Assessing the Effects of Government Spending Shocks: Evidence from OECD and Non-OECD Countries*  

[Preliminary and Incomplete]

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Abstract

We estimate the effects of government spending shocks (multipliers) for different components of government spending (e.g. wages, government investment, use of goods and services and social benefits), using a panel of OECD and Non-OECD countries (49 countries). We find, in line with the existing literature, that multipliers are well below unity in most cases. We also document that multipliers are state-dependent, varying markedly across exchange rate regimes, the level of public indebtedness, the soundness of the financial system and the state of the business cycle. For instance, during a financial crisis spending multipliers are negative; under pegged exchange rates the multipliers are near zero; under fiscal-strain conditions spending multipliers are found to be somewhat larger than in normal times.

Keywords: Fiscal Policy, Government Spending, Fiscal Spending Multipliers, State-Dependent Effects

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1 Introduction

In this paper we estimate government spending multiplier for different components of government expenditure. The usual fiscal multipliers describe the effect of a shock of total government spending on the total output of the economy (Gross Domestic Product or GDP). However, the total government expenditure actually consists of a sum of separate expenditures, which differ considerably between them. Depending on the type of government spending changed each time, different types of effects are triggered in the overall output. Therefore, the calculation of the separate multipliers is particularly important as it provides information on the impact of each component of government spending on the gross domestic product (GDP), separately. Following the classification based on the economic nature of the expenditure used by the International Monetary Fund (IMF), we calculate the multipliers for the following categories of budget expenditure: salaries of civil servants, use of goods and services, public investment and social benefits. For all of the above, we do not limit our study solely to the effects on the overall output, but also examine some more variables of interest, such as the individual components of GDP (consumption, private investment and net exports), as well as inflation, real interest rate, the trade balance and the real exchange rate.

Budgetary policies that have been implemented over the past few years, particularly those aimed at mitigating the effects of the economic crisis and their effects, have led many researchers to conclude that fiscal multipliers vary from country to country. The differences are not due to the fiscal measures taken each time but stem from structural differences between the economies and policy regimes of the countries under consideration. Therefore, it is necessary to take into account elements that characterize the economic environment when assessing fiscal multipliers. For that matter we allow for variations in the economic environment, such as the exchange rate regime (fixed or floating), the amount of public debt, the existence of a financial crisis (bank crisis, debt crisis, exchange rate crisis) and whether the economy is in recession.

The remainder of the paper is organized as follows. Section 2 provides a brief discussion of the literature review. In section 3 we describe the data and the methodology, while the results are presented and discussed in section 4.
2 Related Literature

A key aspect in estimating fiscal multipliers is the identification strategy one chooses to follow. The most common identification strategy in the literature is the one proposed by Blanchard and Perotti (2002), who base their identification approach on the idea that government spending is predetermined and use external information in order to identify some of the structural parameters. A slightly different approach is that of Mountford and Uhlig (2009) who use sign restrictions.

Ramey and Shapiro (1998), on the other hand, used a narrative of episodes of military spending, which can be thought of as exogenous government spending shocks. In more recent work, Ramey (2011) created a new measure of "news" about defend spending, a defense news variable which seeks to measure the expected discounted value of government spending changes due to foreign political events. Using also professional forecasters’ surveys, Ramey concludes that the timing of the shock is of high importance and may also be the cause of the different results between the narrative approach of Ramey and Shapiro (1998) and standard VAR identification methods. More recently, Ramey (2012) compares the narrative approach with various identification schemes (such as structural vector autoregressions (SVARs) or expectational vector autoregressions (EVARS)) in estimating the effects of government spending on private activity, and shows that no matter which identification scheme is used, an increase in government spending never leads to a significant rise in private spending.

A different identification approach is the one introduced by Perotti (1999). This strategy includes two stages of estimation. In the first step a fiscal policy rule is estimated and the residuals of this estimation are used as shocks. This approach was also adopted by Tagkalakis (2008) and Corsetti, Meier and Mueller (2012).

The idea of examining the effects of different components of government spending on the economy is not new in the literature; however, only a handful of studies have addressed this issue. The first attempt to estimate partial multipliers is traced back in 2004, when Perotti (2004) using a structural Vector Autoregressive approach estimated the macroeconomic effects of the three main government spending tools: government investment, consumption, and transfers to households. His findings indicate no evidence
that government investment shocks are more effective than government consumption shocks in boosting GDP (this is true both in the short and in the long run). Auerbach and Gorodnichenko (2012) examine the effects of government spending by breaking it first into defense and non-defense spending and then into consumption and investment spending. Also, Zervas (2015) uses as spending variables either total spending, government consumption or government investment, total or broken into the relevant civilian and military series. Both of these two papers indicate that different components of government spending produce different multipliers. Finally, Engemann, Owyang, Zubairy (2008) use alternative measures of government spending, that is they distinguish between shocks to total government spending and disaggregated measures such as federal government spending and state and local government expenditures. Their results indicate differences between the responses to federal and state/local government spending.

Multipliers are also bound to differ depending on the economic conditions of each country. Tagkalakis (2008) examined the effects of fiscal policy in recessions and expansions when households face credit constraints and found that fiscal policy is more effective in boosting private consumption in recessions than in expansions. Corsetti, Meier and Mueller (2012) condition for the existence of a financial crisis, whether the exchange rate regime is pegged, and whether there is high public debt. In a similar framework, Ilzetzki, Mendoza and Vegh (2013) estimate panel VARs for groups of countries distinguished by: the degree of development, the exchange rate flexibility, openness to trade, or high government debt.

Another strand of the literature estimates multipliers based on the phase of the business cycle, i.e. whether the economy is in recession or expansion. Auerbach and Gorodnichenko (2012a) employ a regime switching model (Smooth Transition VAR) in which transitions across states (i.e., recession and expansion) are smooth, and find that fiscal policy is significantly more effective in recessions than in expansions. In their next papers Auerbach and Gorodnichenko (2012b, 2013) use again regime switching models, but instead of a Smooth Transition VAR they follow Jordà (2005) and estimate the multipliers through local projections. In particular, Auerbach and Gorodnichenko (2013) estimate the cross-country spillover effects of government purchases on output for a large
number of OECD countries, allowing multipliers to vary across states of the business cycle. Riera-Chrichton, Vegh and Vuletin (2015) also address the issue of whether multipliers depend on the state of the business cycle but bring into the picture a new dimension: whether government spending is going up or down. Owyang, Ramey, and Zubairy (2013), Ramey and Zubairy (2015) and Ramey and Zubairy (2016) also take into consideration differences in the state of the economy. In this case the economy is considered to be in a slack state when the unemployment rate is above some threshold. Owyang, Ramey, and Zubairy (2013) use historical data for the United States and Canada, while Ramey and Zubairy (2015) and Ramey and Zubairy (2016) extend the previous study for Canada and U.S., respectively. Ramey and Zubairy (2015) find evidence of higher multipliers during periods of slack, but Ramey and Zubairy (2016) estimate multipliers that are below unity irrespective of the amount of slack in the economy.

3 Data and Empirical Methodology

3.1 Data

We have collected data on 49 OECD and non-OECD economies from various sources. The list of countries in our dataset is shown in Table A.1 in the Appendix. In some detail, we have collected data for the period 1990-2014 from IMF’s Government Financial Statistics, Penn World Tables and IMF’s WEO database. Our fiscal spending variables come entirely from IMF’s Government Financial Statistics. We obtain data on total government expenditure, government wages and salaries, government investment, government use of goods and services and social benefits. As we already discussed above the decomposition of government spending into different economic components will help us in evaluating if different spending components (per capita) have different effects on output per person, private consumption per capita, etc. The latter have been obtained from World Bank, IMF’s WEO and IFS databases as well as from Penn World Tables.

As in our work we aim at evaluating how the effects of fiscal policy differ under different economic conditions, we also make use of certain dummy variables. A full account of our variables and data sources is provided in Table A.2 in the Appendix.
3.2 Empirical Strategy

In order to identify the effects of different components of government spending we employ a variant of the methodology presented in Corsetti, Meier and Mueller (2012), which follows the strategy of Perotti (1999) and Tagkalakis (2008). We do so for two reasons. First, standard VARs are unsuitable for our purposes as the time span of the data available is relatively short, and the estimated effects would be imprecisely estimated – let alone the fact that our panel is unbalanced. Second, as we want to assess the effects of fiscal spending shocks in different economic environments, the two-step approach adopted here allows for considerable flexibility in estimating such effects, e.g. under fixed exchange rate regimes, in periods of crises, etc.

The first step in our work consists of obtaining series of fiscal policy innovations for each country $i$ in the sample, for different components of fiscal spending per person. Following Corsetti, Meier and Mueller (2012) we postulate a fiscal policy rule of the form:

$$g_{i,t} = \alpha_i + \lambda_1 g_{i,t-1} + \lambda_2 g_{i,t-2} + \gamma_1 gdp_{i,t-1} + \gamma_2 gdp_{i,t-2} + \delta debt_{i,t-1}$$

$$+ \zeta_1 crisis_{i,t-1} + \zeta_2 peg_{i,t-1} + \zeta_3 strain_{i,t} + \zeta_4 recession_{i,t-1} + \theta trend_t + \epsilon_{i,t}$$

(1)

where $g_{i,t}$ denotes (log) government spending per capita, $gdp_{i,t-1}$ is log of per capita output, $debt_{i,t-1}$ is log of per capita debt, $crisis_{i,t-1}$ is dummy indicating a banking, debt or currency crisis, $peg_{i,t-1}$ is dummy indicating a pegged exchange rate regime, $strain_{i,t}$ is dummy indicating either high public debt or high levels of borrowing needs, $recession_{i,t-1}$ is a dummy indicating recession and finally $trend_t$ denotes a deterministic time trend.

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1 Most papers in the literature focus only on government consumption, as there seems to be no direct link between the government wage bill and private sector productivity. We depart from the existing literature in accommodating more types of government spending in search of a richer set of empirical regularities.
Note that unlike Corsetti, Meier and Mueller (2012) we also control for the state of the economy (i.e. recession vs. expansion).\textsuperscript{2} In addition, due to the unbalanced nature of our panel dataset, we do not allow for country-specific coefficients in the policy rule, but rather we pool the coefficients across countries. Note by estimating (1) we posit a fiscal policy rule in the spirit of the rule adopted in Blanchard and Perotti (2002). Finally, we estimate (1) for various components of government expenditure including spending on wages and salaries (and total compensation of employees), spending on the use of goods and services, government investment and social benefits.\textsuperscript{3}

Having obtained our fiscal policy innovations ($\hat{\epsilon}_{i,t}$) from (1), in a second step we trace the dynamic effects of these innovations on key macroeconomic variables of interest. In particular, we follow the methodology suggested by Jordà (2005) and employ the method of local projections.\textsuperscript{4} In particular, for each (response) variable of interest we estimate a model of the form:

$$y_{i,t+j} = \eta_i + \beta_j \hat{\epsilon}_{i,t} + \varphi_j y_{i,t-1} + \delta_{1,j} c\text{risi}_i,t-1 + \delta_{2,j} p\text{eg}_i,t-1 + \delta_{3,j} s\text{train}_i,t +$$

$$+ \delta_{4,j} r\text{ecess}_i,t-1 + \gamma_{1,j} c\text{risi}_i,t-1 \hat{\epsilon}_{i,t} + \gamma_{2,j} p\text{eg}_i,t-1 \hat{\epsilon}_{i,t} + \gamma_{3,j} s\text{train}_i,t \hat{\epsilon}_{i,t} +$$

$$+ \gamma_{4,j} r\text{ecess}_i,t-1 \hat{\epsilon}_{i,t} + \varphi_j t\text{rend}_t + u_{i,t} \quad (2)$$

where $j = 0, \ldots, 5$ and $y_{i,t}$ denotes a variable of interest (e.g. government spending itself, private investment, net exports, etc.). In order to make our results comparable, we normalize impulse responses so that the initial increase in government spending is 1% of GDP.

Note that by switching on and off the dummy variable included in (2), we are able to estimate ‘state dependent’ effects of fiscal policy. For instance, when $c\text{risi}_{i,t-1}$ takes

\footnotesize
\begin{enumerate}
\item In line with our identifying assumptions the dummy variables, apart from $s\text{train}$ enter lagged in the specification. See Corsetti et al. (2012) for a discussion.
\item We realize that social benefits have a clear “endogenous” component as they represent transfer payments. We do keep them in the analysis, however, in order to see how ‘surprise’ transfer payments may impact on key macroeconomic variables – if at all.
\item See also Auerbach and Gorodnichenko (2012, 2013), Jordà and Taylor (2016), Owyang, Ramey and Zubairy (2013) and Ramey and Zubairy (2017) \textit{inter alia} for applications employing local projections methods.
\end{enumerate}

\normalsize
the value 1, the parameter $\gamma_{1,j}$ captures the dynamic effect (up to 5 years after the impact) of a government spending shock in economies after experiencing a currency/debt/banking crisis, $\beta_j$ measures the (direct) marginal effect of the spending shock when the economy has been in a state of crisis, while the $\delta_{3,j}$ parameters measure the direct effect of the $\text{crisis}_{i,t-1}$ variable on the macroeconomic variable of interest. Apart from the dummy variable and interaction terms, we also include the lagged dependent variable to control for initial conditions when the economy is hit by a spending shock.

4 Results

4.1 G=Wages and Salaries

We will first examine the case in which government spending is defined as wages and salaries of public servants. Initially, we estimate an unconditional scenario, i.e. a scenario in which we exclude all dummies from both the first step and the second step equation. This way, we abstract from variations in the economic environment and we can easily compare our results with the previous studies. As we can see in Figure 4.1.1, under the unconditional scenario, output and consumption multipliers are positive but below unity (although confidence intervals are pretty wide). Investment and net exports fall after a rise in government spending. Real exchange rate appreciates on impact but depreciates later on. Inflation multiplier is mostly negative, while the interest rate increases on impact and decreases later on. These results are in accordance with the existing literature, especially with the findings of Corsetti, Meier and Mueller (2012).

Next, we estimate the conditional model which accounts for variations in the economic environment, such as: the existence of crisis, whether the exchange rate regime is pegged, whether the public finances are weak (strain) and whether the economy is in recession. In order to trace the effects of government spending under each environment we compare each of the above cases with the baseline scenario, in which there is no crisis, the exchange rate is flexible and the public finances are normal. Figures 4.1.2-4.1.5 contain the results for the different economic environment when G=Wages and Salaries.

In the case of crisis, our results differ from those of Corsetti, Meier and Mueller (2012). Multipliers of output, consumption and investment are lower than the baseline
scenario and negative. Under peg exchange rates, output and consumption multipliers are again lower than in the baseline scenario and around zero, while government investment multiplier is negative on impact and close to zero later on. Trade balance improves on impact, but worsens subsequently, which is also the case for real exchange rate. On the contrary, in fiscal strain output and consumption multipliers are clearly higher than in the baseline scenario, but in recession there seem to be no important differences with baseline.

Figure 4.1.1: G=Wages and Salaries, Unconditional Scenario

Note: Dotted lines denote 90% confidence intervals.
Figure 4.1.2: G=Wages and Salaries, Baseline vs Crisis

Note: Dotted lines denote 90% confidence intervals. Black lines indicate the baseline scenario while red lines indicate the crisis scenario.

Figure 4.1.3: G=Wages and Salaries, Baseline vs Peg

Note: Dotted lines denote 90% confidence intervals. Black lines indicate the baseline scenario while blue lines indicate the peg scenario.
Figure 4.1.4: \( G = \text{Wages and Salaries, Baseline vs Strain} \)

Note: Dotted lines denote 90% confidence intervals. Black lines indicate the baseline scenario while yellow lines indicate the strain scenario.

Figure 4.1.5: \( G = \text{Wages and Salaries, Baseline vs Recession} \)

Note: Dotted lines denote 90% confidence intervals. Black lines indicate the baseline scenario while green lines indicate the recession scenario.
4.2 G=Government Investment

Results are quite similar when government spending contains only government investment. Except for the case of fiscal strain, our variables of interest follow the same pattern with the case of government spending defined as wages and salaries. Indeed, in contrast to the wages and salaries case in which under fiscal strain output, consumption and investment multipliers are higher than in the baseline scenario, in the government investment case they are not only lower than the baseline, but also negative on impact and close to zero later on.

*Figure 4.2.1: G=Investment, Unconditional Scenario*

Note: Dotted lines denote 90% confidence intervals.
Figure 4.2.2: G=Investment, Baseline vs Crisis

Note: Dotted lines denote 90% confidence intervals. Black lines indicate the baseline scenario while red lines indicate the crisis scenario.

Figure 4.2.3: G=Investment, Baseline vs Peg

Note: Dotted lines denote 90% confidence intervals. Black lines indicate the baseline scenario while blue lines indicate the peg scenario.
Figure 4.2.4: G=Investment, Baseline vs Strain

Note: Dotted lines denote 90% confidence intervals. Black lines indicate the baseline scenario while yellow lines indicate the strain scenario.

Figure 4.2.5: G=Investment, Baseline vs Recession

Note: Dotted lines denote 90% confidence intervals. Black lines indicate the baseline scenario while green lines indicate the recession scenario.
4.3 G=Goods and Services

Figures 4.3.1-4.3.5 describe the effects of an increase in government’s expense on goods and services. It should be noted that the results in this case are quite similar to the case of government spending defined as wages and salaries.

Figure 4.3.1: G=Goods and Services, Unconditional Scenario

Note: Dotted lines denote 90% confidence intervals.
Figure 4.3.2: G= Goods and Services, Baseline vs Crisis

Note: Dotted lines denote 90% confidence intervals. Black lines indicate the baseline scenario while red lines indicate the crisis scenario.

Figure 4.3.3: G=Goods and Services, Baseline vs Peg

Note: Dotted lines denote 90% confidence intervals. Black lines indicate the baseline scenario while blue lines indicate the peg scenario.
Figure 4.3.4: G=Goods and Services, Baseline vs Strain

![Graph showing Goods and Services, Baseline vs Strain](image1)

Note: Dotted lines denote 90% confidence intervals. Black lines indicate the baseline scenario while yellow lines indicate the strain scenario.

Figure 4.3.5: G=Goods and Services, Baseline vs Recession

![Graph showing Goods and Services, Baseline vs Recession](image2)

Note: Dotted lines denote 90% confidence intervals. Black lines indicate the baseline scenario while green lines indicate the recession scenario.
References


Ilzetzki, E., Reinhart, C. M., & Rogoff, K. S. (2011). The country chronologies and background material to exchange rate arrangements into the 21st century: Will the anchor


## Appendix

### Table A.1: List of Countries in the Dataset

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<td>Recession</td>
<td>Dummy that takes on the value 1 when lagged GDP growth is &lt;0, and zero otherwise</td>
<td>Based on authors’ calculations</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
Figure A. 1: $G=\text{Compensation of Employees, Unconditional Scenario}$

![Graph showing different economic indicators](attachment:image1)

Note: Dotted lines denote 90% confidence intervals.

Figure A. 2: $G=\text{Compensation of Employees, Baseline vs Crisis}$

![Graph showing different economic indicators](attachment:image2)

Note: Dotted lines denote 90% confidence intervals. Black lines indicate the baseline scenario while red lines indicate the crisis scenario.
Figure A. 3: G=Compensation of Employees, Baseline vs Peg

Note: Dotted lines denote 90% confidence intervals. Black lines indicate the baseline scenario while blue lines indicate the peg scenario.

Figure A. 4: G=Compensation of Employees, Baseline vs Strain

Note: Dotted lines denote 90% confidence intervals. Black lines indicate the baseline scenario while yellow lines indicate the strain scenario.
Figure A. 5: G=Compensation of Employees, Baseline vs Recession

Note: Dotted lines denote 90% confidence intervals. Black lines indicate the baseline scenario while green lines indicate the recession scenario.
Figure A. 6: G=Social Benefits, Unconditional Scenario

Note: Dotted lines denote 90% confidence intervals.

Figure A. 7: G=Social Benefits, Baseline vs Crisis

Note: Dotted lines denote 90% confidence intervals. Black lines indicate the baseline scenario while red lines indicate the crisis scenario.
Figure A. 8: G=Social Benefits, Baseline vs Peg

Note: Dotted lines denote 90% confidence intervals. Black lines indicate the baseline scenario while blue lines indicate the peg scenario.

Figure A. 9: G=Social Benefits, Baseline vs Strain

Note: Dotted lines denote 90% confidence intervals. Black lines indicate the baseline scenario while yellow lines indicate the strain scenario.
Figure A. 10: G=Social Benefits, Baseline vs Recession

Note: Dotted lines denote 90% confidence intervals. Black lines indicate the baseline scenario while green lines indicate the recession scenario.