation of 0.46. There are a total of 24 non-zero values for the endogenous news variable with all but two of them being positive.

2.3 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 (2013b) in testing whether our newly constructed government spending news variable can be predicted on the basis of past information about macroeconomic indicators. For this purpose, we run two kinds of tests. First, we run a linear regression with the government spending news variable as the dependent variable and 4 lags of first difference of (log) output, (log) real income tax revenues, interest rate, unemployment, and inflation as the macroeconomic indicators. Second, we test whether the timing of news about exogenous spending changes can be predicted by macroeconomic indicators. For the second test, 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 this variable by performing an ordered probit regression of the indicator variable ω_t on the same macroeconomic indicator variables that we use in the linear regression.

The results are summarized in table 2. The results from the linear regression show that there is no evidence to believe that the macroeconomic indicators have any predictive power for the exogenous government spending news series. The F-value of the regression is 1.23 with a p-value of 0.23. Furthermore, we found that there was a strong correlation between the macroeconomic indicators and our newly constructed exogenous news series during the Korean war years.

The huge increases in military spending associated with the Korean War that took place in early 1950's were at the same time when Canada was going through a period of extremely low unemployment and high output. This period of economic prosperity was a result of the post World War II boom experienced by most economies worldwide. The data shows that unemployment, in particular, was unusually low during the early 1950's. The sample average of unemployment is close to 7 percent with only 17 values throughout the sample being less than 3 percent. However, all of these low unemployment values were found in the first eight years of our sample during which the Korean war also took place. Similarly, the sample average for the growth rate of real GDP is 0.9 percent per quarter but this was value was around 1.4 percent in the beginning of our sample.

When we re-run the linear regression by omitting the Korean war military spending observations from our data. The p-value of the F-statistic of the regression comes out to be 0.78 which shows that we cannot reject the null hypothesis that the macroeconomic indicators indeed have no predictive power for our newly constructed exogenous news series. When we run the same linear regression with the endogenous government spending news series (shown in row 3), we get a p-value of 0.002 which clearly suggests that the endogenous news variable can indeed be predicted on the basis of past information.

The next two rows show the results from the ordered probit regression. The p-value of the Likelihood Ratio statistic from this ordered probit is 0.153 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 0.033 allowing us to reject the null hypothesis. Thus, this test suggests that the timing of our exogenous news variable cannot be predicted on the basis of past information and supports our claim of this series being exogenous.

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 15.43, with a p-value of 0.00, which allows us to reject the null hypothesis that the exogenous news variable has no predictive power for government spending.

2.4 Announced and Implemented Spending Changes

In the previous subsection, we showed that our news variable has strong predictive power for government spending changes. However, we find that this predictive power significantly diminishes once we remove the observations associated with the Korean War. This is problematic for two reasons. First, it means that it might be difficult to extend our study to other countries that have not experienced large spending changes akin to those associated with the Korean War. Second, this problem limits our study to the those samples that include the Korean war period.

For Canada in particular, we are interested in how the effect of fiscal policy has changed since the mid 1980's. The 1980's saw a shift in federal government's policy towards reducing deficits and debt. The deficits had started to accumulate since before the oil price shocks of 1973 and the counter-cyclical policies of the government during the recessions of the 1970's worsened the debt position of the country. Hence, the government responded to these rising deficits by engaging in fiscal austerity measures from the mid 1980's to the mid 1990's (Thiessen, 2001; Di Matteo, 2017). Our own narrative also makes it clear that there were significant changes in the way spending policy was conducted after the mid 1980's. For example, all the nine negative values that we have in our news variable are in the post-1984:2 period and correspond to deficit consolidation changes enacted by the government to tackle its debt problem.[3]

[3]1984:3 was the first time the government announced reductions in government spending during the mid 1980's. Therefore, we take 1984:2 as the splitting point of our sample.

For the post-1984:2 period, the regression of growth in real government spending on contemporaneous value and 4 lags of our news variable yields an F-statistic of 1.69 with a p-value of 0.14. The F-statistic falls well short of the threshold used in literature of 10 (see Ramey, 2011b and Staiger and Stock, 1997). This indicates that our news variable is a weak instrument for the post-1985 sub-sample.

Ramey (2011b) faces the same problem when using her defense spending news variable for the US for the post Korean war years. The way they gets around the weak predictive nature of their news variable in the post Korean war period is to construct an alternate measure of news about future government spending based on the difference between actual spending and forecasted spending from the survey of professional forecasters. However, no such measure is available for Canada.[4]

Instead, we introduce a different methodology. We construct a new variable consisting of announced and implemented government spending changes. This variable is constructed from the information that we collect to construct our narrative news 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 the dates when the budgets are officially approved (the royal assent dates). For older budgets, we could not find data on the royal assent dates. Our reading of later budgets showed that the budgets were always approved about 3 months after the initial tabling of them. Thus, we assume that all budgets were implemented with a lag of one quarter. Spending changes that are announced midyear through other types of announcements like Financial Statement

[4]Also, Perotti (2011) discusses that the forecast error - difference between actual and forecasted spending - has high predictive power for the actual spending in Ramey (2011b) for the *wrong* reason: the forecast of spending is itself not informative of the actual spending at all. That is why the forecast error is effectively the actual spending minus noise.

or Mini Budget are those that are to be implemented immediately. For such changes, we take the announcement date as the implementation date. In short: we assume that the implementation dates of measures announced in yearly budgets are one quarter after the speech and the implementation dates of measures announced midyear are the same as the announcement dates.

We acknowledge that our assumption of assigning the approval date as the implementation date 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 approval 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. That is because of three 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. This also means that our series can be plausibly considered *unanticipated*. This is a strength of our series because, as argued by Ramey (2011b), anticipated spending changes can have different effects from unanticipated changes. Second, our baseline results will show 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.[5]

We then normalize this series by the nominal GDP of the previous quarter. Figure 2 shows this announced and implemented spending series. The figure also plots the news shock series for comparison. The news series has typically larger values than the announced and implemented series. This is because the news series consists of present values of spending changes announced for several years whereas the announced and implemented series only consists of changes announced and implemented in the same year. Table 1 shows the summary the statistics for this series. The announced and implemented series has 41 increases and 7 decreases. The mean value for this series is 0.07 percent of GDP and the standard deviation is 0.38 percent of GDP.

We also conduct the tests of predictability on the announced and implemented spending series. The results are in Table 2. The linear regression results show that there is no evidence that series can be predicted on the basis of macroeconomic indicators. The F-statistics of the regression is 0.58 with a p-value of 0.92. The ordered probit regression results also show that the timing of the announced and implemented changes cannot be predicted on the basis of past macroeconomic information. The p-value of the Likelihood Ratio test from this regression is 0.52 allowing us to reject the null hypothesis of the series being predictable on the basis of past information.

[5]Most governments in Canada have been majority governments and in case of such governments, the budget is guaranteed to pass. In case of minority governments, the government often includes concessions to smaller parties to ensure passage of the budget. This is because the passage of budget is a confidence measure: if the House votes against the budget the government can fall like in the case of the minority government of Joe Clark in 1980. Thus, finance ministers are confident about the passage of the budget before announcement and that is why is reasonable to believe that they make all the necessary arrangement for spending changes ahead of time.

2.5 News Shock Series and Existing Measures of Spending Changes

In this section, we briefly compare our newly constructed exogenous news shocks series with other measures of spending changes for Canada. In particular, we compare our series with two previous measures of exogenous government spending changes for Canada

Owyang et al. (2013) Military Spending Series: Military spending changes or "war dates" have commonly been used in the literature using the narrative approach to estimate government spending multipliers.[6] It provides multiplier estimates for the temporary, deficit-financed increases in government purchases, that closely mirror the textbook definition of government spending multiplier. Owyang et al. (2013) examine the government spending multipliers in Canada using news about large military spending changes. 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 and some other budget documents to identify news about upcoming changes in government spending. Owyang et al. (2013), on the other hand, use 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 is not problematic for Canada, due to the budget secrecy which ensures that there is little advance knowledge of announcements about government spending changes. Second, Owyang et al. (2013) use subjective assumptions regarding the dating of announcements.[7] We do not need to make these assumptions,

[6]See Ramey and Shapiro (1998), Ramey (2011b), Owyang et al. (2013), Ramey and Zubairy (2014).

[7]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 are used in the construction of every observation in the dataset for the US. In the dataset, typically, there were several dates given for each observation when news about it was became known. The author then makes assumptions regarding the date of each observation. However, different dates can be argued for in some cases. For example, in the dataset 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

as we rely upon the budget speeches and use the dates when those speeches are made in our data set.

Figure 3 shows our newly constructed news shock series and the Owyang et al. (2013) military spending series. For the sample period studied in this paper, 1949:1-2012:1, the Owyang et al. (2013) series only had non-zero values in the early 1950's associated with the Korean war. Our series also had non-zero values during these years but the precise timing of these are different across the two series. This is because of the different sources for news used in the construction of the two series as discussed above.

Guajardo et al. (2014) Fiscal Consolidation Series: Guajardo et al. (2014) construct a series of fiscal consolidations motivated by concerns about government debt for a set of countries that includes Canada. The Guajardo et al. (2014) series is annual and covers the 1978-2009 period whereas our series is quarterly and covers the 1949:1-2012:1 period. To compare the two series, we annualize our news shock series by summing up the values for each year. We plot the two series in figure 4. We only plot the series for the 1985-1997 period for which the Guajardo et al. (2014) series had non-zero values.

The comparison of the two series shows that the fiscal consolidations carried out in 1980's and 1990's are captured by both of them. However, there are a few years when the two series have opposite signs. These can be explained by looking at how the series are constructed. The Guajardo et al. (2014) series looks at *implemented* spending changes regardless of when they were announced. Our shock series is about the *announcement* of upcoming spending changes.

Devries et al. (2011) describes the construction of the series used in Guajardo et al. (2014). They discuss that in 1987, 1996, and 1997, the spending cuts that were implemented were announced in previous budgets. In our news shock series, these would be captured at the time of announcement. Two other years when the signs of the two series differ are

the present discounted value of this change should be dated to the third quarter of 1991.

1991 and 1993. In 1991, Devries et al. (2011) note that the Expenditure Control Plan announced in the 1990 budget was extended. We document this extension in our data as well. However, there was also a military spending increase in 1991 which results in our value for this year being positive. Since Devries et al. (2011) only look at the spending changes motivated by concerns about government debt, they omit this military spending increase. Finally, in 1993, we document the spending decreases but classify them as endogenous. We do this to be consistent with Romer and Romer (2010) and Cloyne (2013a) who classify fiscal changes motivated by concerns about immediate government deficit as endogenous. The 1993 budget made it clear that the spending cuts were due to the higher than expected deficit in the previous year and hence we classify them as endogenous. Overall, we find our series to be consistent with that of Devries et al. (2011) and Guajardo et al. (2014).

3 Effects of the Government Spending Shocks

In this section, we investigate the effect of exogenous changes in news about spending changes on output and government spending.

To estimate the effects of government spending shocks, 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, Canadian overnight interest rate, average income tax rate, and the government spending news variable. $B(L)$ is a lag polynomial with P lags. We follow Ramey (2011b) in choosing 4 as the lag length. Our sample period for is 1949:1 - 2012:1. Since our exogenous news shock series is identified using narrative records, and the tests of predictability support its exogeneity, we do not impose any further

identifying assumptions in the VAR. Thus the ordering of the variables is not important in the specification.

Figure 5 provides the results from the VAR. The impulse responses describe the percent changes in government spending and output due to one percentage point increase in the exogenous news shocks, along with 68% and 90% confidence intervals. The left panel of the first row shows that a one percentage point increase in the news variable leads to an immediate increase in government spending of 0.42 percent. It peaks 3 quarters after of the initial shock at 1.12 percent, and gradually declines but remains significantly positive for several quarters. The right panel of the first row in Figure 5 shows the response of output to a one percentage point increase in the news variable. The figure shows that output increases initially, though insignificantly, and the increase in output reaches the peak seven quarters after the initial shock at 0.22 percent.

Next, we calculate the implied government spending multiplier from the results of the baseline model. To calculate the multiplier, we need a measure of elasticity of output with respect to government spending. This elasticity can be calculated in two different ways: first, we can divided the peak response of output by the peak response of government spending, and second, we can divide the cumulative response of output by the cumulative response of government spending. Finally, we multiply the implied elasticity of output with respect to government spending with the average of ratios of nominal GDP and nominal government spending over the entire sample period to get an estimate for the government spending multiplier.[8]

The estimates for government spending multipliers are in presented Table 3. It shows that the government spending multiplier is 1.08 for Canada when elasticity of output with respect to government is calculated using the peak responses. If we instead use the cumulative

[8]Note that this calculation depends on the ratio of nominal GDP and nominal government spending, which is 5.33 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 4.99 after the year 1960.

responses over two and four years after the initial shock, the estimates of the multiplier come out to be 1.48 and 1.26 respectively.

Figure 5 also shows the response of interest rate and average income tax rate to shocks to exogenous news series. Interest rate rises, but the response remains insignificant for several quarters. The peak response of the interest rate is 0.11 percentage points, taking place after 6 quarters of the initial shock and is marginally significant. The response of average income tax rate is highly insignificant and quantitatively small as well. The maximum quantitative response of the average income tax rate is around 2.2 percent which takes place two quarters after the initial shock and dies down quickly. We conclude that in general, there is no evidence that spending increases in Canada are accompanied by tax increases.

The response of income tax rate in Canada is different from what Ramey (2011b) found for the US. They show that average tax rates can increase by up to 10 percentage points after a exogenous news shock and the effect is significant whereas we find smaller and insignificant effects. In our reading of the budget documents, we do not find evidence that the government raises taxes when it increases expenditure substantially. For example, in the US, the Revenue act of 1950 was enacted to finance the war time expenditure associated with the Korean war which increased tax rates on individuals and corporations.[9]

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 and reduced its spending on some 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

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

defense spending.

A note about the way we calculate the government spending multiplier is in order. We take the ratio of the response of output and response of government spending to a one percent increase in the news variable and then multiply it with the average of ratio of nominal GDP to government spending over the entire sample. Ramey and Zubairy (2018) note that this procedure can yield inaccurate estimates of the multiplier because of the variations in the value of the GDP to government spending ratio over time. They suggest using an alternate method to calculating the multiplier in which variables of interest are all converted to same units e.g. by dividing them by potential output and then using the converted variables to directly calculating the multiplier.

We agree with the arguments made by Ramey and Zubairy (2018) but we should note that the variation in the GDP-government spending ratio, except for the first few years in our sample, has not been large enough to significantly alter the size of the multiplier. The sample average of the GDP-government spending ratio is 5.33. This falls to 5 in the post 1960 period and most observations stay close to this average. From a policy making perspective, the recent few years carry higher importance and the average of the GDP-government spending ratio in this period (2000-2012) has been 5.05 which is close to the overall average. Thus, while our estimate of the government spending multiplier may be dependent upon the size of GDP-government spending ratio, the variation in this ratio has not been huge from an estimation point of view to significantly alter the size of the multiplier.[10]

[10]We should also note that our attempts at calculating the multiplier using the Ramey and Zubairy (2018) approach yielded a wide range of estimates. The estimates were very sensitive to the VAR specification including the form of the variables (level versus first differences), numbers of lags included, and even the choice of variable used to normalize the variables of interest. Our methodology does not suffer from this problem.

4 Comparison of Government Spending Multipliers

Recent literature about macroeconomic effects of fiscal policy shocks has tackled the identification problem in two ways - the narrative approach and the structural VAR (SVAR) approach. In this section, we compare our results with the key papers in these two strands of literature in estimating government spending multiplier for Canada.

4.1 The Narrative Approach: Owyang et al. (2013) Military Spending News Shocks

Owyang et al. (2013) investigate whether the government spending multipliers are greater during periods of slack (defined as period with high unemployment), 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 their news series 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 early 1950's. These are also the only observations with non-zero values for Owyang et al. (2013) series after the second world war. In our data series, there are a total of 16 quarters with news about military spending changes and 4 of them are negative. Apart from the huge increases in military and defence spending in the early 1950's, there were other military spending 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 using the Owyang et al. (2013) data series. The results are shown in Figure 6. Qualitatively, the responses using Owyang et al. (2013) data series look similar with those using our data series. Both government spending and output display hump-shaped responses. Both government spending and output reach their peaks 4 quarters after the initial 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 Owyang et al. (2013) data series is 1.13 when calculated with the peak response and 1.40 when calculated with either 2-year integral, and 1.11 when calculated using the 4-year integral. The multipliers are larger than those in Owyang et al. (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.

4.2 The Structural VAR Approach

The seminal work using the structural VAR approach is that of Blanchard and Perotti (2002). They estimate a structual VAR by using historical relationships between taxes and government spending to identify some of the parameters of the model. The key identification assumption is 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 adopt the structural VAR, essentially relying upon Choleski ordering (in which government spending is ordered before the other variable) to identify fiscal shocks.

Figure 7 provides the estimated IRFs using the structural VAR approach with four variables - government spending, output, interest rates, and average income tax rate. Following a positive government spending shock, 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.

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 are different compared to our earlier estimates that used news shocks. The narrative approaches using either our exogenous government spending shocks

or Owyang et al. (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 hump-shaped, though it peaks much earlier, compared with those estimated with the narrative shock series. Moreover, the implied multipliers estimated with the SVAR approach, in the rage of 0.40 to 0.55, are much smaller than those with the narrative approaches.

4.3 Importance of Non-Defense Shocks

As pointed out by Barro and Redlick (2011), government spending multipliers estimated with military war dates are not particularly useful when we want to evaluate the impact of various government funded programs and projects. It is hard to pin down even theoretically whether the total government spending multipliers or the non-defense spending multipliers should be larger or smaller than the military spending multipliers. Military spending changes are temporary and 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.

However, Barro and Redlick (2011) point out that it is hard to be optimistic about using the macroeconomic time series to isolate multipliers for non-defense spending for two reasons. One is that compared with the military and defense spending due to the events like the Korean war, the variation in non-defense spending is always likely to be small. So, it is very unlikely that there is enough information in the variation of non-defense spending to find an accurate estimate of the non-defense multiplier. The other reason is that the changes

in non-defense spending are likely to be endogenous, that is, correlated with changes in output.

We overcome the second of these challenges by carefully reading the government documents and constructing news about exogenous government spending changes that are uncorrelated with contemporaneous movement in the economy. Even though we can not accurately estimate the effects of non-defense spending changes only due to their small variations, we can estimate the defense spending multiplier by isolating news about changes in defense spending. We can then compare this defense spending multiplier with the overall government spending multiplier to gauge the importance of inclusion of non-defense spending measures in the data set.

To see the effects of changes in defense spending, we restrict our exogenous government spending news variable to only include news about defense spending changes. We include this defense spending news variable in the four variable VAR that includes government spending, output, interest rate, and average income tax rate. The results are in figure 8. Qualitatively the responses are very similar to the case when we use our overall news variable. However, quantitatively, the implied multipliers using defense spending news are between 0.97, 1.26, and 1.07 which are smaller than the multipliers that we estimated using overall news variable. This is likely due to the fact that the overall exogenous spending news variables includes various non-defense spending changes that lead to higher output. In contrast, defense spending changes are often thought to have only negative wealth effects on the economy.

To further see the importance of non-defense spending changes, we combine our news variable with the Owyang et al. (2013) series. Generally, it is reasonable to assume that announcements in budgets are the main source of information for the economy regarding upcoming changes in government spending. This is especially true for Canada given their traditional budget secrecy discussed earlier in the paper. However, when significant events

like a war take place, it is likely that the economy becomes aware of planned spending changes before news about them is officially released. Owyang et al. (2013) rely upon newspaper sources to identify news about defense spending changes associated with the Korean War. That is why, it is reasonable to assume that it captures the anticipation effects associated with the Korean War better than our series. We form a new mixed news series where we replace the observations associated with Korean War in our series with those from the Owyang et al. (2013) series.

We use this mixed news series in our 4 variable VAR and the results are in figure 9. Qualitatively, the responses look similar with those using the narrative approaches with either our new shock series or the Owyang et al. (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. Quantitatively, the multipliers - 1.46, 1.69, and 1.34 when using peak responses, 2-year integral, and 4-year integral - are the largest across different identification and estimation methods. These results show that not only is it important to capture the anticipation effects - which the Owyang et al. (2013) series does the best for the Korean War, it is also important to take into account non-defense spending changes which our series does.[11]

[11]The mixed shock series consists of some defense spending changes from the 1990's and 2000's from our data set. If we compute the multipliers from a mixed defense news shock series comprising of Korean war observations from the Owyang et al. (2013) series and other defense spending changes from our data set then the multipliers are 1.32, 1.52, and 1.21. These are still smaller than the ones that we get from the overall mixed shock series which shows that including non-defense spending changes can make a difference to the estimated multipliers.

5 Effects of Announced and Implemented Government Spending Changes

In this section, we study the effects of changes in announced and implemented government spending changes. We construct this series by isolating out those announced spending changes that are implemented in the same year. We normalize the announced and implemented government spending changes by the GDP of the previous quarter. This way, the estimated coefficients on this variable will directly give us the size of the spending multiplier. This methodology has two strengths. First, the series is reasonably unanticipated since we remove all spending changes that are announced in one year but implemented in future years. Second, the estimation methodology does not require the announced and implemented series to be a strong instrument of overall government spending. This would allow the technique to be replicated for other countries which, unlike the US and Canada, have not experienced large military build-ups and for which the Owyang et al. (2013) technique cannot be used.

We estimate a 4-variable VAR with log of output, our measure of announced and implemented spending changes, interest rate, and average income tax rate. The result for the entire sample is shown in Figure 12. When government spending increases by 1 percent of GDP, output starts to increase significantly after 1 quarter. The peak response of output, an increase of 0.92 percent, takes place 7 quarters after the initial shock. This estimate of spending multiplier is in line with other estimates that we found in this paper. The response of output then starts to taper off but remains significantly positive for several quarters.

Next, we ask the question whether the size of the spending multiplier has changed over time. We estimate the 4-variable VAR (with 4 lags of log of output, interest rate, average income tax rate, and quarterly measure of announced and implemented spending changes) for the pre and post 1984:2 periods. The results are in Figure 14. We document two main differences across the responses of output. First, output responds much more quickly in the

pre-1984:2 period. The peak response takes place 5 quarters after the initial shock. In the post-1984:2 period, the response of output starts to become significantly positive only after 9 quarters of the initial shock and hits its peak after 11 quarters. Second, the multiplier from the post-1985 period - 0.73 - is quantitatively smaller than multiplier from the pre-1984:2 period - 0.81. These multipliers are summarized in table 3.

Here, we briefly try to explain the second difference i.e. the multiplier being smaller for the post-1984:2 period.[12] Our immediate guess was that the austerity measures adopted by the government in the post-1984:2 period may explain the difference in estimated multipliers. To check this, we break our post-1984:2 measure of announced and implemented spending changes into spending increases and decreases. We then re-estimate our model for the post-1984:2 period by including spending increases and decreases separately. The implied multiplier for spending increases comes out to be 0.81 which is very close to the multiplier for the pre-1984:2 period.

While we cannot directly estimate the multiplier associated with spending decreases because of the low number of observations in that series, the results suggest that spending decreases are less contractionary than spending increases are expansionary. A detailed reading of the budget documents supports this result. We found that most of the austerity measures adopted by the government were aimed at reducing surplus spending rather than essential spending. The government would always announce that the austerity measures would not affect the transfer payments and only in one instance, in 1994, did the government reduce unemployment benefits. This suggests that a careful choice of programs during times of austerity can mute the negative effects of government spending decreases.

[12]The multipliers for the two periods are quantitatively different but given the size of standard errors of the impulse responses, it can be argued that they are statistically not different.

5.1 Results Using Annual Data

In this subsection, we estimate the spending multiplier using the announced and implemented changes with annual data.[13] Beetsma et al. (2008) and Guajardo et al. (2014) argue that use of annual data minimizes the anticipation effects of fiscal policy changes. We include log of output, interest rate, and average income tax rates as endogenous variables in the VAR and include the annual measure of announced and implemented spending changes as exogenous variable to allow for its contemporaneous effect on output. We include two lags of the endogenous variables and the contemporaneous and two lagged values of the spending measure. We also include a quadratic time trend in the model.

The results from this exercise are shown in Figure 13. The response of output is insignificant on impact but becomes significant with a lag of one year The peak response of output - an increase of 0.94 percent - takes place in the second year after the initial shock. The response of output then becomes smaller but stays positive - albeit insignificantly so - for three more years. The results from this exercise are similar to when we used quarterly data. The multiplier when we use annual data (0.94) is close to the multiplier we got from the quarterly data (1.08). Furthermore, qualitatively the responses from output are very similar from both exercises. Thus, the results from using annual data provides support to our claim that our assumption regarding implementation dates being the same as announcement dates in quarterly data does not introduce a significant bias in our results.

[13] We take the average of quarterly data on output, interest rate, and income tax revenues to convert it to annual frequency. For the announced and implemented government spending changes, we simply assign the observations to the relevant year and then normalize the series by previous year's nominal GDP.

6 Effect of Government Spending Changes on Other Variables

In this section, we study how changes in government spending affect other macroeconomic variables in the economy.

6.1 Response of Consumption

We begin by examining how consumption is affected by changes in government spending. The response of consumption has been at the centre of the debate about the effects and mechanisms of government spending shocks. Empirical estimates range from being negative to being almost zero to being positive. Narrative studies that use the war dates (e.g. Ramey and Shapiro, 1998, Burnside et al., 2004, and Ramey, 2011b) find a negative effect of government spending increases on consumption. This negative response of consumption 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.

Other studies like Blanchard and Perotti (2002), Fatas and Mihov (2001), Mountford and Uhlig (2009), Galí et al. (2007) and others that use the structural VAR approach find that 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, as 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 narrative approach is the timing of the shock, 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 some evidence regarding the response of consumption for Canada. We also compare our estimates with those estimated with the structural VAR approach. Our narrative news shock series does not require the timing assumption of the structural VAR approach and captures the anticipation effects since, by construction, the news about upcoming changes in government spending would precede the actual implemented changes.[14]

Figure 10 shows the response of consumption when we our exogenous news shocks series. We augment the vector of endogenous variables in the baseline VAR from section 3 with log of real consumption. The figure shows that consumption declines immediately upon the arrival of news about government spending changes. The impact drop is insignificant however. The drop in consumption becomes significantly negative after one quarter of the initial shock. The response of consumption remains negative throughout the forecast horizon although after the initial few quarters, the responses become statistically insignificant.

Figure 11 shows the response of consumption estimated from a structural VAR model. The figure shows that consumption falls in response to a increase in government spending and the response stays negative for most quarters in the forecast horizon. Despite the qualitative similarities between the results from the two approaches; there are some quantitative differences.[15] First, when using our newly constructed news series, we find that consumption

[14]As discussed in Ramey (2011b), according to the permanent income hypothesis, what matters for a consumer's decision making is not the timing of the government spending changes but the change in its present discounted value. And that changes when news about future changes in spending becomes known regardless of when the actual changes take place.

[15]To make the comparison of results easier, we normalize the results from both approaches so that the

shows a stronger short-run response after the shock whereas the response from the SVAR approach is close to 0 for the first several quarters after the initial shock. Second, the maximum drop in consumption when using the news series is larger than the maximum drop in consumption from the SVAR approach. Furthermore, the estimate using the news series is significant.

As discussed earlier, Ramey (2011b) argues that response of consumption estimated using the SVAR approach misses the anticipation effects of government spending changes and that results in an apparent positive response of consumption. Perotti (2011), however, argues that the different results using the narrative and the SVAR approaches found by Ramey (2011b) are because they never estimate the two specifications on the same sample for the US. Perotti (2011) shows that the narrative and the SVAR approaches give virtually the same results when estimated on the same sample using the same variables.

Our results are somewhere in-between the claims made by these two studies. While, we do not find the strong positive response of consumption that other studies using the SVAR approach have found for the US, we also do not find the virtually same results from the two approaches despite using the same sample period for both. Overall, we find our results more in line with what Ramey (2011b) found i.e. that consumption shows a strong negative response to increases in government spending.

6.2 Other Variables

In this section, we briefly discuss the effects of government spending changes on other macroeconomic variables. We use the annualized announced and implemented spending series for this section since the quarterly data for most variables was not available for the entire sample period. For each of the variables that we study, we augment the same VAR as described in section 5.1 with a macroeconomic variable of interest as an endogenous variable.

peak response of government spending is 1 percent.

Figure 15 shows the effects of government spending changes on categories of consumption and investment. Overall, we find a significant decline in consumption expenditure on impact due to an increase in government spending. We found a similar decrease in consumption when we used quarterly data. The figure also shows that the impact of an increase in government spending on durable consumption is large and negative on impact but the estimate is highly insignificant. We also find a significantly negative impact on non-durable consumption (defined as the sum of semi-durable and non-durable consumption). Finally, figure 15 shows that increase in government spending results in investment spending decreasing on impact but the effect is insignificant. The effect then becomes quantitatively small in the following years.

Figure 16 shows the effects of government spending changes on labor market variables. The variables that we considered were labor income, employment, total hours worked and average hours worked. We do not find a significant effect of government spending on either of the variables. The results show evidence that both total employment, and total hours increase following an increase in spending. The effects on labor income and average hours worked are insignificant.

Figure 17 shows the effects of government spending changes on exports and imports. The figure shows that a spending increase results in a significant increase in exports while imports increase marginally. The increase in exports following a spending increase is puzzling. A simple textbook model of open economy would predict an appreciation of the home currency after fiscal expansion which should result in exports decreasing and imports increasing.

One potential explanation for the increase in exports following spending increases in Canada lie in the way fiscal policies in Canada and the US are related. The US is the main export destination for Canada. Between 1989 and 2011, on average, the US was the destination for around 80 percent of Canadian exports.[16] Also, the government spending

[16]The calculation is based on data of Canadian exports by destination downloaded from the World Inte-

changes between the two countries are correlated. In particular, we find that between 1949 and 2011, the government spending between the two countries had a correlation of 0.61.[17] The close economic linkage with the US means that any economic shock affecting the US economy would have a similar effect on the Canadian economy. Indeed, our reading of the Canadian budget documents shows that the Canadian government often took the US economic conditions into account while setting their fiscal policy. A fiscal expansion in Canada may well take place at the same time as fiscal expansion in the US which would then lead to an increase in exports from Canada to the US. We leave a detailed investigation of this result as a future research question.

Finally, we also study the effect of spending shocks on real exchange rate. To do this, we return to the quarterly data set in order to capture the potential high frequency changes in real exchange rate that may be missed in yearly data. The results are shown in figure 18. The results show that, surprisingly, the real exchange rate significantly depreciates following an increase in government spending.[18] While the depreciation of the real exchange rate following a spending increase is puzzling, our study is not the first one to find such a result.

Ravn et al. (2012) and Monacelli and Perotti (2010) use data of 4 countries - including Canada - to find a similar result that increase in government spending depreciates the real exchange rate. Ravn et al. (2012) suggest a model with deep habit formation to explain their findings.[19] Miyamoto et al. (2019) study a panel of 125 countries and find that government purchases depreciate the real exchange rate in developed countries. Similarly, Kim (2015)

grated Trade Solution database of World Bank.

[17] This calculation is based on quarterly HP-filtered data of first differenced log of real government spending data of the two countries. We used the Owyang et al. (2013) data for this calculation.

[18] We use the narrative news series in this estimation but get a similar significant depreciation if we use the announced and implemented series. The sample period for the exchange rate estimation is 1960:1 - 2010:4.

[19] Ravn et al. (2006) discuss that deep habit formation – where households form habits over individual goods rather than over a composite good – can result in counter-cyclical mark-ups. An increase in output, for example due to government spending shocks, would result in a decrease in mark-ups. Ravn et al. (2012) show that in an open economy model, an increase in government spending will cause a decrease in domestic mark-ups relative to foreign mark-ups. This will result in domestic price level decreasing relative to the foreign price level which in turn causes real exchange rate depreciation.

studies a panel of 18 countries - that includes Canada - and finds that real exchange rate depreciates following a spending increase.

7 Conclusion

In this paper, we construct a novel measure of news about exogenous government spending changes for the post war period in Canada to estimate government spending multiplier. Previous studies have typically used news about military spending as an instrument for overall government spending, whereas we include all exogenous government spending changes. We rely upon government budget documents, mostly the budget speech, to document all announced government spending changes and classify them as exoegnous or endogenous. Our results show that government spending multiplier for Canada is around 1.08 to 1.69, which is higher than those estimates by the narrative approach with war dates and the structural VAR approach.

One significant contribution of our paper is the use of the announced and implemented spending changes. This is important because most countries have not experienced the likes of military spending increases that US and Canada have. Furthermore, even with these countries, we have to stretch the sample back to the 1950's to seek identification in the empirical analysis. The analysis using announced and implemented spending changes do not have such requirements and can easily be replicated for other countries.

There are other important results that can be drawn from our paper. First, we have shown that including non-military spending changes is important in the narrative approach even if they (as a set) alone do not have enough explanatory power for overall spending changes. Second, we have shown that, for Canada, the negative response of consumption to an increase in government is stronger using our news series than from an SVAR model. This result is consistent with Ramey (2011b) who argues that government shocks identified from

an SVAR approach can be anticipated and can lead to a different effect on consumption. Finally, we have documented a puzzling result regarding the response of - exports increase following a spending increase which is in contrast to textbook open economy models. This result should be investigated in future research.

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Table 1: Summary Statistics

Variable	Mean	Standard Deviation	Non-Zero Values	Negative Values
Exogenous series	0.26	1.68	48	9
Endogenous series	0.07	0.46	24	2
All (exogenous + endogenous)	0.33	1.75	60	11
Announced and Implemented Series	0.07	0.38	48	7

Table 2: Test of Exogeneity and Test of Predictive Power

Dependent Variable	Regression	Test Statistic	p-value
Test of exogeneity:			
Exogenous News (All)	Linear	1.23 (F)	0.228
Exogenous News (without Korean War Obs.)	Linear	0.74 (F)	0.78
Endogenous News	Linear	2.29 (F)	0.002
Exogenous News	Ordered Probit	26.39 (LR)	0.153
Endogenous News	Ordered Probit	33.08 (LR)	0.033
Announced and Implemented	Linear	0.58 (F)	0.924
Announced and Implemented	Ordered Probit (LR)	19.11 (LR)	0.515
Tests of predictive power:			
Government Spending	Linear	15.43 (F)	0.000

Table 3: Government Spending Multipliers

	Peak Responses	2-year Integral	4-year Integral
Narrative news shock series	1.08	1.48	1.26
Owyang et al. (2013) military spending news series	1.13	1.40	1.11
Structural VAR approach	0.40	0.55	0.46
Defense Spending Shocks	0.97	1.26	1.07
Mixed News Series	1.46	1.69	1.34
Announced and Implemented Quarterly Spending Shocks	0.92	-	-
Announced and Implemented Annual Spending Shocks	0.94	-	-
Announced and Implemented Quarterly Spending Shocks - Pre-1984:2	0.81	-	-
Announced and Implemented Quarterly Spending Shocks - Post-1984:2	0.73	-	-

Notes: Narrative news shock series is the newly constructed data series on the news of exogenous government spending changes. Owyang et al. (2013) military spending news series are the data series constructed by Owyang et al. (2013) using news sources on military spending changes. Structural VAR approach is where the government spending shocks are identified by the structural VAR with recursive identification assumptions. Mixed news series are the data series which incorporate Owyang et al. (2013) military spending variables and our non-military spending observations. The announced and implemented shock series consists of spending changes announced and implemented in the same year.

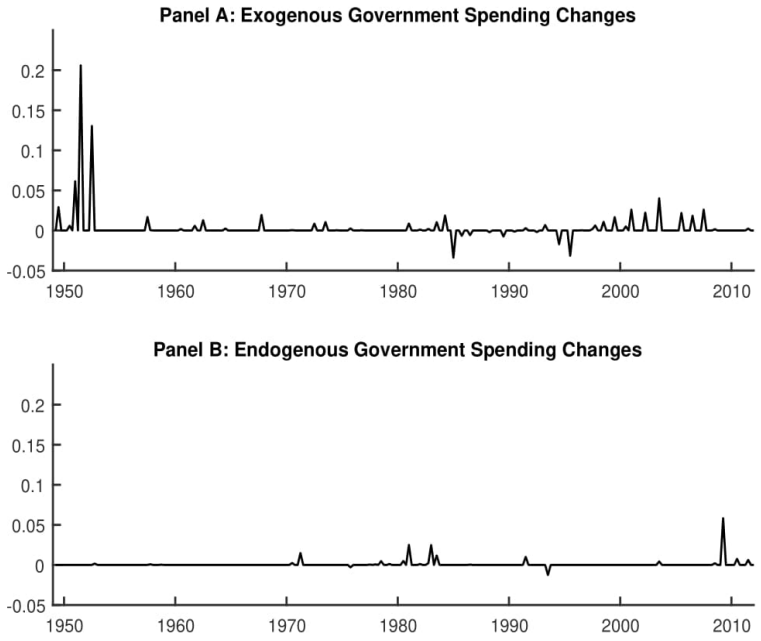

Figure 1: Government Spending Changes in Canada 1949 - 2012

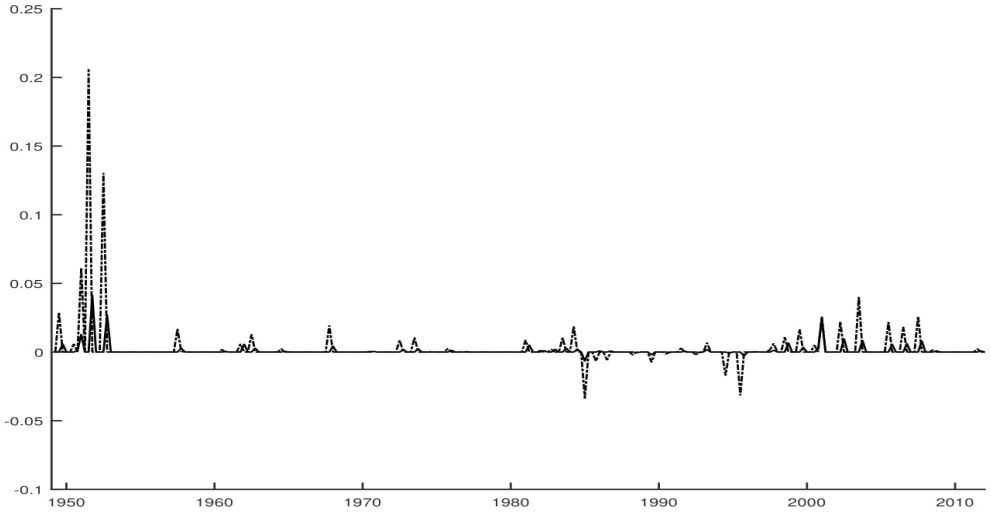

Figure 2: Narrative news shock series (dashed line) and the announced and implemented news shock series (solid line)

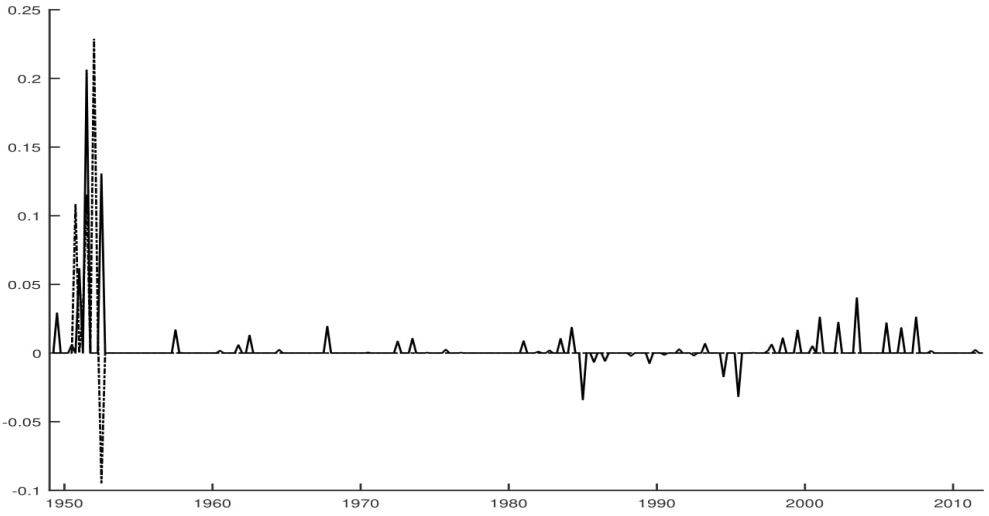

Figure 3: Owyang et al. (2013) military spending news shocks (dashed line) and the narrative news shock series (solid line)

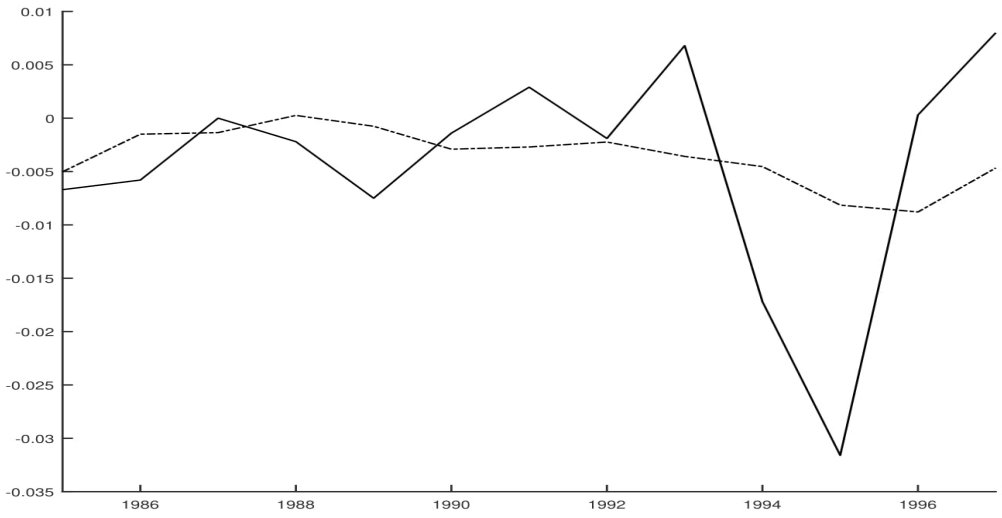

Figure 4: Guajardo et al. (2014) fiscal consolidation data (dashed line) and narrative news shock series in annual frequency (solid line)

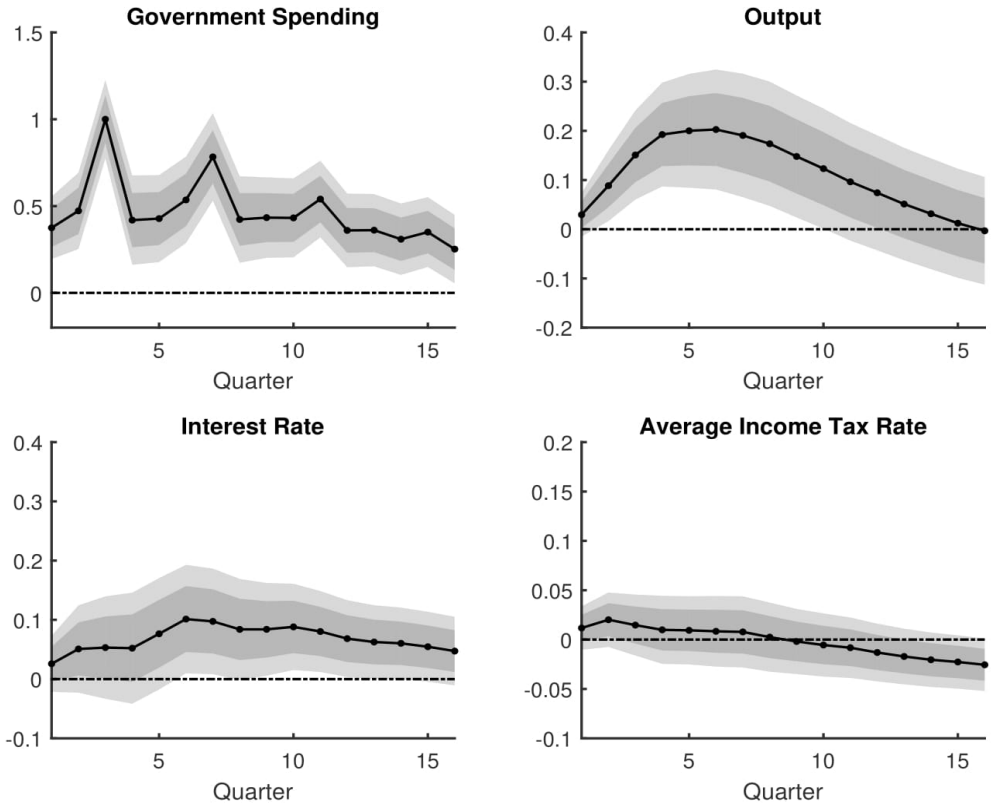

Figure 5: Macroeconomic Effects of Government Spending Shocks - Baseline Controlling for Tax and Monetary Policy (Dark shaded regions represent 68% confidence intervals, and light shaded regions represent 90% confidence intervals.)

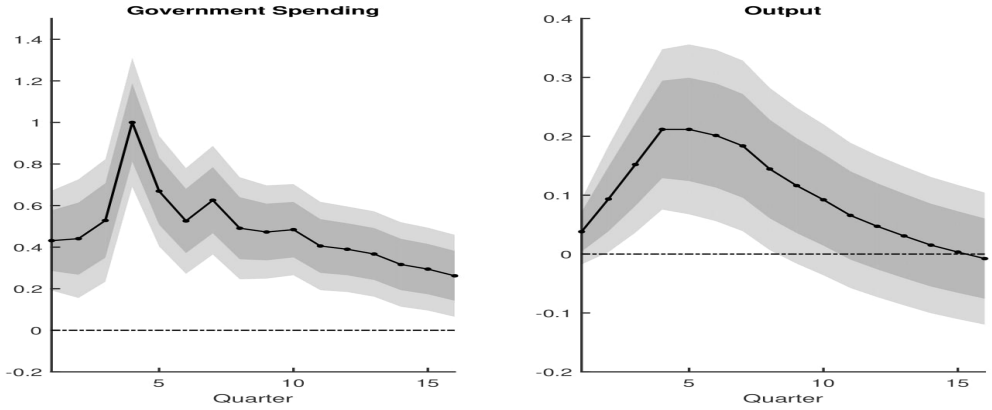

Figure 6: Macroeconomic Effects of Government Spending Shocks - ORZ(2013) Military Spending News Shocks (Dark shaded regions represent 68% confidence intervals, and light shaded regions represent 90% confidence intervals.)

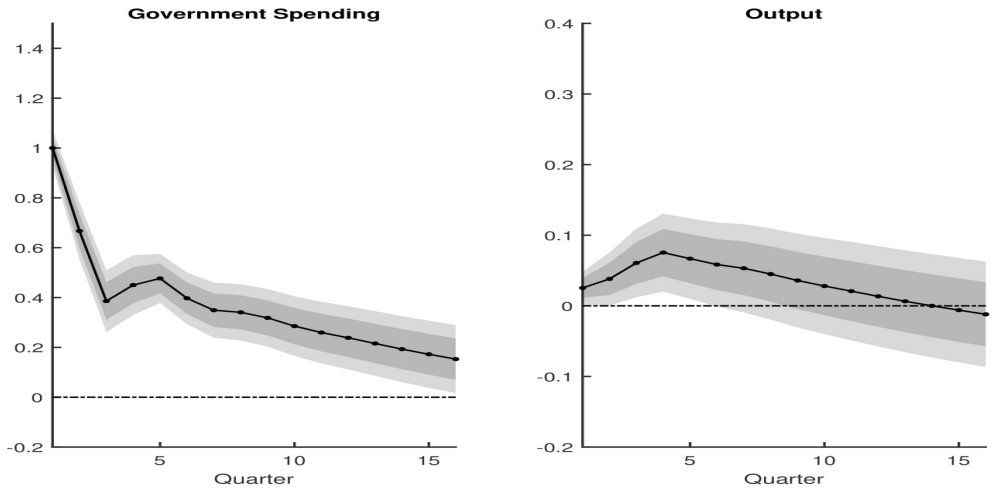

Figure 7: Macroeconomic Effects of Government Spending Shocks - the SVAR Approach (Dark shaded regions represent 68% confidence intervals, and light shaded regions represent 90% confidence intervals.)

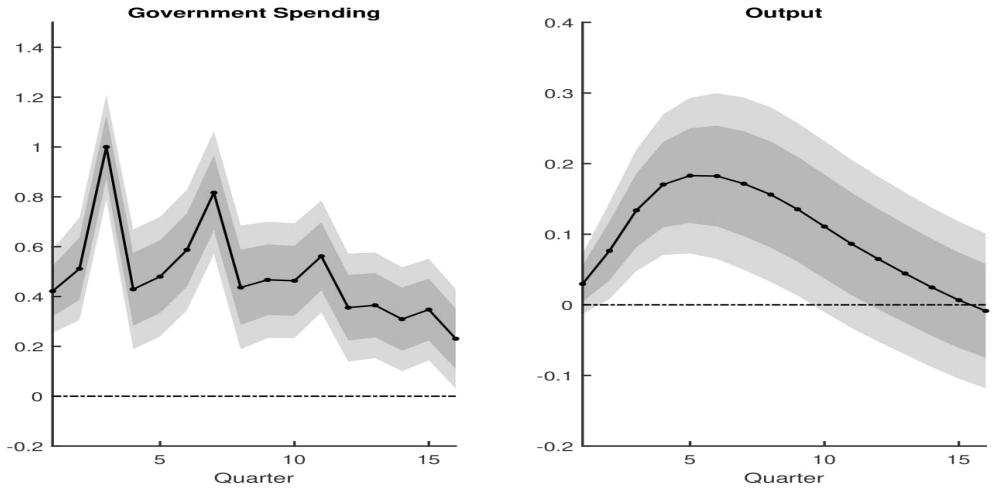

Figure 8: Macroeconomic Effects of Government Spending Shocks - Defense spending Shocks (Dark shaded regions represent 68% confidence intervals, and light shaded regions represent 90% confidence intervals.)

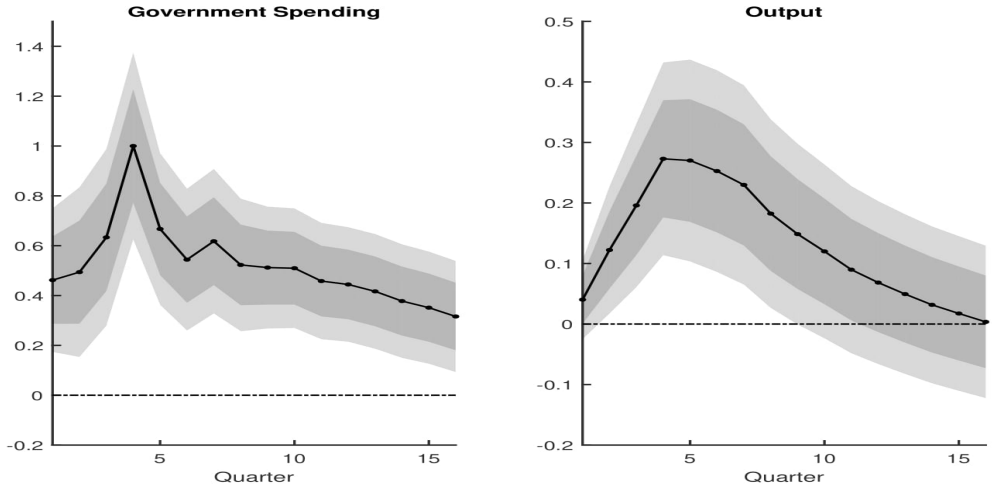

Figure 9: Macroeconomic Effects of Government Spending Shocks - Mixed News Series (Dark shaded regions represent 68% confidence intervals, and light shaded regions represent 90% confidence intervals.)

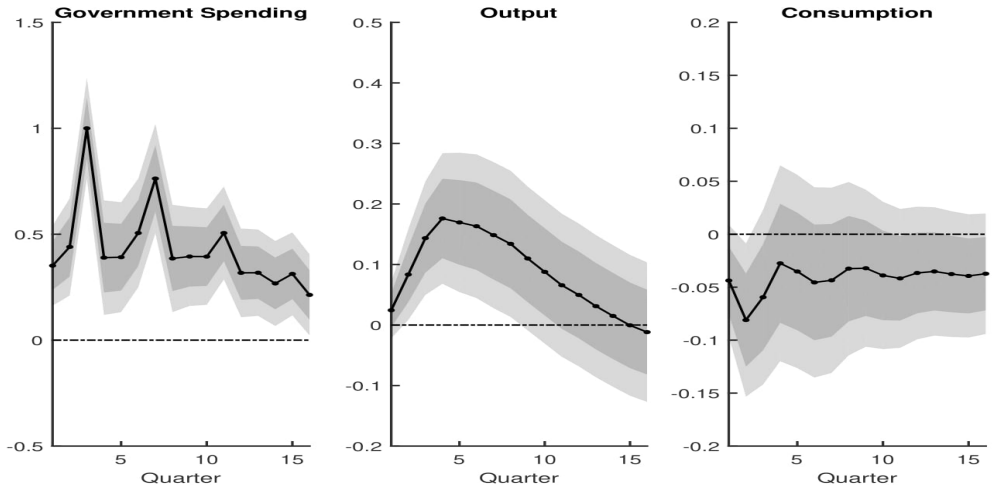

Figure 10: Responses of Consumption - the Narrative Approach (Dark shaded regions represent 68% confidence intervals, and light shaded regions represent 90% confidence intervals.)

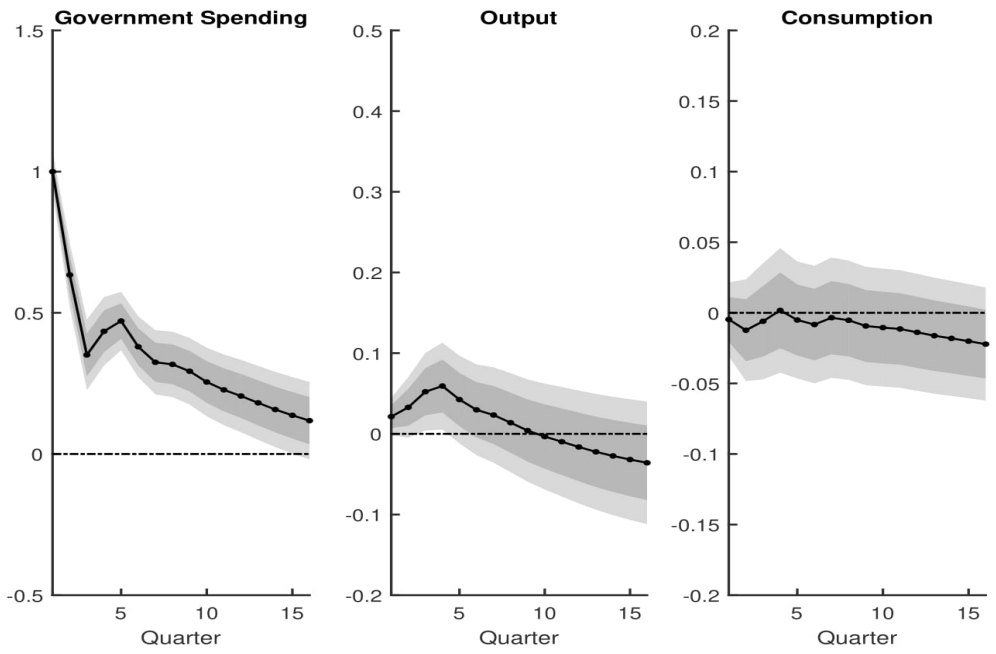

Figure 11: Responses of Consumption - the SVAR Approach (Dark shaded regions represent 68% confidence intervals, and light shaded regions represent 90% confidence intervals.)

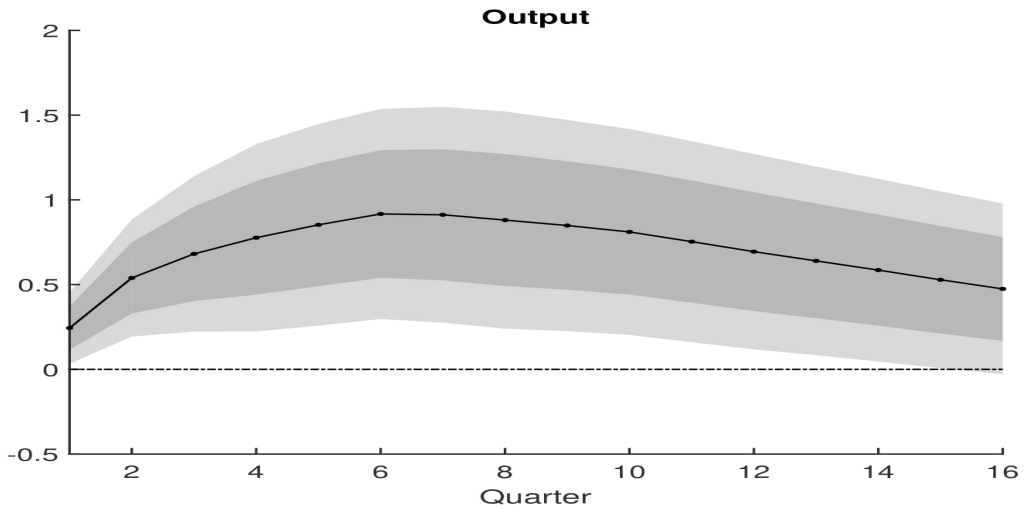

Figure 12: Macroeconomic Effects of Announced and Implemented Shocks - Quarterly Data (Dark shaded regions represent 68% confidence intervals, and light shaded regions represent 90% confidence intervals.)

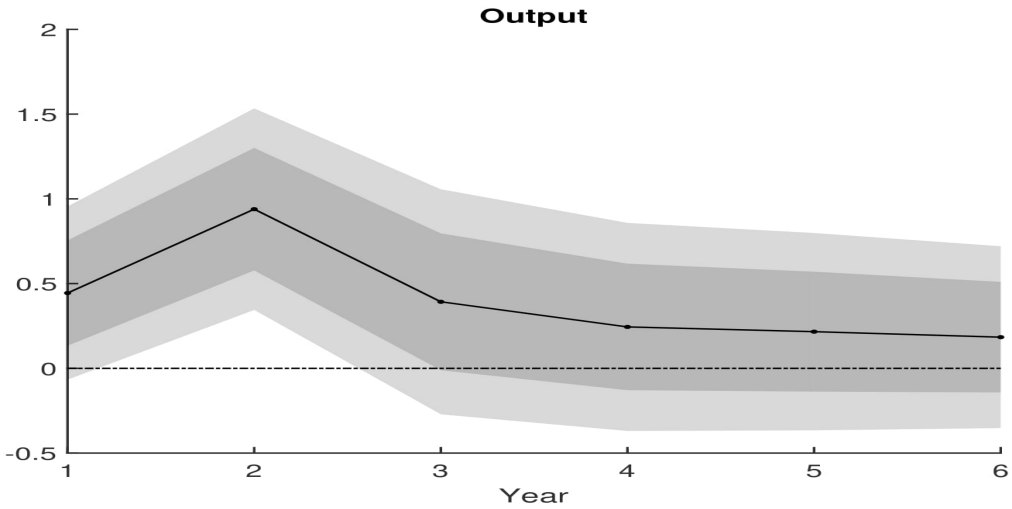

Figure 13: Macroeconomic Effects of Announced and Implemented Shocks - Annual data (Dark shaded regions represent 68% confidence intervals, and light shaded regions represent 90% confidence intervals.)

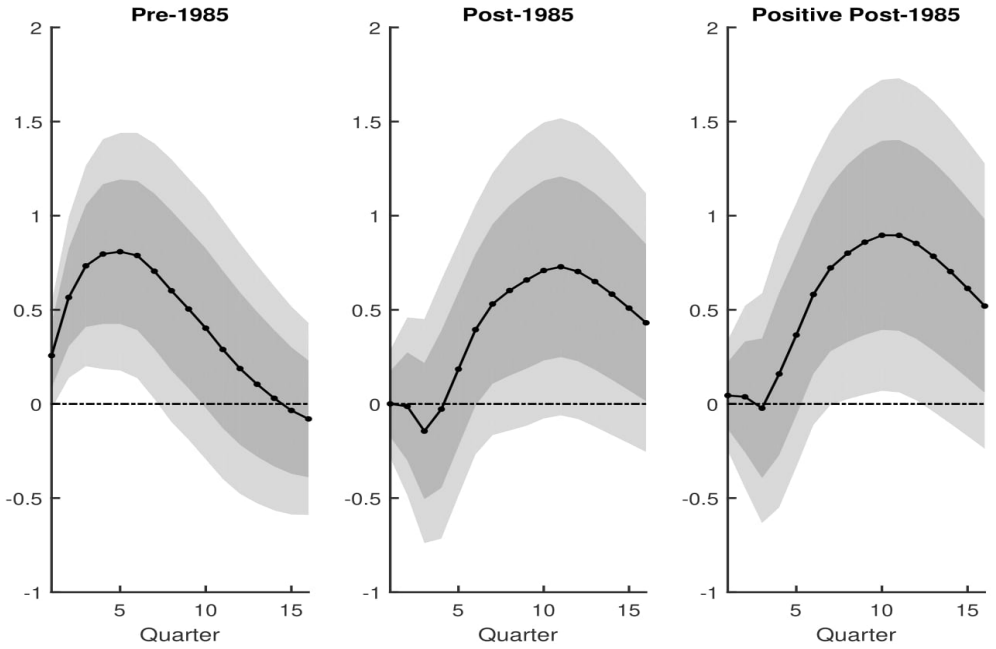

Figure 14: Macroeconomic Effects of Announced and Implemented Shocks - Subsample (Dark shaded regions represent 68% confidence intervals, and light shaded regions represent 90% confidence intervals.)

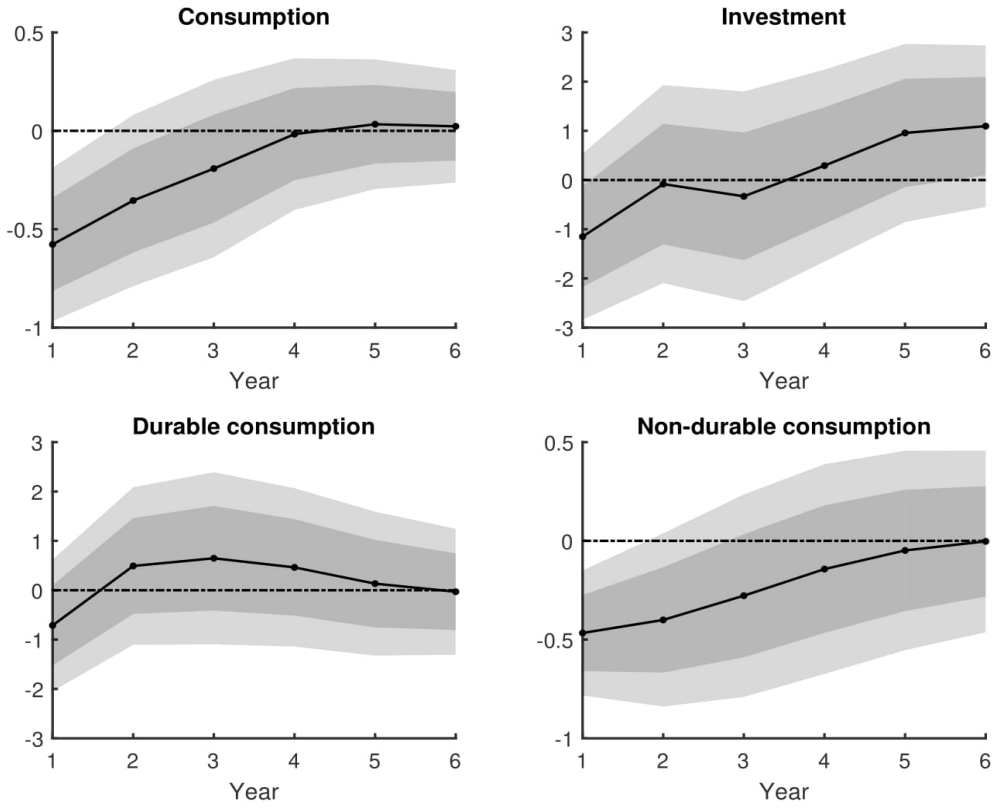

Figure 15: Macroeconomic Effects of Annual Announced and Implemented Shocks on Consumption and Investment (Dark shaded regions represent 68% confidence intervals, and light shaded regions represent 90% confidence intervals.)

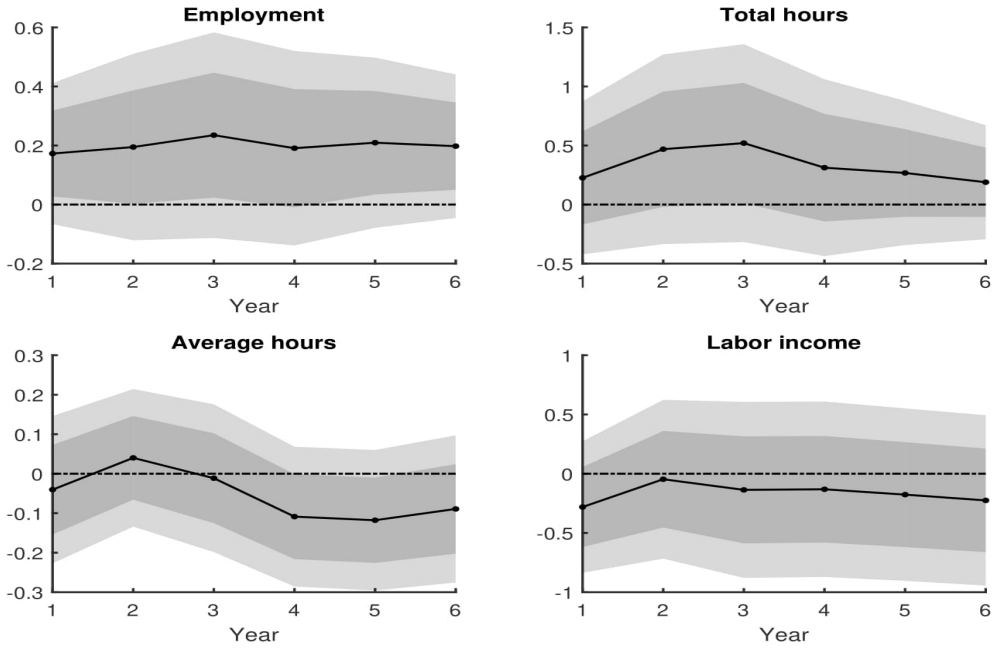

Figure 16: Macroeconomic Effects of Annual Announced and Implemented Shocks on Labor Market (Dark shaded regions represent 68% confidence intervals, and light shaded regions represent 90% confidence intervals.)

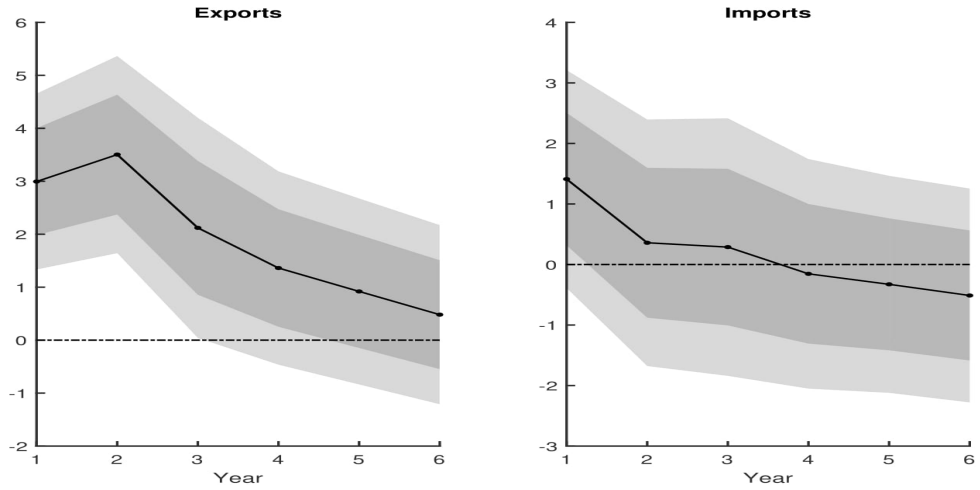

Figure 17: Macroeconomic Effects of Annual Announced and Implemented Shocks on Imports and Exports (Dark shaded regions represent 68% confidence intervals, and light shaded regions represent 90% confidence intervals.)

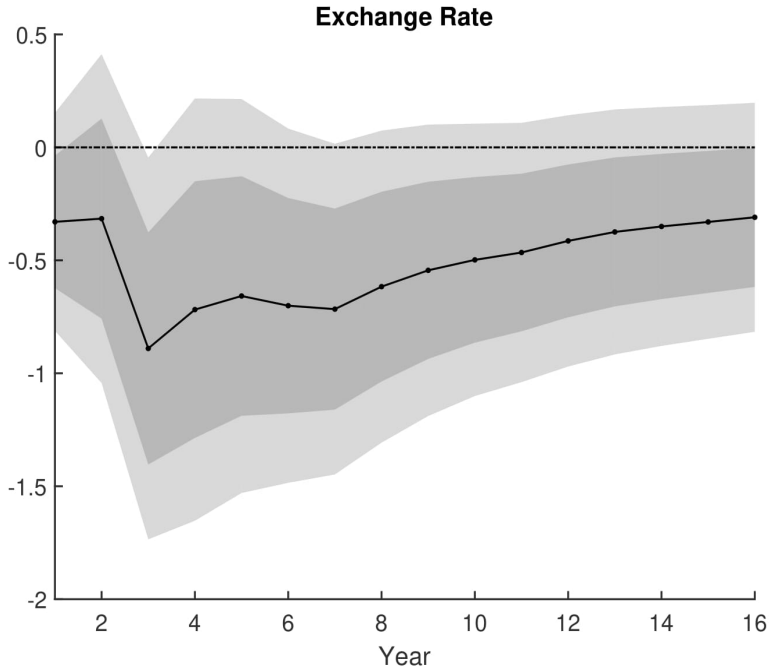

Figure 18: Macroeconomic Effects of Quarterly Announced and Implemented Shocks on Real Exchange Rate (Dark shaded regions represent 68% confidence intervals, and light shaded regions represent 90% confidence intervals.)