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**THE EFFECTS OF GOVERNMENT SPENDING  
OVER THE BUSINESS CYCLE:  
A DISAGGREGATED ANALYSIS FOR OECD  
AND NON-OECD COUNTRIES**

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# The Effects of Government Spending Over the Business Cycle: A Disaggregated Analysis for OECD and Non-OECD Countries\*

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## Abstract

Using a panel of OECD and non-OECD economies, we estimate the effects of three types of government expenditure (compensation of government employees, government use of goods and services and government investment) and social benefits on output, private consumption and investment. In OECD economies, we find that compensation of government employees and government investment generate significantly positive multipliers, whereas government use of goods and services does not. However, only the multipliers of compensation of government employees are found higher during recessions and only for horizons of up to two years ahead. In non-OECD economies, the multipliers of compensation of government employees and government investment are positive but smaller than those for the OECD group and they do not tend to differ in recessions and in expansions. We also provide evidence that social benefits generate increases of private consumption, for both OECD and non-OECD countries.

*Keywords:* Fiscal Policy, Government Spending Multipliers, State-Dependent Multipliers, Local Projections, Non-Linear Models

*JEL Classification:* E62, E32, C33

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# 1 Introduction

Interest in the effects of fiscal policy has been renewed in the aftermath of the global financial crisis and Great Recession, as changes in nominal interest rates provided limited ability to monetary authorities to stimulate the economy, and government spending packages were used to generate higher aggregate demand. A useful metric used to summarize the effects of government spending on output is the so-called government spending multiplier, i.e. the amount of extra output generated by an additional dollar of spending.<sup>1</sup> However different components of government expenditure may give rise to different multipliers and knowledge of their size is of importance to policy makers. A related question is whether the economy reacts differently to fiscal policy depending on the state of the business cycle: this distinction is crucial as in “bad” times, policy makers are more likely to use fiscal spending to stimulate the economy than in “good” times. In this context, two natural questions emerge: (1) how do different government spending components affect the macroeconomy; and (2) do these effects vary over the business cycle (see e.g. [Auerbach & Gorodnichenko, 2012, 2013a](#))? Our work contributes to the recent empirical literature on the effects of government spending by trying to address these two issues.

In doing so, we make three contributions to the existing empirical literature. *First*, we estimate multipliers for government spending, disaggregating it according to its economic classification.<sup>2</sup> More specifically, we estimate multipliers for the compensation of government employees, government use of goods and services, and government investment, but we also examine the effects of these components on household consumption and private investment – two key ingredients of GDP that are thought to be affected by changes in government spending (see e.g. [Baxter & King, 1993](#); [Galí et al. , 2007](#)). In addition, we estimate the dynamic effects of changes in social benefits (which, strictly speaking, is not part of government spending). *Second*, our approach allows shedding some light on the question of how these effects might be state-dependent, which is what we find in the data: we document that the effects of government spending are in fact state-dependent, but they do not vary much across the business cycle.<sup>3</sup> Instead, they tend to differ more during periods of financial crises. *Third*, we present evidence for a panel of 35 OECD and 49 non-OECD economies, which allows us to make comparisons across the two groups of countries and identify similarities and differences. Most existing studies (e.g. [Auerbach & Gorodnichenko, 2013a](#); [Corsetti et al. , 2012](#); [Tagkalakis, 2008](#)) have studied OECD economies alone, and to the best of our knowledge such a comparison has not been attempted before at such a level of disaggregation.<sup>4</sup>

Our main findings can be summarized as follows. *First*, we note there is some degree of heterogeneity among the effects of different components of government spending, especially when these

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<sup>1</sup>A thorough survey of the theoretical and empirical literature on government spending multipliers is given in [Ramey \(2011a\)](#).

<sup>2</sup>This is based on the type or economic characteristics of expenditure. See [IMF \(2014\)](#) for a detailed discussion.

<sup>3</sup>For instance focusing on the US, [Auerbach & Gorodnichenko \(2012\)](#) present evidence that these effects vary over the business cycle, while [Owyang et al. \(2013\)](#) and [Ramey & Zubairy \(2018\)](#) find no such evidence.

<sup>4</sup>One exception is [Ilzetzki et al. \(2013\)](#) that includes some non-OECD economies, which however has a smaller cross-sectional dimension relative to ours.

are estimated using linear models. We also document that these multipliers tend to differ across OECD and non-OECD economies, with multipliers of government use of goods and services being an exception: they are small and in most cases insignificant for both groups of countries. Instead, we find that the multipliers of compensation of government employees and government investment are much larger of OECD economies.

*Second*, we find that in periods of *slack*, multipliers tend to be higher, but the evidence is limited: this holds for the compensation of government employees when we study OECD economies and only for horizons up to two years; and for government investment for non-OECD countries but only on impact. In general these findings are in line with those [Owyang \*et al.\* \(2013\)](#) and [Ramey & Zubairy \(2018\)](#) report for the US. In addition, we note that the estimated multipliers – state-dependent or not – are not very far from unity. In a series robustness experiments we find that multipliers are much larger in the period following the Great Recession, but much smaller in the pre 2008 period; and that they tend to be sizeable during periods of financial crises, while they are much smaller during normal times.

A *third* set of results relates to the effects of social benefits. We find that social benefits increase only moderately output at short horizons, but private consumption responds significantly in linear models (in line with what [Romer & Romer \(2016\)](#) document for the US). When we condition on the business cycle of the economy, we find that consumption increases both in recessions and in expansions in OECD economies, but only in recessions in non-OECD countries.

Our paper is related to work that disaggregates government spending: [Perotti \(2004\)](#) and [Auerbach & Gorodnichenko \(2012\)](#) distinguish between government consumption and government investment, while [Fatás & Mihov \(2001\)](#) and [Bermperoglou \*et al.\* \(2012\)](#) disaggregate government consumption into wage and non-wage components.<sup>5</sup> In a DSGE context, this issue is addressed by [Sims & Wolff \(2018\)](#) who break down government spending into consumption and investment and [Cortuk & Guler \(2015\)](#), who distinguish between wage, non-wage and investment spending. Recent studies that introduce a fine level of disaggregation include [Bouakez \*et al.\* \(2018\)](#) and [Bermperoglou \*et al.\* \(2017\)](#). [Bouakez \*et al.\* \(2018\)](#) disaggregate government consumption into wages, durables, non-durables and services, and government investment into structures and equipment; while [Bermperoglou \*et al.\* \(2017\)](#) disaggregate government wages by distinguishing between public sector employment (number of public sector employees) and the public sector wage rate.

The effects of social benefits, on the other hand, have not been studied much, two possible reasons being that, strictly speaking, they cannot be classified as a government spending, and they also contain a strong automatic stabilizer component. However [Furceri & Zdzienicka \(2012\)](#) estimate the effects of social benefits on several macroeconomic variables for a panel of OECD countries,

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<sup>5</sup>Other papers who break government spending into consumption and investment components include [Tagkalakis \(2006\)](#), [Pappa \(2009\)](#) and [Bénétrix \(2011\)](#) who study on the effects of government spending shocks on employment and the real wage; and [Beetsma \*et al.\* \(2006, 2008\)](#), [Bénétrix & Lane \(2010, 2013\)](#), and [Lane & Perotti \(2003\)](#) who focus on the effects of government spending shocks on trade and real exchange rate. [Pappa \(2009\)](#), [Bénétrix & Lane \(2010, 2013\)](#), [Bénétrix \(2011\)](#), [Lane & Perotti \(2003\)](#) and [Tagkalakis \(2006\)](#), also distinguish between wage and non-wage components of government consumption.

while [Romer & Romer \(2016\)](#) using U.S. data, focus on the effects of social benefits on private consumption.

Our paper is also related to a small but growing strand of the literature that examines whether the effects of government spending vary with the business cycle or with other economic conditions that influence the economy.<sup>6</sup> [Tagkalakis \(2008\)](#) examined the effects of fiscal spending 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. [Owyang \*et al.\* \(2013\)](#) and [Ramey & Zubairy \(2018\)](#) investigate whether multipliers are higher during periods of slack (i.e. high unemployment). In the same spirit, [Koh \(2016\)](#) shows that fiscal multipliers are larger during business cycle downturns, and [Fazzari \*et al.\* \(2015\)](#) support the idea of state-dependence of multipliers, estimating threshold VAR models.<sup>7</sup> Our work is closely related to that of [Auerbach & Gorodnichenko \(2013a\)](#) who estimate smooth-transition models, using data for a panel of OECD countries, but they do not distinguish between different components of government spending. Instead, we introduce a finer level of disaggregation of government expenditure, and provide results also for non-OECD economies. Our work also relates to [Auerbach & Gorodnichenko \(2012\)](#) who use US data and estimate Smooth-Transition Vector Autoregressive (STVAR) models, distinguishing between government consumption and government investment, while we introduce a finer level of disaggregation for government consumption, separating between compensation of government employees and purchases of goods and services for a larger group of countries. Finally, in the context of DSGE models state-dependence of government spending multipliers has been addressed addressed by [Canzoneri \*et al.\* \(2016\)](#) and [Sims & Wolff \(2018\)](#).

The rest of paper is organized as follows. In [Section 2](#) we describe the data and our empirical methodology. Our main findings are presented in [Section 3](#) and [Section 4](#) contains an extension for social benefits. [Section 5](#) discusses the robustness of our findings and [Section 6](#) contains our concluding remarks.

## 2 Data and Methodology

### 2.1 Data

We have collected annual data for the period covering 1991 to 2015 on 35 OECD and 49 non-OECD economies – the list of countries is shown in [Table A.1](#). The selection of non-OECD countries has been dictated purely by data availability rather than any other characteristic – we do control for various such characteristics in our robustness analysis. As we would like to evaluate the effects

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<sup>6</sup>For example, [Corsetti \*et al.\* \(2012\)](#) condition on the existence of a financial crisis, whether the exchange rate regime is pegged, and whether there is high public debt. Similarly, [Ilzetzki \*et al.\* \(2013\)](#) estimate panel VARs for groups of countries distinguished by the degree of development, the degree of exchange rate flexibility, their openness to trade, or whether their government debt is high.

<sup>7</sup>The work of [Candelon & Lieb \(2013\)](#) is also similar in that they employ a threshold vector error-correction model (VECM).

of different economic components of government expenditure, we chose to employ data on government expenditure on the compensation of government employees, the government use of goods and services, government investment and social benefits – the latter employed as an extension of our main results. Our fiscal spending variables come from IMF’s Government Financial Statistics (see [IMF, 2014](#)). The response variables of interest to us are output (to estimate fiscal spending multipliers), household consumption and private investment for which we obtained data from the World Bank and the OECD. In the main body of our analysis we also control for the levels of debt and tax revenue, which were also obtained from the IMF. A full account of our variables and data sources is provided in [Table A.2](#) in the Appendix.

To get an overall feeling of the fiscal spending variables employed here, [Table A.3](#) presents the average shares of each government spending component in GDP and in total government expenditure. A key feature to note is that the overall size of the public sector is about 15 percentage points of GDP larger in OECD economies, but if one looks at specific components of public spending, these seem closely aligned for OECD and non-OECD economies with the exception of social benefits which are about three times larger for OECD countries.

## 2.2 Identification of Fiscal Spending Shocks

Many papers in the literature identify government spending shocks using Structural Vector Autoregressive (SVAR) models following [Blanchard & Perotti \(2002\)](#) or by imposing sign restrictions ([Mountford & Uhlig, 2009](#); [Caldara & Kamps, 2008](#)). Another widely used method of identification is the so-called “narrative” approach (e.g. [Ramey & Shapiro, 1998](#)) that is based on military spending shocks, which can be thought as exogenous, since the decisions regarding military spending are not based on local economic conditions.<sup>8,9</sup>

In order to identify the effects of different components of government spending we employ a variant of the methodology discussed in [Corsetti \*et al.\* \(2012\)](#), which follows the strategy of [Perotti \(1999\)](#) and [Tagkalakis \(2008\)](#) and involves two steps: in the first step, a fiscal policy rule is estimated and the residuals are used as shocks; and in the second step, one estimates the effects of these shocks on some variables of interest. 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 (we have a maximum of 25 observations per country), and the estimated effects would be imprecisely estimated – let alone the fact that our panel is unbalanced. Second, as we would also like to assess the effects of fiscal spending shocks in different economic environments (e.g. in periods of recessions and expansions of the economy), the two-step approach adopted here allows for considerable flexibility in estimating such effects.<sup>10</sup>

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<sup>8</sup>In recent work, [Ramey \(2011b\)](#) created a measure of “news” about defense spending, capturing the expected discounted value of government spending changes due to foreign political events. Moreover, [Ben Zeev & Pappa \(2017\)](#) identified defense spending news as a shock that is orthogonal to current defense spending, and, best explains future movements in defense spending over a horizon of five years.

<sup>9</sup>An excellent account of different identification approaches of government spending shocks is [Ramey \(2016\)](#).

<sup>10</sup>Using linear panel VARs it would be possible to examine differences of the effects of government spending across

The first step in our work amounts to obtaining series of fiscal policy innovations for each country  $i$  in the sample and for different components of fiscal spending,<sup>11</sup> and the second step in estimating their dynamic effects. The usual practice in the literature has been to use the log of variables (for example GDP and government spending) and transform the estimated impulse responses into elasticities and/or multipliers ex post, using the sample average of the ratio of GDP to government spending (see e.g. [Auerbach & Gorodnichenko, 2012](#)). [Ramey & Zubairy \(2018\)](#) explain that such practice might cause biases due to variations of the sample average – which applies to our case as well, with sample averages varying considerably across countries. To avoid such bias, we follow the suggestion of [Ramey & Zubairy \(2018\)](#) and employ the [Gordon & Krenn \(2010\)](#) transformation: we divide government spending, GDP, consumption, and investment, by an estimate of potential, or trend GDP.<sup>12</sup> This puts all variables in the same units, which means that there is no need for an ex-post transformation, also making the interpretation of impulse responses easier.

With this transformation at hand, following [Corsetti \*et al.\* \(2012\)](#) we postulate a fiscal policy rule of the form:

$$g_{i,t} = \alpha_i + \lambda_1 g_{i,t-1} + \lambda_2 g_{i,t-2} + \gamma_1 gdp_{i,t-1} + \gamma_2 gdp_{i,t-2} + \delta debt_{i,t-1} + \tau tax_{i,t-1} + \theta trend_t + \varepsilon_{i,t} \quad (1)$$

where  $g_{i,t}$  denotes government spending,  $gdp_{i,t}$  is real output,  $trend_t$  denotes a deterministic time trend and  $\varepsilon_{i,t}$  captures discretionary policy changes. In order to account for the role of financing as well as the level of outstanding liabilities of the government, we control for taxes by adding one lag of the average tax rate (tax revenues as a ratio to GDP)  $tax_{i,t}$ , and one lag of the debt-to-GDP ratio,  $debt_{i,t-1}$ . Because of the unbalanced nature of our dataset, we do not allow for country-specific coefficients in the policy rule, but rather we pool the coefficients across countries. It is important to highlight that by estimating (1) we posit a fiscal policy rule in the spirit of the rule adopted in [Blanchard & Perotti \(2002\)](#): identification is achieved by assuming that spending cannot respond simultaneously to output changes, but only to past growth developments.<sup>13</sup>

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subsets of the data, using sample splits, but it would be difficult to account for time-varying regimes, such as the presence of a recession.

<sup>11</sup>Some scholars (e.g. [Bermperoglou \*et al.\*, 2017](#); [Corsetti \*et al.\*, 2012](#); [Ilzetzki \*et al.\*, 2013](#)) 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 other types of government spending (use of goods and services and government investment) in search of a richer set of empirical regularities. We do assume however that all types of government expenditure we consider do not affect potential output.

<sup>12</sup>In order to estimate (log) trend real output, we fit log real GDP to a third-degree polynomial in time, on a country-by-country basis. Then “potential GDP” is estimated as an exponential of the fitted trend.

<sup>13</sup>Note that the Blanchard-Perotti identification has been employed with annual data in [Beetsmaa \*et al.\* \(2006\)](#) and [Bénétrix & Lane \(2013\)](#). [Born & Müller \(2012\)](#) show that this timing assumption is valid with annual data for the United States, United Kingdom, Canada, and Australia. [Beetsmaa \*et al.\* \(2009\)](#) using an alternative test reached the same conclusion.

## 2.3 Estimating Cumulative Multipliers and Impulse Responses

Having obtained our fiscal policy innovations ( $\hat{\varepsilon}_{i,t}$ ) from (1), it is possible to estimate cumulative output multipliers and impulse responses of key variables of interest. The former, answer a policy question of interest as they measure the cumulative change in GDP relative to the cumulative change in government spending for horizons of up to  $h$  years-ahead – we compute multipliers for up to five-year-ahead in our work. Impulse responses may be estimated employing the method of local projections proposed by Jordà (2005).<sup>14</sup> In particular, in the linear case (where we abstract from any variations in the state of the economy), we estimate models of the form

$$y_{i,t+h} = \eta_{i,h} + \beta_h \hat{\varepsilon}_{i,t} + \boldsymbol{\psi}_h \mathbf{x}_{i,t-1} + \kappa_h \text{trend}_t + v_{i,t+h}, \quad (2)$$

where  $y_{i,t+h}$  denotes a variable of interest (such as government spending itself, GDP, private consumption, or private investment)  $h$  periods after the shock,  $\mathbf{x}_{i,t-1}$  is a vector of control variables,  $\boldsymbol{\psi}_h$  is a vector of coefficients and  $\text{trend}_t$  is a time trend. The vector  $\mathbf{x}_{i,t-1}$  includes two lags of government spending, two lags of GDP, one lag of debt and one lag of tax rate – similar to (1) above. We have chosen to include the same variables in  $\mathbf{x}_{i,t-1}$  both in (2) and in (1) only for simplicity: in fact, whenever (2) is estimated for consumption and private investment,  $\mathbf{x}_{i,t-1}$  also includes two lags of the relevant left-hand side variable.<sup>15</sup> We estimate this model with fixed effects regressions for horizons up to 5 years after the shock, i.e. we estimate the above equation for  $h = 0, \dots, 5$ . Then, the parameter  $\beta_h$  defines the response of  $y$  to a shock in period  $t$ ,  $h$  periods after the shock. Gathering up all the  $\beta_h$ 's, provides us with the Impulse Response Function (IRF) of the specific variable  $y$ .

The method of local projections can easily be adopted to estimating non-linear models. In particular, when we wish to estimate a state-dependent model, this is easily accomplished by estimating (see Auerbach & Gorodnichenko, 2012, 2013a)

$$y_{i,t+h} = \eta_{i,h} + (1 - F(z_{i,t-1})) \left[ \beta_{E,h} \hat{\varepsilon}_{i,t} + \boldsymbol{\psi}_{E,h} \mathbf{x}_{i,t-1} \right] + F(z_{i,t-1}) \left[ \beta_{R,h} \hat{\varepsilon}_{i,t} + \boldsymbol{\psi}_{R,h} \mathbf{x}_{i,t-1} \right] + \kappa_h \text{trend}_t + v_{i,t+h}, \quad (3)$$

where  $F(\cdot)$  is the transition function given by the logistic function:

$$F(z_{i,t}) = \frac{\exp(-\gamma z_{i,t})}{1 + \exp(-\gamma z_{i,t})}, \quad \text{with } \gamma > 0. \quad (4)$$

Here  $F(z_{i,t})$  can be interpreted as the probability of being in a recession.  $z_{i,t}$  is a transition variable, measuring the state of the business cycle; we choose  $z_{i,t}$  to be the 2-year moving average of GDP growth rate (normalized to have zero mean and unit variance).<sup>16</sup> The parameter  $\gamma$  captures the

<sup>14</sup>See also Auerbach & Gorodnichenko (2013a; 2013b), Jordà & Taylor (2016), Owyang *et al.* (2013) and Ramey & Zubairy (2018) inter alia for applications employing local projections.

<sup>15</sup>In addition we extend the vector of controls  $\mathbf{x}_{i,t-1}$  in (2) in our robustness analysis below.

<sup>16</sup>In order to avoid extreme values in our transition variable, we do not include in our analysis observations for which



smoothness of the transition between regimes: when  $\gamma = 0$ , we get the linear case, while when  $\gamma$  takes very high values, the state indicator resembles a usual dummy variable. When  $F(z_{i,t}) = 1$  the economy is in deep recession, while when  $F(z_{i,t}) = 0$  the economy is in extreme expansion. We follow [Auerbach & Gorodnichenko \(2013a\)](#) and set  $\gamma = 1.5$ .<sup>17</sup> The vector  $\mathbf{x}_{i,t-1}$  is the same set of control variables as in (2),  $\boldsymbol{\psi}_{E,h}$  and  $\boldsymbol{\psi}_{R,h}$  are vector coefficients in expansions and recessions, and  $\{\beta_{E,h}\}_{h=0}^H$  and  $\{\beta_{R,h}\}_{h=0}^H$  are the responses of  $y$  in a state of expansion and recession respectively, to a shock in period  $t$ ,  $h$  periods after the shock. In our work we employ clustered standard errors at the country level.

In computing cumulative multipliers we follow the one-step approach put forth by [Ramey & Zubairy \(2018\)](#), which is an instrumental variable estimation of the sum of GDP on the sum of government spending, using the estimated shock as an instrument – the benefit being that we obtain a standard errors for each multiplier estimate, making inference on these easier.<sup>18</sup> In the linear case the model of interest reads

$$\sum_{j=0}^h y_{i,t+j} = \chi_{i,h} + m_h \sum_{j=0}^h g_{i,t+j} + \boldsymbol{\psi}_h \mathbf{x}_{i,t-1} + \phi_h trend_t + \omega_{i,t+h}, \quad h = 0, 1, \dots, 5 \quad (5)$$

where  $\sum_{j=0}^h y_{i,t+j}$  is the sum of GDP from  $t$  to  $t+h$ ,  $\sum_{j=0}^h g_{i,t+j}$  is the sum of the government spending component from  $t$  to  $t+h$ . The idea is to use the estimated shock  $\hat{\varepsilon}_{i,t}$ , as an instrument for  $\sum_{j=0}^h g_{i,t+j}$ . Then,  $m_h$  is the  $h$ -period cumulative output multiplier. Accordingly, in the state-dependent case, the model used becomes:

$$\begin{aligned} \sum_{j=0}^h y_{i,t+j} = & \chi_{i,h} + (1 - F(z_{i,t-1})) \left[ m_{E,h} \sum_{j=0}^h g_{i,t+j} + \boldsymbol{\psi}_{E,h} \mathbf{x}_{i,t-1} \right] + \\ & F(z_{i,t-1}) \left[ m_{R,h} \sum_{j=0}^h g_{i,t+j} + \boldsymbol{\psi}_{R,h} \mathbf{x}_{i,t-1} \right] + \phi_h trend_t + \omega_{i,t+h}, \quad h = 0, 1, \dots, 5 \end{aligned} \quad (6)$$

where we use  $F(z_{i,t-1}) \cdot \hat{\varepsilon}_{i,t}$  and  $(1 - F(z_{i,t-1})) \cdot \hat{\varepsilon}_{i,t}$  as instruments for  $F(z_{i,t-1}) \cdot \sum_{j=0}^h g_{i,t+j}$  and  $(1 - F(z_{i,t-1})) \cdot \sum_{j=0}^h g_{i,t+j}$ , respectively. This procedure provides us with state-dependent multipliers  $m_{E,h}$  and  $m_{R,h}$  and their associated standard errors – we also employ clustered standard errors when estimating multipliers.

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the annual growth rate has been above 10% or below -10%.

<sup>17</sup>[Auerbach & Gorodnichenko \(2013a\)](#) calibrate  $\gamma$ , so that the economy spends about 20% of time in recession, where they define an economy to be in a recession if  $F(z_{i,t}) > 0.8$ . This is consistent with the duration of recessions in the US.

<sup>18</sup>Alternatively, it would be possible to estimate cumulative multipliers (in linear models) using the following three steps: (i) estimate equation (2) for output and government spending, for each horizon up to  $h$ ; (ii) sum the  $\beta_h$ 's for output and government spending, respectively; and, (iii) compute the cumulative multipliers as the ratio of the sum of the  $\beta_h$ 's for output to the sum of the  $\beta_h$ 's for government spending. [Ramey & Zubairy \(2018\)](#) explain that the multipliers from the two procedures should be equal if one uses the exact same sample for all of the regressions and also drops the last  $h$  observations.

### 3 Main Empirical Results

This section contains our main empirical findings. We first discuss the results for OECD countries in our sample and then compare these to our results for non-OECD economies.

#### 3.1 Main Findings for OECD Countries

Our main findings for OECD economies are summarized in [Figure 1](#) and [Table 1](#). [Figure 1](#) presents the IRFs of output, household consumption and private investment estimated using equations (2) and (3) for three different components of government spending. It displays the response of each variable (expressed in percent of GDP) when a shock to the respective component of government expenditure leads to its increase by 1% of GDP. [Table 1](#) reports cumulative output multipliers, where we note that when these are estimated using linear specifications, they take values well below unity, whereas when they are estimated using state-dependent models, they are below one in expansions but, in general, larger than one during recessions – we elaborate on these findings below.

[Figure 1a](#) reports the impulse responses to a shock that raises the compensation of government employees by 1% of GDP. Starting with the linear specification (top row), we note that output and private consumption increase for three years after the shock, but after that the effect fades away. Instead, private investment increases at longer horizons. On the other hand in non-linear environments we get a different picture: in expansions, shocks that increase the compensation of government employees have no effect at all; while during recessions, they lead to output and consumption increases for horizons of up to three years, whereas investment remains level. The findings we uncover in recessionary environments are in line with models which feature rule-of-thumb consumers ([Galí et al. , 2007](#)) and/or liquidity-constrained households ([Kara & Sin, 2018](#)). The cumulative output multipliers reported in Panel A of [Table 1](#) range between 0.58 and 0.78 in linear environments, being significant at all horizons considered. Our results are in line with existing studies (e.g. [Bouakez et al. , 2018](#); [Burgert & Gomes, 2012](#); [Bermperoglou et al. , 2017](#)), but our estimates are smaller (for US data they report multipliers in the range of 1.1 to 5.5, with some being insignificant however). We also find that in expansions, the multiplier is significant only on impact and equal to 0.73; while it takes values above unity during recessions, it is significant at all horizons and peaks at 1.48, five years after the shock. In order to assess more formally the difference of multipliers in recessions and expansions, we perform a simple test of equality at each horizon considered. Our results show that multipliers differ significantly for horizons up to two years, but not at longer horizons – this finding being in line with [Auerbach & Gorodnichenko \(2012\)](#), who show that the government consumption multiplier is higher in recessions than expansions.<sup>19</sup>

Shocks to government purchases of goods and services do not seem to have strong effects as we can see in [Figure 1b](#). In the linear specification, output responds significantly only for two

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<sup>19</sup>The fact that compensation of government employees behaves much the same way as government consumption is not surprising, since compensation of employees makes up the largest part of government consumption.

years after the shock and investment is crowded out for up to two years.<sup>20</sup> When controlling for the business cycle, such a shock has no effect during expansionary periods, while during recessions output and consumption respond positively at horizons of one to two years after the shock. The multipliers reported in Panel B of [Table 1](#) indicate that variations in the government expenditure on goods and services affect output only at short horizons (up to one year after the shock). The estimates are between 0.55 and 0.56 in linear models, but are slightly larger in non-linear cases, namely about 0.61 in expansions and 1.05 in recessions. These estimates are much lower compared to those reported in [Bouakez \*et al.\* \(2018\)](#) for the US, which range between 0 and 2.87 for non-defense expenditure on non-durable goods and between 1.64 and 2.70 for non-defense expenditure on services. Moreover, formal testing reveals that in this case the multiplier estimates do not differ significantly in recessions and in expansions at all horizons considered – in line with the evidence discussed for the US by [Ramey & Zubairy \(2018\)](#) for government purchases however.

Finally, shocks to government investment produce effects that are between those generated by shocks to government purchases of goods and services and shocks to compensation of government employees (see [Figure 1c](#)). In the linear specification, output and consumption increase for about three years, and private investment is crowded out but only on impact. Instead, in expansions we find that a government investment shock leaves all variables virtually unaffected at all horizons, while during recessions, we note a significant increase in both GDP and household consumption for horizons between one to three years after the shock – the response of private investment being close to zero. Additionally, in Panel C of [Table 1](#) where we report output multipliers of government investment, we note a picture similar to that of Panel A: in the linear specification, the multiplier estimates vary between 0.299 (on impact) and 0.816 (two years after the shock), being significant at all horizons considered. Note that [Burgert & Gomes \(2012\)](#) find a present value multiplier for government investment at a five year horizon ranging between 0.80 and 3.29 for the US (depending on the identification used); whereas [Bermperoglou \*et al.\* \(2012\)](#) find multipliers which are much larger at a three year horizon, ranging between 1.80 for the EU (but being insignificant) and 8.29 for the US. In expansions, we find that the multipliers are significant only at a horizon of one and two years after the shock, and peak at 0.815. During recessions, the multipliers are significant for all horizons between one and five years, peaking at 1.78 (five years ahead). Testing for differential multipliers in recessions and expansions, we only find such evidence at the five-year horizon. Comparing our results to those of [Auerbach & Gorodnichenko \(2012\)](#), we note that their government investment multipliers are larger than our estimates (between 1.5 and 2 in the linear case, around 1 in expansions and above 2 in recessions). In addition, we do not find strong evidence that these multipliers vary across the business cycle, in line with the evidence discussed in [Ramey & Zubairy \(2018\)](#) for the US economy.

To sum up, for OECD economies we find that the multiplier estimates of government purchases of goods and services tend to be insignificant both in recessions and in expansions. Instead, the

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<sup>20</sup>[Bouakez \*et al.\* \(2018\)](#) find that in the US a shock to federal government spending on non-durable goods or services does not have a significant effect on output.

multipliers of the compensation of government employees and government investment are found to be significant. Although the point estimates are less than one in the linear specification and during expansions, and slightly above unity during recessions, taking into account estimation uncertainty indicates that our multiplier estimates do not significantly exceed one in all cases. Moreover, formal testing provides some evidence in favor of the hypothesis that the multipliers vary with the business cycle: this however holds at relatively short horizons for government compensation of employees and at a five-year horizon for government investment. The fact that compensation of government employees and government investment have a significant effect on output, while government purchases of goods and services do not, is not surprising. An explanation is provided by theoretical models in [Bermperoglou \*et al.\* \(2012, 2017\)](#) and [Cortuk & Guler \(2015\)](#). As opposed to spending on goods and services, which is only meant for consumption purposes, both compensation of government employees and public investment contribute to productive government operations. Government production in turn increases the productivity of the private sector leading to higher output, something empirically confirmed in [Figure 1](#). The response of private investment to shocks to government purchases of goods and services is negative at all times. Its response to compensation of employees and government investment, however, tends to become positive at long horizons, implying that these two types of spending have a “productive” nature, which takes some years to materialize.

### 3.2 Empirical Findings for non-OECD Countries

Here we repeat the above experiments for 49 non-OECD economies listed in [Table A.1](#) in order to assess the effects of different government spending components for this group of countries. The results are summarized in [Figure 2](#) and [Table 2](#).

We first note that when using the linear specification to trace the effect of a shock to the compensation of government employees in [Figure 2a](#), the response of output and consumption is essentially zero, whereas investment is significantly crowded out only five years after the shock. Controlling for the business cycle, we note a similar picture: the only variable that seems to respond (marginally) in a significant manner is investment, when the economy is in expansions. Overall, however, increases in the compensation of government employees do not seem to generate significant changes in output and consumption for non-OECD countries. Along similar lines, the estimated multipliers in Panel A of [Table 2](#) are significant only on impact in expansions and recessions taking values of 0.56 and 0.63 respectively – but they do not differ significantly. These findings are in contrast to those for OECD economies, for which we found higher and, more importantly, significant multipliers in most cases. In addition, for OECD countries we found that multipliers did differ at some horizons (2–3 years), but no significant difference was uncovered for non-OECD countries.

A similar pattern is observed when the government spending variable we employ is the expenditure on goods and services. The response of all variables is indistinguishable from zero in the

linear specification (Figure 2b), while we note a significant drop in investment during recessions, but only at a horizon of one year after the shock. Multipliers in Panel B of Table 2 are everywhere insignificant. The conclusion to be drawn again is that variations in government purchases of goods and services do not tend to generate significant responses in output, consumption or investment.

When we look at the effects of government investment using a linear specification (Figure 2c), we get a slightly different picture. A rise in government investment is associated with a small and short-lived increase in output, leaving household consumption and private investment essentially unaffected. This finding is interesting, as it is in line with models in which households behave in a Ricardian manner: none of the transitory increase in output seems to translate into higher consumption.<sup>21</sup> Allowing for business cycle dependence we get a similar picture: in expansions, output drops on impact but quickly returns to its pre-shock level – with consumption and private investment being unaffected. During recessions, we observe that output increases on impact and remains above trend for a year, reverting quickly back to its pre-shock level. Investment is also found to fall one year after the shock, with consumption being completely insulated from output variations. One way to interpret this finding is that it provides evidence both in favor of the textbook Keynesian model but also in favor of models with forward-looking (Ricardian) agents: during recessions a fiscal expansion leads to an increase in output which crowds out private investment, but household consumption is completely unaffected – probably reflecting higher savings to cover future tax obligations. In Panel B of Table 2 we find that government investment multipliers are significant for at most one year ahead – in sharp contrast with our findings for OECD countries (Table 1), where multipliers are significant almost at all horizons considered. We also note that the point estimates are found to be larger in recessions than in expansions only on impact – the difference being significant again only on impact. The finding that multipliers do not differ significantly in expansions and recessions at most horizons is analogous to what we found for OECD economies; the only difference being that evidence of differential multipliers are obtained on impact for non-OECD economies and at horizons of five years ahead for the OECD group.

To recap, our findings for non-OECD economies indicate there is essentially only weak evidence of multipliers which vary with the business cycle, and this is so only on impact and only for government investment. Moreover, we find that changes in the compensation of government employees and government investment generate statistically significant multipliers, but only at short horizons (of up to one year ahead) – the point estimates being rather moderate, ranging between 0.389 and 0.630, much lower than the corresponding multipliers found for OECD economies.

## 4 An Extension: Assessing the Effects of Social Benefits

Our analysis thus far has focused on measuring the effect of government expenditure on output, consumption and private investment. A useful extension we consider is measuring the effects of

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<sup>21</sup>It is true that one would expect such a behavior to be manifested in developed (e.g. OECD) economies. Yet this is what we uncover in our data.

variations in social benefits. While we do understand that social benefits contain a strong cyclical component and are essentially automatic stabilizers, we feel that trying to measure their effects on output and consumption will be informative and of interest to policy makers. This task has been undertaken in recent work by [Romer & Romer \(2016\)](#) for the U.S. who identify exogenous variations in social security benefits relying on external sources. Instead, we adhere to our methodology and extract ‘exogenous’ shocks to social benefits by means of a policy rule like (1), which is close to the way [Furceri & Zdzienicka \(2012\)](#) obtained results for OECD countries. As the identifying assumption of exogenous variation in social benefits might be violated (e.g. the timing assumption we use), the results we present should be interpreted with a grain of salt in that they provide indications rather than conclusive evidence.

The results from our impulse response analysis ([Figure 3a](#)) show that for OECD economies, an increase in social benefits leaves output unaffected. This holds clearly when we employ a linear specification. Consumption on the other hand is found to increase in the first years after the shock, while investment is crowded out. When we allow for dependence on the business cycle, output rises by 1.42% in recessions (one year after the shock) and by 1.63% in expansions (three years after the shock). Consumption also increases in expansions, and during the first years after the shock in recessions. This increase in private consumption after an increase in social benefits is also confirmed by [Romer & Romer \(2016\)](#) for the US. Finally, the response of investment is very close to zero in expansions, but in recessions, investment falls on impact and remains in negative territory for about one year after the shock. Moreover, we have estimated output multipliers for social benefits (Panel A in [Table 3](#)) and found that these multipliers tend to be small (around 0.70-0.89) – both in recessions and in expansions – and significant for horizons of up to two years. Finally, we once again we obtain evidence favoring differences of these multipliers in recessions and expansions only on impact. We should also highlight that our multiplier estimates here are slightly larger than those in [Furceri & Zdzienicka \(2012\)](#), who report a multiplier of 0.6 for OECD countries.

Turning to non-OECD economies, impulse responses in [Figure 3b](#) suggest that social benefits trigger a rise in household consumption of about 0.88% of GDP at horizons of up to three years after the shock, while leaving output unaffected – private investment is also crowded out at longer horizons by half a percentage point. In the non-linear specification, social benefits again leave output unaffected and the same applies for investment. Instead, during recessions they generate large increases in consumption of about 2.27–2.56% of GDP at a two to three year horizon.<sup>22</sup> Moreover, the cumulative multipliers in Panel B of [Table 3](#) point in the same direction: the multipliers are insignificant everywhere but during expansions and only on impact. We note here that these findings are not very far from those reported for OECD countries above.

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<sup>22</sup>These estimates have  $p$ -values of about 0.11 and 0.10 respectively.

## 5 Robustness Analysis and Further Results

In order to assess the robustness of our results, we conduct a series of experiments. We briefly discuss the findings from these experiments here and refer the reader to the online appendix, where these are discussed in some detail.

First, a natural question that arises is whether our results are driven by the way we estimate potential output – recall all variables are normalized by trend GDP following [Gordon & Krenn \(2010\)](#) and [Ramey & Zubairy \(2018\)](#). In order to explore this issue, we obtain two more estimates of potential output: the first one is obtained by fitting a second-degree polynomial in time to log real GDP, and the second one is given by the trend-GDP estimated using the Hodrick-Prescott filter.<sup>23</sup> In both cases, we note no significant qualitative or quantitative difference relative to the results discussed above, the only exception being that multipliers estimated using quadratic trend-GDP tend to be slightly higher for both groups of countries.

Second, the form of ‘state-dependence’ we have explored relates only to the phase of the business cycle, while it is possible to define other types of state-dependence. For instance, one could explore how our results change in the face of financial crises.<sup>24</sup> To this end, we follow [Laeven & Valencia \(2018\)](#) and define a financial crisis as a banking, debt or currency crisis, which now becomes our ‘state’ variable. In doing so, we find some strong evidence of state-dependence: multipliers tend to differ (in a significant manner) during crisis and non-crisis periods, especially for non-OECD economies. In some detail, we find that for OECD economies the multipliers of compensation of government employees is significant in normal times and higher when the economy is in a state of financial crisis, ranging between 1.243 and 3.131. We also note that the multipliers of government use of goods and services do not change much, while the multipliers of government investment are found significant in normal times and insignificant during periods of crises, despite the fact that they were positive and significant during recessions. For non-OECD countries, we also find that the multipliers of compensation of government employees are higher during periods of financial crises (ranging between 3.324 and 8.841), while the multipliers of government use of goods and services and government investment are negative, although for government investment, the multiplier turns positive, five years after the shock. Looking at social benefits, we find that they are associated with positive multipliers for OECD countries during crisis periods, but these multipliers are smaller than those we have reported for periods of recession. Instead, the social benefits multipliers are negative for non-OECD economies, both during normal and crisis periods (although during crises they are larger in magnitude).

Third, while the OECD countries in our sample form a rather homogeneous group as they share many common characteristics, this is probably not the case for the group of non-OECD economies. In order to control for differences across countries that have not been explicitly taken into account thus far, we extend the set of variables in  $\mathbf{x}_{t-1}$  in (5)–(6). In particular, we control for the quality

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<sup>23</sup>We use a smoothing parameter of 100, which is quite common for annual data.

<sup>24</sup>We are grateful to an anonymous referee for raising this issue.

of various institutions (government stability, corruption, and law and order), for the exchange rate regime as well as trade openness, for monetary policy, for government effectiveness and we also account for whether a country is a commodity producer or not. While this extension is important mostly for the non-OECD group, we perform the analysis again for both groups of countries for the sake of completeness.

We find that when we control for institutions, trade openness, the exchange rate regime, and whether the country is a commodity producer or not, the results are similar the ones already discussed. When we control for monetary policy, the multipliers in OECD economies are almost the same, but some differences arise in non-OECD countries: the multiplier estimates tend to be larger for all three types of government expenditure. Moreover, the multipliers of social benefits become negative and significant for non-OECD countries at three to five year horizons.<sup>25</sup> When controlling for government effectiveness the results change slightly. For OECD countries, the estimated multipliers of compensation of government employees are higher and the same applies for the multipliers of goods and services in expansions, while the government investment multipliers do not change much (they are slightly higher in expansions). For non-OECD economies, we find that multipliers of government use of goods and services become significant in the linear specification, but otherwise they are in line with those analyzed in [Section 3](#). Finally, including all extra controls together leads to results similar to those just discussed when we control for government effectiveness – a minor difference being that the multipliers of compensation of government employees become negative in expansions for non-OECD economies.

Finally, as it is quite likely that the multiplier estimates have changed during and after the period of the global financial crisis, we perform another set of experiments to verify how the inclusion of the latter part of the sample affects our results.<sup>26</sup> We do so by allowing the values of the multipliers to vary in the pre and post 2008 period.<sup>27</sup>

As far as the OECD countries are concerned, we find strong evidence that multipliers differ in the pre and post 2008 sub-periods, being higher during the latter period. In particular we find that this is the case in the linear specification as well as during recessions, when looking at the multipliers of compensation of government employees and those of government use of goods and services. Regarding the multipliers of government investment we find evidence that these differ in the two sub-periods, but only in the linear specification. Instead, we note that for all three types of government spending there is no evidence favoring the difference of multipliers during expansions between the two sub-periods.

When looking at non-OECD countries, we get a slightly different picture. As far as the multipliers of compensation of government employees is concerned, there is no evidence that these differ in the two sub-period. Instead, we note that the multipliers of government purchases of goods and

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<sup>25</sup>This finding is consistent with a *reversal* in social benefits observed in [Figure 3b](#): a rise today is followed by a future reduction in order to ‘finance’ the initial increase.

<sup>26</sup>We would like to thank two anonymous referees for raising this issue.

<sup>27</sup>We also estimated multipliers for the period 1991-2007, and obtained results (available in an online appendix) which are in line with the ones we are about to discuss here.



services differ markedly in the two sub-periods: this difference is much clearer in the linear specification, while we also find such evidence for states of recession (for horizons up to two years). Finally, we also find some evidence favoring the difference of government investment multipliers in the two sub-periods, but for horizons of at most two years, especially in the linear specification.<sup>28</sup>

Finally, as far as social benefits multipliers are concerned we find that these differ in the two sub-periods only for OECD economies, and in particular in states of expansion.<sup>29</sup> We do not uncover any differences for non-OECD countries.

## 6 Conclusions

Driven by the the need to obtain information about the size of the multipliers for specific classes of government spending, In this paper we have we have focused on the effects of compensation of government employees, government use of goods and services and government investment. In our effort to account for differences pertaining to diverse countries and obtain as general results as possible, we have employed data for 35 OECD and 49 non-OECD economies. Moreover, we have tried to assess whether the effects of fiscal spending vary across the business cycle but also in periods of financial crises.

Our results show that the effects of government spending differ across groups of countries: compensation of government employees and government investment produce higher responses of output and higher multipliers for OECD economies, but estimates fall short of unity when estimated using linear specifications. Instead, purchases of goods and services do not seem to help in stimulating the economy, producing effectively zero multipliers both for OECD and non-OECD countries, regardless of whether we condition on the phase of the business cycle.

Moreover, we find that multipliers tend to differ depending on the state of the economy. For OECD economies, this is clearly the case for the multipliers of the compensation of government employees: the (cumulative) multipliers differ significantly for horizons up to two years, being much higher in states of recession. Likewise, we find that the multipliers of government investment differ only at a five year horizon for OECD countries, again being higher during recessions. Instead, we find no difference in the multipliers of the compensation of government employees for non-OECD economies. However, the government investment multipliers for non-OECD countries are found to be significantly larger in periods of recession, but only for horizons of one year ahead.

Finally, we present evidence on the effects of social benefits on the macroeconomy. We find that the estimated multipliers are small in all cases, and statistically significant only when accounting for the business cycle. We nonetheless find that increases in social benefits lead to large increases in household consumption, both for OECD and non-OECD economies in states of recession; but only for OECD countries in states of expansion.

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<sup>28</sup>There is also some evidence favoring different multipliers in the two sub-period at the one year horizon both in recessions and in expansions.

<sup>29</sup>Multipliers also differ at a one year horizon (linear case) and on impact (during recessions).

The results we have presented do come with caveats. We are forced to use historical data, so we do not have controlled experiments that would allow us to estimate average treatment effects. In addition, the period and countries we studied are characterized by particular paths of taxes, so our results are not directly applicable to the case of fiscal consolidations, where taxes might follow different paths. Finally, while the results for social benefits are interesting in their own sake, the ‘shocks’ identified might not be fully exogenous as we have already explained.

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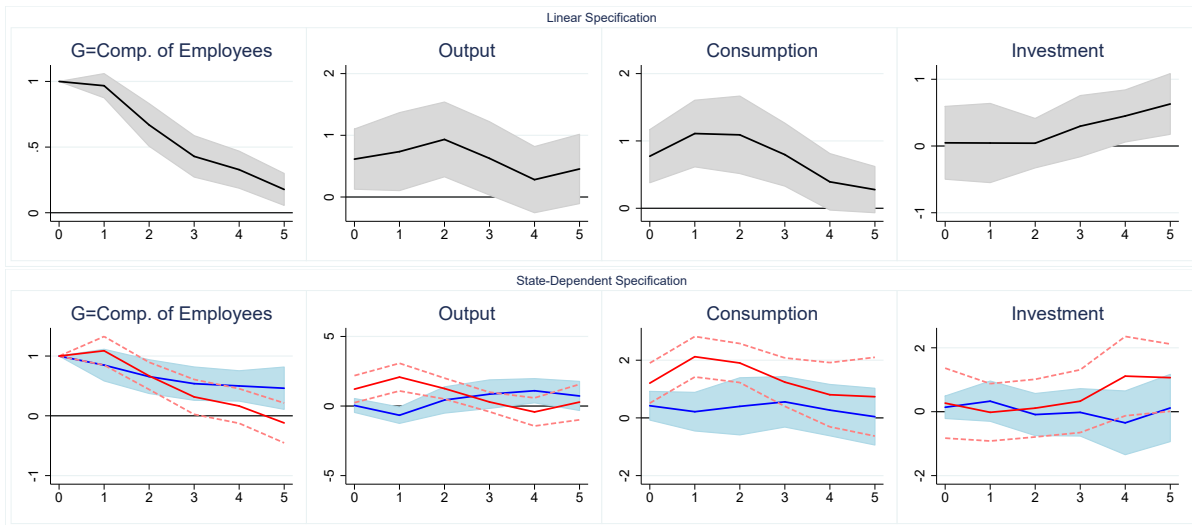
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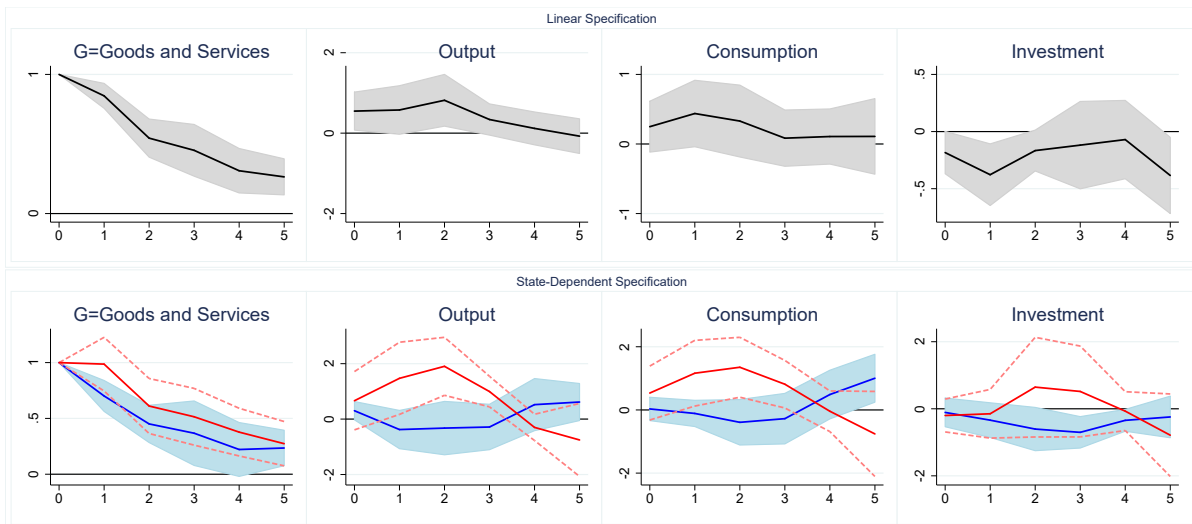
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Figure 1: Impulse Responses to Government Spending Shocks for OECD Countries

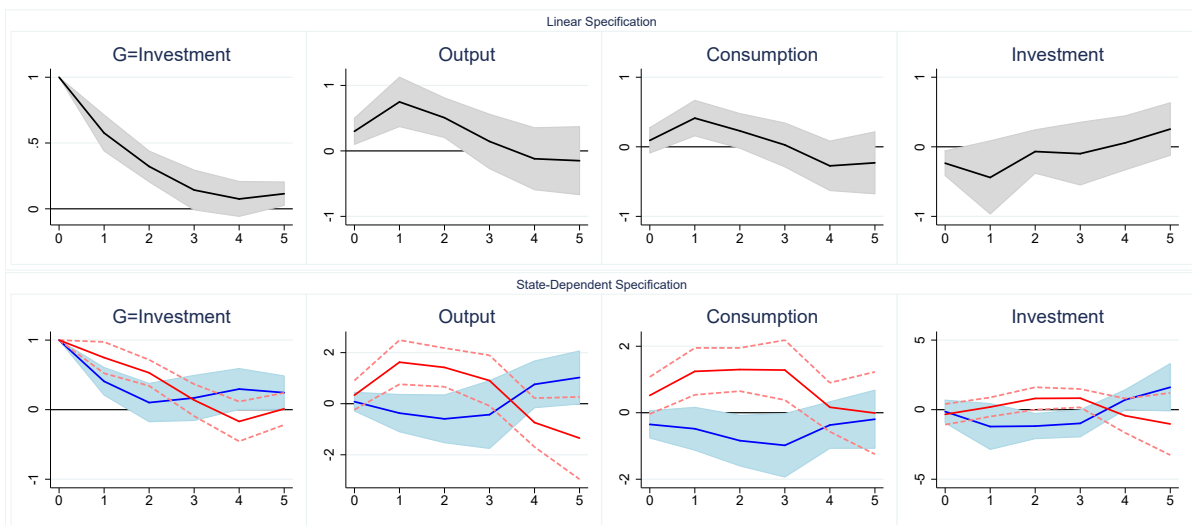
(a) Shocks to Compensation of Government Employees



(b) Shocks to Government Purchases of Goods and Services



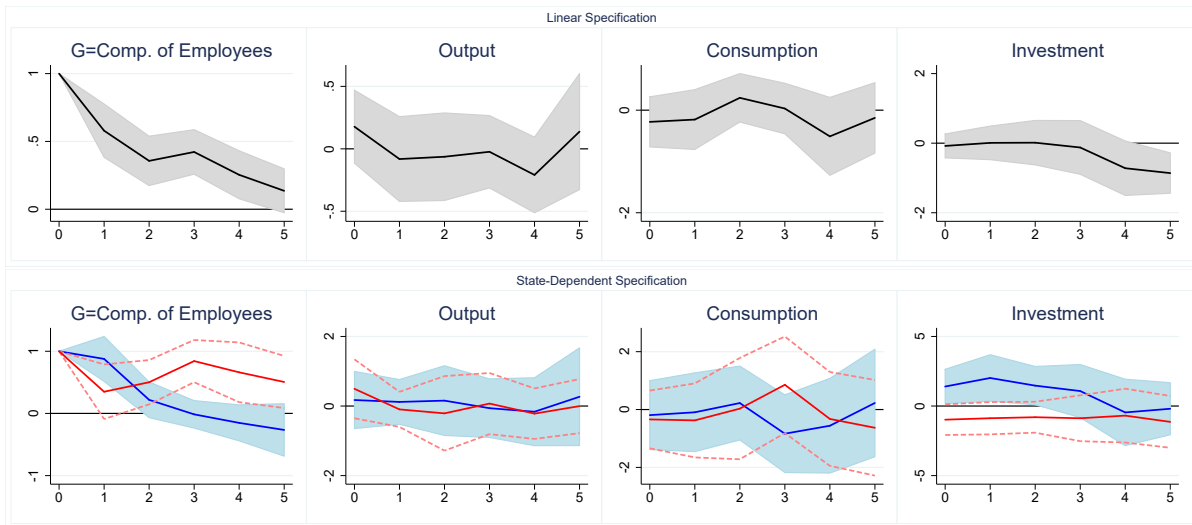
(c) Shocks to Government Investment



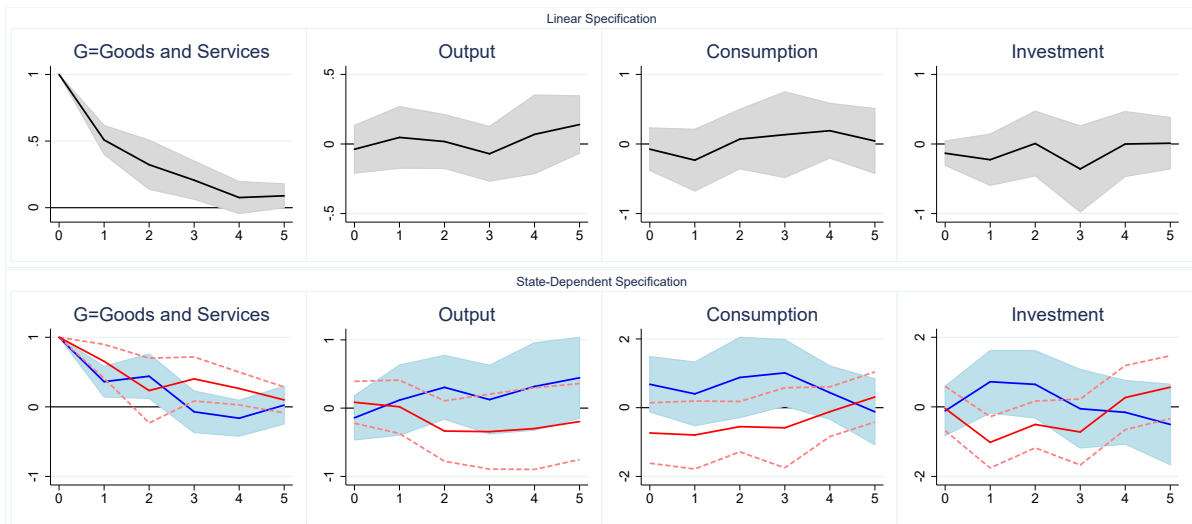
Notes: **Figure 1** reports the effects of a shock which raises government spending by 1% of GDP, in the linear specification, in the **expansion** state; and in the **recession** state. Shaded areas denote 90% confidence regions. The horizon is in years after the shock.

Figure 2: Impulse Responses to Government Spending Shocks for Non-OECD Countries

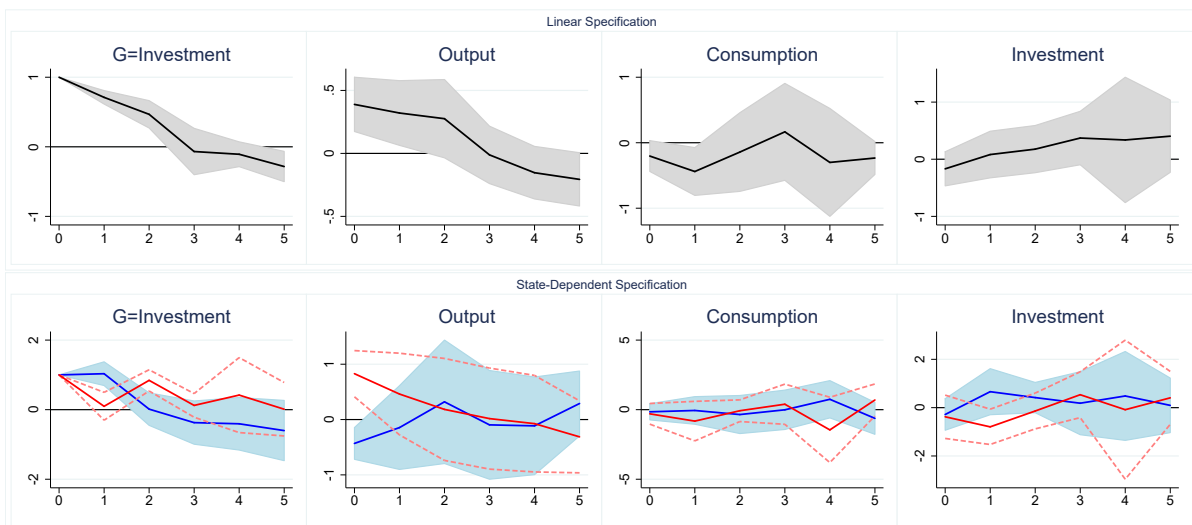
(a) Shocks to Compensation of Government Employees



(b) Shocks to Government Purchases of Goods and Services



(c) Shocks to Government Investment

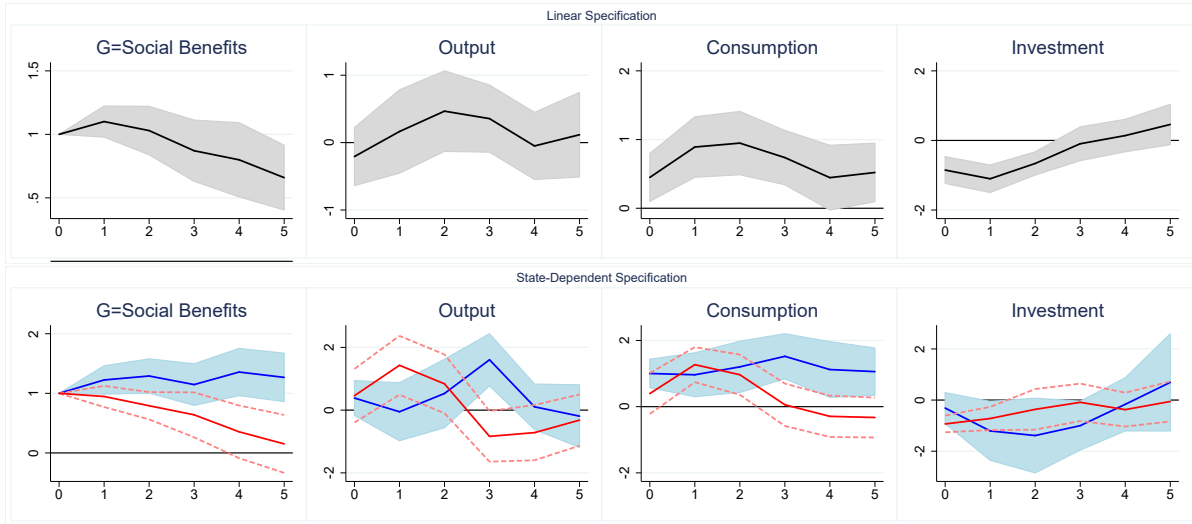


Notes: Figure 2 reports the effects of a shock which raises government spending by 1% of GDP, in the linear specification, in the expansion state; and in the recession state. Shaded areas denote 90% confidence regions. The horizon is in years after the shock.

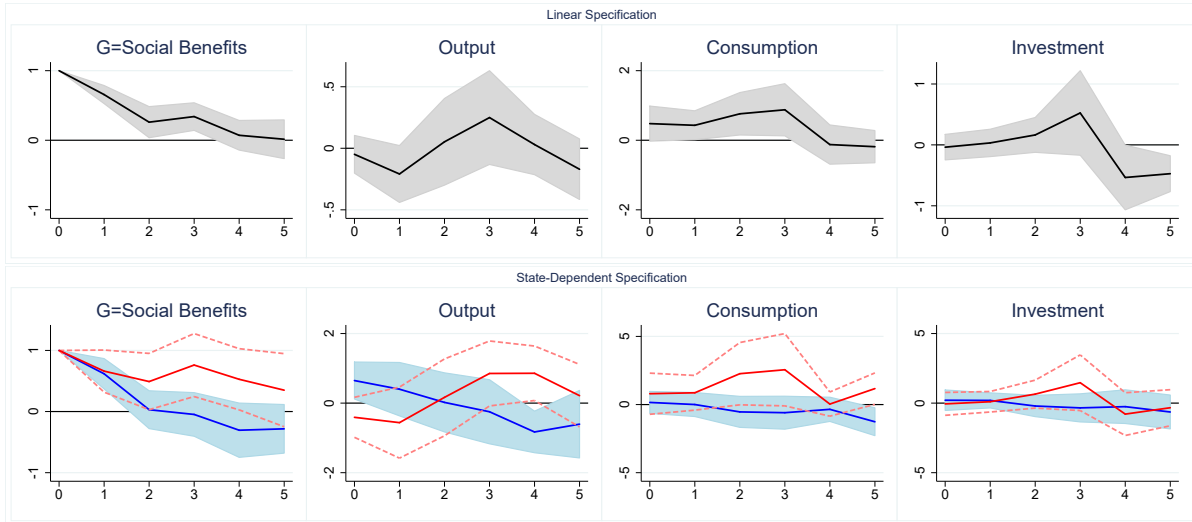


Figure 3: Impulse Responses to Social Benefits Shocks

(a) Effects of Social Benefits: OECD Economies



(b) Effects of Social Benefits: Non-OECD Economies



Notes: **Figure 3** reports the effects of a shock which raises government spending by 1% of GDP, in the linear specification, in the **expansion** state; and in the **recession** state. Shaded areas denote 90% confidence regions. The horizon is in years after the shock.

Table 1: Cumulative Government Spending Multipliers for OECD Economies

	Horizon (years after the shock)					
	0	1	2	3	4	5
<b>Panel A: Compensation of Government Employees</b>						
<b>A.1 Linear Specification</b>	0.614** (0.291)	0.583* (0.317)	0.752** (0.361)	0.760** (0.387)	0.720* (0.384)	0.780* (0.421)
<b>A.2 Expansion</b>	0.730** (0.324)	0.461 (0.353)	0.665 (0.417)	0.723 (0.468)	0.729 (0.527)	0.875 (0.563)
<b>A.3 Recession</b>	1.250** (0.514)	1.297*** (0.496)	1.473*** (0.451)	1.215*** (0.449)	0.996* (0.548)	1.482** (0.642)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	2.65	11.81***	7.66***	1.69	0.21	1.24
$p$ -value	0.1033	0.0006	0.0057	0.1935	0.6431	0.2659
Obs	674	632	590	551	512	476
Countries	34	34	33	33	32	31
<b>Panel B: Expenditure on Goods and Services</b>						
<b>B.1 Linear Specification</b>	0.548* (0.282)	0.563* (0.332)	0.586 (0.392)	0.481 (0.365)	0.330 (0.353)	0.147 (0.329)
<b>B.2 Expansion</b>	0.608** (0.246)	0.602 (0.375)	0.350 (0.447)	0.242 (0.484)	0.0911 (0.526)	0.00189 (0.504)
<b>B.3 Recession</b>	0.864 (0.580)	1.045* (0.610)	0.919 (0.618)	0.640 (0.485)	0.315 (0.451)	0.00614 (0.366)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	0.06	0.87	1.38	1.09	0.34	0.00
$p$ -value	0.8014	0.3510	0.2399	0.2962	0.5624	0.9924
Obs	666	624	582	543	504	468
Countries	34	34	33	33	32	31
<b>Panel C: Government Investment</b>						
<b>C.1 Linear Specification</b>	0.299** (0.119)	0.815*** (0.218)	0.816*** (0.221)	0.782*** (0.255)	0.668** (0.260)	0.687** (0.320)
<b>C.2 Expansion</b>	0.275 (0.174)	0.815*** (0.297)	0.683* (0.385)	0.560 (0.379)	0.427 (0.486)	0.559 (0.486)
<b>C.3 Recession</b>	0.393 (0.260)	1.291*** (0.335)	1.288*** (0.330)	1.429*** (0.475)	1.286** (0.559)	1.781** (0.737)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	0.79	2.12	2.47	1.79	1.36	5.28**
$p$ -value	0.3727	0.1452	0.1160	0.1808	0.2434	0.0216
Obs	673	629	585	544	503	464
Countries	35	35	34	34	33	31

Notes: [Table 1](#) reports the estimated cumulative output multipliers for OECD countries when the measure of government expenditure is the compensation of government employees (panel A), expenditure on goods and services (panel B), and government investment (panel C). The horizon (top row) is in years after the shock. The linear model specification presents the multipliers by estimating (5), and the specification in expansion and recessions present multipliers by estimating (6). Each panel also reports tests of the null of equality of the multipliers across states of the economy and their associated  $p$ -values. The sample spans the period 1991-2016. Standard errors (in parentheses) are clustered at the country level, with \*, \*\* and \*\*\* denoting significance at the 10%, 5% and 1% level respectively.

Table 2: Cumulative Government Spending Multipliers for Non-OECD Economies

	Horizon (years after the shock)					
	0	1	2	3	4	5
<b>Panel A: Compensation of Government Employees</b>						
<b>A.1 Linear Specification</b>	0.177 (0.175)	-0.036 (0.308)	-0.109 (0.436)	0.091 (0.456)	0.179 (0.458)	0.184 (0.404)
<b>A.2 Expansion</b>	0.556*** (0.198)	0.385 (0.379)	0.024 (0.578)	0.189 (0.642)	0.204 (0.699)	0.108 (0.844)
<b>A.3 Recession</b>	0.630** (0.284)	0.133 (0.288)	-0.034 (0.406)	0.311 (0.402)	0.312 (0.330)	0.359 (0.292)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	0.13	0.82	0.04	0.26	0.27	1.03
<i>p</i> -value	0.7163	0.3664	0.8516	0.6120	0.6040	0.3090
Obs	487	421	365	317	274	238
Countries	48	45	41	37	34	32
<b>Panel B: Expenditure on Goods and Services</b>						
<b>B.1 Linear Specification</b>	-0.038 (0.103)	-0.023 (0.174)	-0.039 (0.206)	0.021 (0.270)	0.004 (0.366)	0.116 (0.388)
<b>B.2 Expansion</b>	-0.080 (0.130)	-0.022 (0.283)	0.047 (0.312)	0.206 (0.349)	0.252 (0.505)	0.710 (0.585)
<b>B.3 Recession</b>	-0.016 (0.141)	-0.050 (0.207)	-0.170 (0.220)	-0.088 (0.278)	-0.129 (0.363)	0.068 (0.460)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	1.17	0.03	1.18	1.77	1.32	2.34
<i>p</i> -value	0.2794	0.8665	0.2782	0.1829	0.2502	0.1259
Obs	482	415	358	310	266	231
Countries	48	45	41	37	33	31
<b>Panel C: Government Investment</b>						
<b>C.1 Linear Specification</b>	0.389*** (0.129)	0.395** (0.202)	0.345 (0.296)	0.672 (0.620)	0.490 (0.655)	0.478 (0.709)
<b>C.2 Expansion</b>	0.125 (0.112)	-0.079 (0.235)	-0.157 (0.549)	-0.517 (1.466)	-1.034 (1.885)	-1.514 (3.280)
<b>C.3 Recession</b>	0.489*** (0.176)	0.184 (0.243)	-0.001 (0.319)	0.088 (0.693)	0.058 (0.797)	0.318 (0.828)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	9.67***	1.29	0.15	0.37	0.78	0.50
<i>p</i> -value	0.0019	0.2559	0.7016	0.5438	0.3776	0.4815
Obs	462	393	337	292	251	218
Countries	49	45	39	35	31	29

Notes: Table 2 reports the estimated cumulative output multipliers for Non-OECD countries when the measure of government expenditure is the compensation of government employees (panel A), expenditure on goods and services (panel B), and government investment (panel C). The horizon (top row) is in years after the shock. The linear model specification presents the multipliers by estimating (5), and the specification in expansion and recessions present multipliers by estimating (6). Each panel also reports tests of the null of equality of the multipliers across states of the economy and their associated *p*-values. The sample spans the period 1991-2017. Standard errors (in parentheses) are clustered at the country level, with \*, \*\* and \*\*\* denoting significance at the 10%, 5% and 1% level respectively.

Table 3: Cumulative Government Spending Multipliers of Social Benefits

	Horizon (years after the shock)					
	0	1	2	3	4	5
<b>Panel A: OECD Economies</b>						
<b>A.1 Linear Specification</b>	-0.207 (0.257)	-0.0693 (0.292)	-0.0146 (0.319)	-0.0952 (0.275)	-0.122 (0.268)	-0.0319 (0.261)
<b>A.2 Expansion</b>	0.698* (0.360)	0.642 (0.441)	0.655 (0.456)	0.510 (0.411)	0.344 (0.372)	0.365 (0.334)
<b>A.3 Recession</b>	0.620 (0.444)	0.894** (0.452)	0.808* (0.468)	0.323 (0.383)	0.0720 (0.407)	0.0785 (0.438)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	5.20**	1.62	0.79	0.06	0.37	0.31
<i>p</i> -value	0.0226	0.2031	0.3746	0.8107	0.5447	0.5751
Obs	599	561	523	487	451	416
Countries	34	34	33	33	32	31
<b>Panel B: Non-OECD Economies</b>						
<b>B.1 Linear Specification</b>	-0.0489 (0.0917)	-0.202 (0.124)	-0.0202 (0.244)	0.00574 (0.297)	-0.297 (0.325)	-0.452 (0.297)
<b>B.2 Expansion</b>	0.364** (0.174)	0.225 (0.186)	0.266 (0.364)	0.285 (0.505)	-0.391 (0.527)	-0.907 (0.675)
<b>B.3 Recession</b>	0.0928 (0.184)	-0.120 (0.254)	0.0766 (0.394)	0.164 (0.420)	-0.308 (0.380)	-0.538 (0.380)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	1.79	2.91*	0.58	0.07	0.00	0.00
<i>p</i> -value	0.1815	0.0882	0.4463	0.7927	0.9861	0.9440
Obs	446	382	327	277	238	205
Countries	48	45	41	34	31	29

Notes: [Table 3](#) reports the estimated cumulative output multipliers for OECD and Non-OECD countries when the measure of government ‘expenditure’ is social benefits. See also notes for [Table 1](#).

# Appendix

Table A.1: List of Countries in the Dataset

OECD Countries		Non-OECD Countries	
1	Australia	1	Albania
2	Austria	2	Armenia, Republic of
3	Belgium	3	Azerbaijan, Republic of
4	Canada	4	Belarus
5	Chile	5	Bhutan
6	Czech Republic	6	Bolivia
7	Denmark	7	Bosnia and Herzegovina
8	Estonia	8	Brazil
9	Finland	9	Bulgaria
10	France	10	China, P.R.: Hong Kong
11	Germany	11	Colombia
12	Greece	12	Congo, Republic of
13	Hungary	13	Costa Rica
14	Iceland	14	Croatia
15	Ireland	15	Cyprus
16	Israel	16	Egypt
17	Italy	17	El Salvador
18	Japan	18	Georgia
19	Korea, Republic of	19	Honduras
20	Latvia	20	Indonesia
21	Luxembourg	21	Iran, Islamic Republic of
22	Mexico	22	Jordan
23	Netherlands	23	Kazakhstan
24	New Zealand	24	Kiribati
25	Norway	25	Lesotho
26	Poland	26	Lithuania
27	Portugal	27	Macedonia, FYR
28	Slovak Republic	28	Maldives
29	Slovenia	29	Malta
30	Spain	30	Mauritius
31	Sweden	31	Moldova
32	Switzerland	32	Mongolia
33	Turkey	33	Morocco
34	United Kingdom	34	Myanmar
35	United States	35	Paraguay
		36	Peru
		37	Romania
		38	Russian Federation
		39	San Marino
		40	Serbia, Republic of
		41	Seychelles
		42	Singapore
		43	South Africa
		44	Thailand
		45	Tunisia
		46	Ukraine
		47	United Arab Emirates
		48	Uzbekistan
		49	Yemen, Republic of

Table A.2: Data Sources and Definitions

<b>Variable</b>	<b>Definition</b>	<b>Source</b>
Total Government Expense	Total Government Expense (W0 S1 G2)	IMF: Government Financial Statistics (GFS, Expense)
Government Expense on Compensation of Employees	Government Expense on Compensation of Employees (W0 S1 G21)	IMF: Government Financial Statistics (GFS, Expense)
Government Expense on Investment	Government Investment in Non-Financial Assets (G31 NG)	IMF: Government Financial Statistics (GFS, Main Aggregates and Balances)
Government Expense on the Use of Goods and Services	Government Expense on Use of Goods and Services (W0 S1 G22)	IMF: Government Financial Statistics (GFS, Expense)
Government Expense on Social Benefits	Government Expense on Social Benefits (W0 S1 G27)	IMF: Government Financial Statistics (GFS, Expense)
GDP	GDP, PPP (constant 2011 international U.S. Dollars)	World Bank: World Development Indicators
Private Consumption	Household final consumption expenditure	World Bank: World Development Indicators
Private Investment	OECD Countries: Private non-residential gross fixed capital formation, Non-OECD Countries: Gross Fixed Capital Formation, Private Sector	OECD Countries: OECD, Non-OECD Countries: World Bank: World Development Indicators
Debt	Public Debt	IMF: Historical Public Debt (HPDD)
Taxes	Tax revenue (W0 S1 G11)	IMF: Government Financial Statistics (GFS, Revenue)

Table A.3: Average Shares of Government Spending (G)

OECD Countries

<b>Definition of G</b>	<b>% of GDP</b>	<b>% of G</b>
Total Expense	42.59	100.00
Compensation of Employees	10.32	24.43
Goods and Services	6.15	14.76
Investment	3.42	8.44
Social Benefits	15.89	36.87

Non-OECD Countries

<b>Definition of G</b>	<b>% of GDP</b>	<b>% of G</b>
Total Expense	28.33	100.00
Compensation of Employees	9.11	32.56
Goods and Services	6.35	23.09
Investment	4.87	19.53
Social Benefits	6.83	21.95

Source: Authors' calculations

# **The Effects of Government Spending Over the Business Cycle: A Disaggregated Analysis for OECD and Non-OECD Countries (Not for Publication) Online Appendix**

This draft: September 18, 2019

## **Abstract**

This appendix contains results discussed in the robustness analysis but not actually reported in the paper.

*JEL Classification:* C33, E32, E62

*Keywords:* Fiscal Policy, Government Spending Multipliers, State-Dependent Multipliers, Local Projections, Non-Linear Models

*JEL:* E62, E32, C33



## A Robustness Analysis

For the sake of completeness we repeat here the main equations we employ in estimating multipliers. In the linear case, we use

$$\sum_{j=0}^h y_{i,t+j} = \chi_{i,h} + m_h \sum_{j=0}^h g_{i,t+j} + \boldsymbol{\psi}_h(L) \mathbf{x}_{i,t-1} + \phi_h trend_t + \omega_{i,t+h}, \quad h = 0, 1, \dots, 5, \quad (\text{A.1})$$

while in the state-dependent case we estimate

$$\begin{aligned} \sum_{j=0}^h y_{i,t+j} = & \chi_{i,h} + (1 - F(z_{i,t-1})) \left[ m_{E,h} \sum_{j=0}^h g_{i,t+j} + \boldsymbol{\psi}_{E,h}(L) \mathbf{x}_{i,t-1} \right] + \\ & F(z_{i,t-1}) \left[ m_{R,h} \sum_{j=0}^h g_{i,t+j} + \boldsymbol{\psi}_{R,h}(L) \mathbf{x}_{i,t-1} \right] + \phi_h trend_t + \omega_{i,t+h}, \quad h = 0, 1, \dots, 5 \end{aligned} \quad (\text{A.2})$$

In the linear case  $\hat{\varepsilon}_{i,t}$  is employed as an instrument for  $\sum_{j=0}^h g_{i,t+j}$ , while in the state-dependent case,  $F(z_{i,t-1}) \cdot \hat{\varepsilon}_{i,t}$  and  $(1 - F(z_{i,t-1})) \cdot \hat{\varepsilon}_{i,t}$  are used as instruments for  $F(z_{i,t-1}) \cdot \sum_{j=0}^h g_{i,t+j}$  and  $(1 - F(z_{i,t-1})) \cdot \sum_{j=0}^h g_{i,t+j}$ , respectively.

In order to assess the robustness of the results discussed in the paper, we have performed a series of experiments. In what follows, we focus only on cumulative multipliers in order to make comparisons easier.

In the paper, following [Gordon & Krenn \(2010\)](#) and [Ramey & Zubairy \(2018\)](#) we transform our data by dividing all variables with an estimate of potential or trend GDP. This puts all variables in the same units, so that the multiplier is estimated directly. In our baseline specification potential GDP is estimated by fitting log real GDP to a third-degree polynomial in time, on a country-by-country basis, and then use its exponential. However, it is important to assess whether the way we estimate potential GDP affects our results. We consider two alternative specifications: one in which potential GDP is estimated by fitting a second-degree polynomial in time, and one in which potential GDP is given by the trend GDP estimated by the Hodrick-Prescott filter.<sup>1</sup>

In [Table A.1 – Table A.3](#) we present the results when we employ a quadratic trend, and in [Table A.4 – Table A.6](#) the results when we employ the Hodrick-Prescott trend. Even though we do not observe any major changes in either case, we note that in the first case, multipliers of the compensation of government employees, government uses of goods and services and government investment are found slightly higher, but those of social benefits are slightly lower, for both OECD and Non-OECD countries. When we use the Hodrick-Prescott filter, for OECD countries, the multipliers of compensation of government employees are slightly smaller, the multipliers of government uses of goods and services are insignificant in recessions, and the multipliers of government investment are slightly higher. Instead, the impact multiplier of social benefits becomes negative and significant (from insignificant) in the linear specification. On the other hand, for non-OECD countries,

<sup>1</sup>The smoothing parameter is set equal to 100.

the multipliers of compensation of government employees are slightly smaller, the multipliers of government use of goods and services are again found to be negative in recessions (here being significant at a two year horizon), while the multipliers of government investment and social benefits are in line with what we report in the paper.

Next, the ‘measure’ of state-dependence we employ tracks whether the economy is in states of expansion or recession. Here we opt for a different measure of “state-dependence”, namely the existence of a financial crisis. Following [Laeven & Valencia \(2018\)](#), we construct a dummy variable which is equal to one when the economy is in a banking, currency or debt crisis, and zero otherwise. In estimating our multipliers, we use this dummy as a state-variable, instead of the transition function described in [\(A.2\)](#). Note that now the models estimated become threshold models, where the change between regimes is rather abrupt but the philosophy remains the same.<sup>2</sup>

Results from this experiment are given in [Table A.7 – Table A.9](#). The overall conclusion we draw from this experiment is that we now find stronger evidence of state-dependence: multipliers tend to differ significantly in crisis and non-crisis periods, especially for non-OECD economies. For OECD countries ([Table A.7](#)), the multiplier of compensation of government employees is significant in normal times and higher when the economy is in a state of financial crisis, with values ranging between 1.243 (at a five year horizon) and 3.131 (at a one year horizon). Multipliers of government use on goods and services do not change much relative to the baseline discussed in the paper and are again found to be somewhat larger in crisis periods – albeit they do not differ significantly. Instead, multipliers of government investment are significant in normal times and insignificant in crisis periods, despite the fact they were found to be positive and significant during recession in our baseline estimations. Testing for differences, we only find evidence that multipliers of compensation of government employees differ for horizons up to two years.

For non-OECD countries ([Table A.8](#)), we find that the multiplier of compensation of government employees is higher during periods of financial crisis (ranging between 3.324 at a five year horizon and 8.841 at a two year horizon). Instead, the multiplier of government purchases of goods and services is found to be negative, significant and sizable during crisis periods (attaining a value of  $-22.32$  at a two year horizon) eventually turning positive and significant at a five year horizon. For both these types of government spending, we find strong evidence against the null hypothesis of equal multipliers in normal times and in periods of crisis. As far as government investment is concerned, we note again that multipliers in periods of crisis are found negative and significant, but formal testing reveals that multipliers do not differ significantly in crisis and non-crisis periods – one exception being at a four year horizon.

Turning to social benefits, on the other hand, we find positive multipliers for OECD countries in crisis periods (at a four and five year horizon) but smaller than those estimated in recessions (see [Table 3](#) in the paper). Instead, social benefits multipliers for non-OECD countries in crisis periods are found initially positive and significant (on impact and one-year ahead), then turning negative for horizons of up to four years.<sup>3</sup> Again formal testing reveals that we can safely reject the null of

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<sup>2</sup>See for instance [Fazzari et al. \(2015\)](#) who obtain state-dependent effects by estimating threshold VAR models.

<sup>3</sup>These multipliers are also estimated to be negative for normal periods, being significant however only at a five

equal multipliers for horizons between two and four years at all conventional significance levels.

Our next set of experiments concerns enlarging the set of controls  $\mathbf{x}_{t-1}$  in (A.1) and (A.2). The reason for doing so is that while the OECD economies we study are a rather homogeneous group (they share many common characteristics), this is probably not the case for the non-OECD countries. In order to account for such differences across countries that have not been explicitly taken into account we include in  $\mathbf{x}_{t-1}$  variables that proxy for the quality of institutions (government stability, corruption, and law and order); trade openness and the exchange rate regime; whether a country is a commodity producer or not; and finally we control for monetary policy as well as the degree of government effectiveness, which might affect the size of the estimated multipliers. A detailed description of the variables we employ in this extension as well as their sources is given in Table B.1.

In Table A.10 to Table A.27 in order to assess the sensitivity of our findings, we obtain results by including one control at a time, and then include all extra controls simultaneously (see Table A.28 to Table A.30). The first set of conclusions that emerges from Table A.10 – Table A.21, is that when we control for institutions, trade openness, the exchange rate regime, and whether the country is a commodity producer or not, the results are in line with our baseline estimates reported in the paper. When we control for monetary policy,<sup>4</sup> the multipliers in OECD economies are almost the same, while we do note some differences in non-OECD countries: the multiplier estimates tend to be larger for all three types of government expenditure and we also note that in the linear model these are also significant for government use of goods and services. Moreover, the multipliers of social benefits become negative and significant for non-OECD countries at three to five year horizons.<sup>5</sup> In addition, controlling for government effectiveness the results change slightly. For OECD countries, the estimated multipliers of compensation of government employees are higher and the same applies for the multipliers of government expense on use of goods and services in expansions, while the government investment multipliers do not change much (they are slightly higher in expansions). For non-OECD economies, we note that the multipliers of government use of goods and services become significant in the linear specification, but apart from this change the multipliers are in line with those discussed in the paper. Finally, including all these extra control variables together produces results similar to those we report when controlling for government effectiveness, the only difference being that the multipliers of compensation of government employees become negative in expansions for non-OECD economies.

The final set of experiments we perform relates to the time period covered. One could argue that the results discussed in the paper could be driven by the later part of the sample, i.e. the inclusion of the global financial crisis and the fiscal response that followed. In order to explore this issue we perform two types of experiments. In the first, we re-estimate all multipliers with

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year horizon.

<sup>4</sup>The next set of results should be interpreted with a grain of salt as far as the non-OECD economies group is concerned. The reason is that due to the lack of data on monetary policy interest rates the number of countries is reduced significantly from 49 to 28 (from 29 to 17 at a horizon of five years) and when including all controls the number of countries drops to 23 (to 14 at a horizon of five years).

<sup>5</sup>This is consistent with a reversal in social benefits observed in Figure 3 in the paper: an initial increase today is followed by a reduction in the future in order to ‘finance’ the initial rise.

the sample stopping at 2007 (thereby excluding from the analysis the recent global financial crisis and its aftermath), while in the second we allow for the multipliers to differ for the period from 2008 onward (i.e. multipliers differ from the global financial crisis onward). The results from the first experiment are presented in [Table A.31](#) to [Table A.33](#). These suggests that, in contrast to our baseline specification, for OECD countries ([Table A.31](#)), multipliers of compensation of government employees are insignificant; multipliers of government purchases of goods and services are larger and significant; and multipliers of government investment are much higher, especially in states of recession. Instead, the estimated multipliers for non-OECD countries ([Table A.32](#)) are mostly insignificant, while the same applied for the multipliers of social benefits ([Table A.33](#)).

Our results from the second experiment are reported in [Table A.34](#) to [Table A.36](#). To obtain these results, essentially we have interacted all the right hand side of (A.1) and (A.2) with a dummy variable that takes the value of unity when the period  $t$  is equal to 2008 and above and zero otherwise. What we do note is that in the majority of cases the point estimates of the multipliers are much larger for the post 2008 period, relative to the pre-crisis period. As far as OECD countries are concerned ([Table A.34](#)), we find strong evidence that multipliers differ in the pre and post 2008 sub-periods, being higher during the years following the global financial crisis of 2008. In particular we find that this is the case in the linear specification as well as during recessions, when looking at the multipliers of compensation of government employees and those of government use of goods and services. For the multipliers of government investment we find evidence that these differ in the two sub-periods, but only in the linear model. Instead, we note that there is no evidence favoring the difference of multipliers during expansions in the two sub-periods.

When looking at non-OECD countries, we get a slightly different picture. As far as the multipliers of government compensation of employees is concerned, there is no evidence that these differ in the two sub-period. Instead, we note that the multipliers of government purchases of goods and services differ markedly in the two sub-periods: this is more profound in the linear specification, while we also find such evidence for states of recession (for horizons up to two years). We also find some evidence favoring the difference of government investment multipliers in the two sub-periods, but for horizons of at most two years especially in the linear specification.<sup>6</sup>

Finally, as far as social benefits multipliers are concerned we find that these tend to differ in the two sub-periods only for OECD economies, and in particular in states of expansion.<sup>7</sup> We do not uncover any differences for non-OECD countries.

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<sup>6</sup>There is also some evidence favoring different multipliers in the two sub-period at the one year horizon both in recessions and in expansions.

<sup>7</sup>Multipliers also differ at a one year horizon (linear case) and on impact (during recessions).

Table A.1: Cumulative Government Spending Multipliers for OECD Economies – Quadratic Trend

	Horizon (years after the shock)					
	0	1	2	3	4	5
<b>Panel A: Compensation of Government Employees</b>						
<b>A.1 Linear Specification</b>	0.483*	0.597*	0.884**	1.081**	1.103**	1.193**
	(0.270)	(0.333)	(0.405)	(0.441)	(0.436)	(0.469)
<b>A.2 Expansion</b>	0.494*	0.569	1.018*	1.393**	1.472**	1.585**
	(0.272)	(0.410)	(0.538)	(0.614)	(0.660)	(0.674)
<b>A.3 Recession</b>	0.833**	1.041**	1.367***	1.495***	1.432***	2.031***
	(0.373)	(0.421)	(0.423)	(0.448)	(0.481)	(0.541)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	3.233	5.082	1.198	0.00000814	0.375	0.115
<i>p</i> -value	0.0721	0.0242	0.274	0.998	0.540	0.735
Obs	674	632	590	551	512	476
Countries	34	34	33	33	32	31
<b>Panel B: Expenditure on Goods and Services</b>						
<b>B.1 Linear Specification</b>	0.540**	0.596*	0.772*	0.776*	0.749	0.742
	(0.273)	(0.320)	(0.421)	(0.444)	(0.474)	(0.551)
<b>B.2 Expansion</b>	0.662**	0.829**	0.798	0.861	0.867	0.878
	(0.286)	(0.423)	(0.540)	(0.628)	(0.715)	(0.756)
<b>B.3 Recession</b>	0.710	0.925*	0.944	0.879	0.735	0.810
	(0.498)	(0.520)	(0.595)	(0.538)	(0.512)	(0.631)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	0.684	0.0000	0.0387	0.0701	0.443	0.408
<i>p</i> -value	0.408	0.996	0.844	0.791	0.506	0.523
Obs	666	624	582	543	504	468
Countries	34	34	33	33	32	31
<b>Panel C: Government Investment</b>						
<b>C.1 Linear Specification</b>	0.375***	0.739***	0.831***	0.796**	0.811*	0.802
	(0.123)	(0.211)	(0.253)	(0.319)	(0.419)	(0.549)
<b>C.2 Expansion</b>	0.499***	0.726***	0.691*	0.554	0.488	0.431
	(0.167)	(0.268)	(0.383)	(0.517)	(0.663)	(0.767)
<b>C.3 Recession</b>	0.557**	1.151***	1.364***	1.370***	1.659**	2.198*
	(0.237)	(0.312)	(0.292)	(0.410)	(0.730)	(1.154)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	0.922	2.286	3.262	2.163	2.297	5.297
<i>p</i> -value	0.337	0.131	0.0709	0.141	0.130	0.0214
Obs	673	629	585	544	503	464
Countries	35	35	34	34	33	31

Notes: Table A.1 reports the estimated cumulative output multipliers for OECD countries when the measure of government expenditure is the compensation of government employees (panel A), expenditure on goods and services (panel B), and government investment (panel C). The horizon (top row) is in years after the shock. To obtain trend log output, we fit log real GDP to a second-degree polynomial in time, on a country-by-country basis. Then “potential GDP” is estimated as an exponential trend. The linear model specification presents the multipliers by estimating (A.1), and the specification in expansion and recessions present multipliers by estimating (A.2). Each panel also reports tests of the null of equality of the multipliers across states of the economy and their associated *p*-values. The rob02a spans the period 1991-2017. Standard errors (in parentheses) are clustered at the country level, with \*, \*\* and \*\*\* denoting significance at the 10%, 5% and 1% level respectively.

Table A.2: Cumulative Government Spending Multipliers for Non-OECD Economies – Quadratic Trend

	Horizon (years after the shock)					
	0	1	2	3	4	5
<b>Panel A: Compensation of Government Employees</b>						
<b>A.1 Linear Specification</b>	0.239 (0.228)	0.250 (0.445)	0.214 (0.608)	0.169 (0.698)	0.464 (0.744)	0.635 (0.734)
<b>A.2 Expansion</b>	0.685** (0.289)	0.442 (0.491)	0.224 (0.737)	0.211 (0.930)	0.938 (1.050)	1.752 (1.379)
<b>A.3 Recession</b>	0.806** (0.345)	0.857* (0.507)	0.733 (0.569)	0.506 (0.629)	0.817 (0.618)	0.946 (0.605)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	0.939	2.372	3.045	0.698	0.0621	0.0171
$p$ -value	0.333	0.124	0.0810	0.403	0.803	0.896
Obs	487	421	365	317	274	238
Countries	48	45	41	37	34	32
<b>Panel B: Expenditure on Goods and Services</b>						
<b>B.1 Linear Specification</b>	0.0448 (0.140)	0.0926 (0.240)	-0.00275 (0.376)	-0.0725 (0.524)	-0.138 (0.748)	0.00876 (0.808)
<b>B.2 Expansion</b>	0.0955 (0.115)	0.156 (0.236)	0.118 (0.410)	0.0926 (0.593)	0.0286 (0.884)	0.562 (0.877)
<b>B.3 Recession</b>	0.00681 (0.140)	-0.00606 (0.226)	-0.210 (0.350)	-0.391 (0.524)	-0.502 (0.750)	-0.366 (0.857)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	0.717	0.725	1.799	2.146	1.148	2.560
$p$ -value	0.397	0.395	0.180	0.143	0.284	0.110
Obs	482	415	358	310	266	231
Countries	48	45	41	37	33	31
<b>Panel C: Government Investment</b>						
<b>C.1 Linear Specification</b>	0.453*** (0.173)	0.585** (0.276)	0.702* (0.364)	1.509*** (0.502)	1.241** (0.574)	1.207 (0.822)
<b>C.2 Expansion</b>	0.0451 (0.164)	-0.0228 (0.307)	0.420 (0.383)	0.954 (0.993)	0.613 (1.157)	-1.667 (6.106)
<b>C.3 Recession</b>	0.356* (0.187)	0.411 (0.309)	0.812* (0.474)	1.394 (0.944)	0.852 (0.935)	0.527 (1.262)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	10.89	2.526	1.278	0.742	0.259	0.125
$p$ -value	0.001	0.112	0.258	0.389	0.611	0.724
Obs	462	393	337	292	251	218
Countries	49	45	39	35	31	29

Notes: Table A.2 reports the estimated cumulative output multipliers for Non-OECD countries when the measure of government expenditure is the compensation of government employees (panel A), expenditure on goods and services (panel B), and government investment (panel C). The horizon (top row) is in years after the shock. To obtain trend log output, we fit log real GDP to a second-degree polynomial in time, on a country-by-country basis. Then “potential GDP” is estimated as an exponential trend. The linear model specification presents the multipliers by estimating (A.1), and the specification in expansion and recessions present multipliers by estimating (A.2). Each panel also reports tests of the null of equality of the multipliers across states of the economy and their associated  $p$ -values. The rob02a spans the period 1991-2017. Standard errors (in parentheses) are clustered at the country level, with \*, \*\* and \*\*\* denoting significance at the 10%, 5% and 1% level respectively.

Table A.3: Cumulative Government Spending Multipliers of Social Benefits – Quadratic Trend

	Horizon (years after the shock)					
	0	1	2	3	4	5
<b>Panel A: OECD Economies</b>						
<b>A.1 Linear Specification</b>	-0.364 (0.259)	-0.154 (0.315)	-0.0280 (0.370)	0.0393 (0.374)	0.0954 (0.368)	0.241 (0.359)
<b>A.2 Expansion</b>	0.574** (0.289)	0.838* (0.446)	1.109** (0.537)	1.209** (0.528)	1.202** (0.514)	1.345*** (0.493)
<b>A.3 Recession</b>	0.288 (0.401)	0.634 (0.478)	0.671 (0.521)	0.465 (0.503)	0.312 (0.500)	0.348 (0.497)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	8.529	0.0563	0.496	2.059	3.516	3.413
<i>p</i> -value	0.00349	0.812	0.481	0.151	0.0608	0.0647
Obs	599	561	523	487	451	416
Countries	34	34	33	33	32	31
<b>Panel B: Non-OECD Economies</b>						
<b>B.1 Linear Specification</b>	0.148 (0.124)	0.119 (0.217)	0.409 (0.264)	0.389 (0.365)	0.485 (0.480)	0.613 (0.445)
<b>B.2 Expansion</b>	0.294** (0.141)	0.122 (0.254)	0.562 (0.510)	0.465 (0.782)	0.132 (0.799)	0.772 (1.052)
<b>B.3 Recession</b>	0.400** (0.181)	0.373 (0.275)	0.691** (0.337)	0.456 (0.536)	0.449 (0.599)	0.421 (0.581)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	2.216	1.932	0.901	0.0555	0.619	0.0104
<i>p</i> -value	0.137	0.165	0.342	0.814	0.432	0.919
Obs	446	382	327	277	238	205
Countries	48	45	41	34	31	29

Notes: [Table A.3](#) reports the estimated cumulative output multipliers for OECD and Non-OECD countries when the measure of government ‘expenditure’ is social benefits. See also notes for [Table A.1](#).

Table A.4: Cumulative Government Spending Multipliers for OECD Economies – Hodrick-Prescott Trend

	Horizon (years after the shock)					
	0	1	2	3	4	5
<b>Panel A: Compensation of Government Employees</b>						
<b>A.1 Linear Specification</b>	0.314 (0.240)	0.361 (0.278)	0.532 (0.337)	0.635* (0.364)	0.630* (0.346)	0.660* (0.399)
<b>A.2 Expansion</b>	0.164 (0.241)	0.0476 (0.302)	0.298 (0.356)	0.499 (0.397)	0.534 (0.434)	0.687 (0.456)
<b>A.3 Recession</b>	0.475 (0.351)	0.647* (0.370)	0.866** (0.343)	0.841** (0.332)	0.763** (0.359)	1.250*** (0.474)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	2.514	10.99	6.226	0.821	0.151	0.979
$p$ -value	0.113	0.0009	0.0126	0.365	0.698	0.323
Obs	674	632	590	551	512	476
Countries	34	34	33	33	32	31
<b>Panel B: Expenditure on Goods and Services</b>						
<b>B.1 Linear Specification</b>	0.394 (0.247)	0.394 (0.279)	0.468 (0.336)	0.415 (0.336)	0.294 (0.331)	0.180 (0.363)
<b>B.2 Expansion</b>	0.451** (0.215)	0.469 (0.302)	0.287 (0.354)	0.208 (0.405)	0.0943 (0.449)	0.0320 (0.450)
<b>B.3 Recession</b>	0.432 (0.428)	0.618 (0.440)	0.619 (0.475)	0.524 (0.395)	0.348 (0.363)	0.310 (0.425)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	1.158	0.162	1.145	1.658	0.855	1.157
$p$ -value	0.282	0.688	0.285	0.198	0.355	0.282
Obs	666	624	582	543	504	468
Countries	34	34	33	33	32	31
<b>Panel C: Government Investment</b>						
<b>C.1 Linear Specification</b>	0.344*** (0.107)	0.658*** (0.179)	0.732*** (0.179)	0.710*** (0.181)	0.696*** (0.233)	0.708** (0.315)
<b>C.2 Expansion</b>	0.401** (0.163)	0.599** (0.261)	0.587* (0.322)	0.488 (0.383)	0.383 (0.482)	0.497 (0.509)
<b>C.3 Recession</b>	0.383* (0.232)	0.895*** (0.286)	1.082*** (0.266)	1.200*** (0.282)	1.423*** (0.428)	2.147*** (0.686)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	0.0275	1.401	2.418	2.307	2.636	7.544
$p$ -value	0.868	0.236	0.120	0.129	0.104	0.006
Obs	673	629	585	544	503	464
Countries	35	35	34	34	33	31

Notes: Table A.4 reports the estimated cumulative output multipliers for OECD countries when the measure of government expenditure is the compensation of government employees (panel A), expenditure on goods and services (panel B), and government investment (panel C). The horizon (top row) is in years after the shock. Trend log output is obtained as the HP-trend with smoothing parameter set equal to 100, on a country-by-country basis. Then “potential GDP” is estimated as an exponential trend. The linear model specification presents the multipliers by estimating (A.1), and the specification in expansion and recessions present multipliers by estimating (A.2). Each panel also reports tests of the null of equality of the multipliers across states of the economy and their associated  $p$ -values. The sample spans the period 1991-2017. Standard errors (in parentheses) are clustered at the country level, with \*, \*\* and \*\*\* denoting significance at the 10%, 5% and 1% level respectively.



Table A.5: Cumulative Government Spending Multipliers for Non-OECD Economies – Hodrick-Prescott Trend

	Horizon (years after the shock)					
	0	1	2	3	4	5
<b>Panel A: Compensation of Government Employees</b>						
<b>A.1 Linear Specification</b>	0.0916 (0.184)	0.00314 (0.345)	-0.0246 (0.475)	-0.0485 (0.542)	0.0528 (0.580)	0.148 (0.560)
<b>A.2 Expansion</b>	0.380* (0.212)	0.121 (0.370)	-0.110 (0.596)	-0.251 (0.690)	-0.238 (0.707)	-0.0421 (0.767)
<b>A.3 Recession</b>	0.471* (0.246)	0.272 (0.344)	0.224 (0.375)	0.154 (0.425)	0.259 (0.381)	0.395 (0.370)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	0.447	0.482	2.155	1.800	1.566	0.847
$p$ -value	0.504	0.487	0.142	0.180	0.211	0.358
Obs	487	421	365	317	274	238
Countries	48	45	41	37	34	32
<b>Panel B: Expenditure on Goods and Services</b>						
<b>B.1 Linear Specification</b>	-0.0663 (0.110)	-0.142 (0.175)	-0.211 (0.258)	-0.234 (0.330)	-0.288 (0.442)	-0.207 (0.467)
<b>B.2 Expansion</b>	-0.0845 (0.110)	-0.150 (0.206)	-0.204 (0.319)	-0.175 (0.409)	-0.194 (0.563)	0.187 (0.552)
<b>B.3 Recession</b>	-0.137 (0.145)	-0.190 (0.180)	-0.341* (0.204)	-0.329 (0.249)	-0.398 (0.346)	-0.292 (0.418)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	0.564	0.126	0.713	0.546	0.384	1.594
$p$ -value	0.453	0.723	0.399	0.460	0.535	0.207
Obs	482	415	358	310	266	231
Countries	48	45	41	37	33	31
<b>Panel C: Government Investment</b>						
<b>C.1 Linear Specification</b>	0.370** (0.147)	0.472** (0.234)	0.486* (0.291)	1.070** (0.432)	0.873* (0.468)	0.851 (0.566)
<b>C.2 Expansion</b>	-0.0220 (0.127)	-0.00489 (0.197)	0.0523 (0.318)	0.208 (0.832)	-0.140 (1.083)	-0.751 (3.109)
<b>C.3 Recession</b>	0.183 (0.148)	0.151 (0.229)	0.145 (0.313)	0.349 (0.657)	0.174 (0.680)	0.0675 (0.740)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	7.536	0.611	0.108	0.127	0.347	0.118
$p$ -value	0.006	0.434	0.742	0.722	0.556	0.731
Obs	462	393	337	292	251	218
Countries	49	45	39	35	31	29

Notes: Table A.5 reports the estimated cumulative output multipliers for Non-OECD countries when the measure of government expenditure is the compensation of government employees (panel A), expenditure on goods and services (panel B), and government investment (panel C). The horizon (top row) is in years after the shock. Trend log output is obtained as the HP-trend with smoothing parameter set equal to 100, on a country-by-country basis. Then “potential GDP” is estimated as an exponential trend. The linear model specification presents the multipliers by estimating (A.1), and the specification in expansion and recessions present multipliers by estimating (A.2). Each panel also reports tests of the null of equality of the multipliers across states of the economy and their associated  $p$ -values. The sample spans the period 1991-2017. Standard errors (in parentheses) are clustered at the country level, with \*, \*\* and \*\*\* denoting significance at the 10%, 5% and 1% level respectively.

Table A.6: Cumulative Government Spending Multipliers of Social Benefits – Hodrick-Prescott Trend

	Horizon (years after the shock)					
	0	1	2	3	4	5
<b>Panel A: OECD Economies</b>						
<b>A.1 Linear Specification</b>	-0.397*	-0.238	-0.152	-0.115	-0.150	-0.108
	(0.232)	(0.262)	(0.298)	(0.299)	(0.290)	(0.294)
<b>A.2 Expansion</b>	0.310	0.420	0.584	0.587	0.425	0.409
	(0.274)	(0.378)	(0.416)	(0.381)	(0.347)	(0.315)
<b>A.3 Recession</b>	0.242	0.541	0.547	0.336	0.112	0.0401
	(0.336)	(0.368)	(0.403)	(0.397)	(0.408)	(0.446)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	6.971	0.606	0.0755	0.168	0.523	0.664
<i>p</i> -value	0.0083	0.436	0.784	0.682	0.470	0.415
Obs	599	561	523	487	451	416
Countries	34	34	33	33	32	31
<b>Panel B: Non-OECD Economies</b>						
<b>B.1 Linear Specification</b>	-0.0314	-0.123	0.157	0.0639	-0.178	-0.177
	(0.105)	(0.137)	(0.244)	(0.338)	(0.331)	(0.272)
<b>B.2 Expansion</b>	0.225*	0.0861	0.396	0.214	-0.436	-0.478
	(0.118)	(0.169)	(0.393)	(0.629)	(0.579)	(0.655)
<b>B.3 Recession</b>	0.113	0.0643	0.376	0.186	-0.119	-0.243
	(0.181)	(0.227)	(0.303)	(0.462)	(0.344)	(0.318)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	0.0286	0.0103	0.0560	0.0020	0.640	0.0283
<i>p</i> -value	0.866	0.919	0.813	0.964	0.424	0.866
Obs	446	382	327	277	238	205
Countries	48	45	41	34	31	29

Notes: [Table A.6](#) reports the estimated cumulative output multipliers for OECD and Non-OECD countries when the measure of government 'expenditure' is social benefits. See also notes for [Table A.4](#).

Table A.7: Cumulative Government Spending Multipliers for OECD Economies – Financial Crisis as ‘state’ of the Economy

	Horizon (years after the shock)					
	0	1	2	3	4	5
<b>Panel A: Compensation of Government Employees</b>						
<b>A.1 Linear Specification</b>	0.614** (0.291)	0.583* (0.317)	0.752** (0.361)	0.760** (0.387)	0.720* (0.384)	0.780* (0.421)
<b>A.2 Normal Times</b>	0.551** (0.272)	0.504* (0.294)	0.709** (0.358)	0.788** (0.378)	0.803** (0.371)	0.891** (0.402)
<b>A.3 Financial Crisis</b>	3.031*** (0.692)	3.131*** (0.772)	2.413*** (0.673)	1.690** (0.679)	1.427*** (0.499)	1.243** (0.500)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	7.071	15.56	7.435	1.609	1.841	0.944
$p$ -value	0.0078	0.0001	0.0064	0.205	0.175	0.331
Obs	674	632	590	551	512	476
Countries	34	34	33	33	32	31
<b>Panel B: Expenditure on Goods and Services</b>						
<b>B.1 Linear Specification</b>	0.548* (0.282)	0.563* (0.332)	0.586 (0.392)	0.481 (0.365)	0.330 (0.353)	0.147 (0.329)
<b>B.2 Normal Times</b>	0.577** (0.274)	0.574* (0.329)	0.608 (0.391)	0.529 (0.373)	0.391 (0.360)	0.229 (0.329)
<b>B.3 Financial Crisis</b>	1.654** (0.699)	1.990* (1.104)	1.417 (1.403)	0.0322 (1.120)	-0.163 (0.606)	-0.495 (0.727)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	2.062	1.475	0.447	0.0317	0.128	0.506
$p$ -value	0.151	0.225	0.504	0.859	0.720	0.477
Obs	666	624	582	543	504	468
Countries	34	34	33	33	32	31
<b>Panel C: Government Investment</b>						
<b>C.1 Linear Specification</b>	0.299** (0.119)	0.815*** (0.218)	0.816*** (0.221)	0.782*** (0.255)	0.668** (0.260)	0.687** (0.320)
<b>C.2 Normal Times</b>	0.364*** (0.119)	0.897*** (0.216)	0.869*** (0.215)	0.803*** (0.240)	0.661** (0.308)	0.615 (0.413)
<b>C.3 Financial Crisis</b>	-0.872 (1.088)	-0.798 (1.509)	-0.261 (1.050)	-0.292 (1.069)	-1.733 (3.215)	-1.992 (5.468)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	0.346	1.003	0.743	0.548	0.429	0.184
$p$ -value	0.556	0.316	0.389	0.459	0.512	0.668
Obs	673	629	585	544	503	464
Countries	35	35	34	34	33	31

Notes: Table A.7 reports the estimated cumulative output multipliers for OECD countries when the measure of government expenditure is the compensation of government employees (panel A), expenditure on goods and services (panel B), and government investment (panel C). The ‘state’ of the economy is a financial crisis dummy variable following Laeven & Valencia (2018). The horizon (top row) is in years after the shock. Each panel also reports tests of the null of equality of the multipliers across states of the economy and their associated  $p$ -values. Standard errors (in parentheses) are clustered at the country level, with \*, \*\* and \*\*\* denoting significance at the 10%, 5% and 1% level respectively.

Table A.8: Cumulative Government Spending Multipliers for Non-OECD Economies – Financial Crisis as ‘state’ of the Economy

	Horizon (years after the shock)					
	0	1	2	3	4	5
<b>Panel A: Compensation of Government Employees</b>						
<b>A.1 Linear Specification</b>	0.177 (0.175)	-0.0361 (0.308)	-0.109 (0.436)	0.0906 (0.456)	0.179 (0.458)	0.184 (0.404)
<b>A.2 Normal Times</b>	-0.0174 (0.122)	-0.262 (0.231)	-0.605* (0.323)	-0.431 (0.364)	-0.363 (0.420)	-0.356 (0.471)
<b>A.3 Financial Crisis</b>	8.344*** (1.689)	3.532 (3.372)	8.841*** (0.887)	3.661*** (1.129)	1.445 (1.172)	3.324** (1.548)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	7.509	1.610	43.12	5.361	0.860	4.092
$p$ -value	0.0061	0.204	0.0000	0.0206	0.354	0.0431
Obs	435	376	325	283	242	208
Countries	43	41	37	35	32	30
<b>Panel B: Expenditure on Goods and Services</b>						
<b>B.1 Linear Specification</b>	-0.0380 (0.103)	-0.0233 (0.174)	-0.0388 (0.206)	0.0206 (0.270)	0.00412 (0.366)	0.116 (0.388)
<b>B.2 Normal Times</b>	-0.0530 (0.109)	0.102 (0.173)	0.198 (0.162)	0.406** (0.186)	0.560** (0.245)	0.804*** (0.259)
<b>B.3 Financial Crisis</b>	0.116 (2.275)	-5.320* (3.026)	-22.32*** (4.975)	-7.357*** (1.999)	-3.572*** (1.056)	0.614*** (0.199)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	0.0111	3.155	18.18	9.549	8.727	1.366
$p$ -value	0.916	0.0757	0.0000	0.002	0.0031	0.243
Obs	430	370	318	276	234	201
Countries	43	41	37	35	31	29
<b>Panel C: Government Investment</b>						
<b>C.1 Linear Specification</b>	0.389*** (0.129)	0.395** (0.202)	0.345 (0.296)	0.672 (0.620)	0.490 (0.655)	0.478 (0.709)
<b>C.2 Normal Times</b>	0.250** (0.0973)	0.190 (0.166)	0.0780 (0.281)	0.0915 (0.938)	-0.0613 (1.132)	-0.220 (1.680)
<b>C.3 Financial Crisis</b>	3.318 (2.367)	0.907 (0.837)	0.862 (1.284)	-1.082*** (0.329)	-2.601*** (0.366)	2.738*** (0.796)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	1.253	0.877	0.345	1.526	6.687	2.677
$p$ -value	0.263	0.349	0.557	0.217	0.0097	0.102
Obs	413	350	299	258	219	188
Countries	44	41	36	33	29	27

Notes: Table A.8 reports the estimated cumulative output multipliers for Non-OECD countries when the measure of government expenditure is the compensation of government employees (panel A), expenditure on goods and services (panel B), and government investment (panel C). The ‘state’ of the economy is a financial crisis dummy variable following Laeven & Valencia (2018). The horizon (top row) is in years after the shock. Each panel also reports tests of the null of equality of the multipliers across states of the economy and their associated  $p$ -values. Standard errors (in parentheses) are clustered at the country level, with \*, \*\* and \*\*\* denoting significance at the 10%, 5% and 1% level respectively.

Table A.9: Cumulative Government Spending Multipliers of Social Benefits – Financial Crisis as ‘state’ of the Economy

	Horizon (years after the shock)					
	0	1	2	3	4	5
<b>Panel A: OECD Economies</b>						
<b>A.1 Linear Specification</b>	-0.207 (0.257)	-0.0693 (0.292)	-0.0146 (0.319)	-0.0952 (0.275)	-0.122 (0.268)	-0.0319 (0.261)
<b>A.2 Normal Times</b>	-0.0320 (0.235)	0.0653 (0.282)	0.110 (0.314)	0.0690 (0.257)	0.0293 (0.231)	0.152 (0.223)
<b>A.3 Financial Crisis</b>	0.666 (0.658)	0.603 (0.420)	0.502 (0.346)	0.221 (0.487)	0.447** (0.200)	0.307* (0.163)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	0.407	1.088	0.991	0.147	5.814	1.212
<i>p</i> -value	0.523	0.297	0.320	0.702	0.0159	0.271
Obs	599	561	523	487	451	416
Countries	34	34	33	33	32	31
<b>Panel B: Non-OECD Economies</b>						
<b>B.1 Linear Specification</b>	-0.0489 (0.0917)	-0.202 (0.124)	-0.0202 (0.244)	0.00574 (0.297)	-0.297 (0.325)	-0.452 (0.297)
<b>B.2 Normal Times</b>	-0.0713 (0.0907)	-0.172* (0.100)	-0.0516 (0.265)	-0.0430 (0.339)	-0.526 (0.345)	-0.646** (0.307)
<b>B.3 Financial Crisis</b>	3.804** (1.874)	1.640** (0.832)	-5.257*** (0.807)	-3.036*** (0.694)	-2.932*** (0.811)	4.519 (4.520)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	3.351	6.176	43.17	18.21	10.29	1.703
<i>p</i> -value	0.0672	0.0129	0.0000	0.0000	0.0013	0.192
Obs	394	337	287	243	206	175
Countries	43	41	37	32	29	27

Notes: [Table A.9](#) reports the estimated cumulative output multipliers for OECD and Non-OECD countries when the measure of government ‘expenditure’ is social benefits. See also notes for [Table A.7](#).

Table A.10: Cumulative Government Spending Multipliers for OECD Economies – Controlling for Institutions

	Horizon (years after the shock)					
	0	1	2	3	4	5
<b>Panel A: Compensation of Government Employees</b>						
<b>A.1 Linear Specification</b>	0.597** (0.283)	0.555* (0.302)	0.690** (0.334)	0.658* (0.341)	0.564* (0.329)	0.576 (0.353)
<b>A.2 Expansion</b>	0.619** (0.291)	0.394 (0.341)	0.601 (0.400)	0.677 (0.428)	0.656 (0.442)	0.729 (0.448)
<b>A.3 Recession</b>	1.260** (0.506)	1.284*** (0.487)	1.370*** (0.444)	1.023** (0.453)	0.727 (0.530)	1.050* (0.628)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	3.709	10.75	6.041	0.886	0.0141	0.252
$p$ -value	0.0541	0.00104	0.0140	0.346	0.905	0.616
Obs	672	630	588	549	510	473
Countries	34	34	33	33	32	30
<b>Panel B: Expenditure on Goods and Services</b>						
<b>B.1 Linear Specification</b>	0.543* (0.282)	0.559* (0.318)	0.614 (0.375)	0.521 (0.331)	0.408 (0.304)	0.241 (0.257)
<b>B.2 Expansion</b>	0.572** (0.287)	0.600 (0.387)	0.396 (0.415)	0.366 (0.388)	0.311 (0.379)	0.242 (0.337)
<b>B.3 Recession</b>	0.901 (0.610)	1.091* (0.638)	0.950 (0.643)	0.653 (0.501)	0.347 (0.453)	0.0295 (0.358)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	0.0156	0.994	1.156	0.537	0.0000	0.787
$p$ -value	0.901	0.319	0.282	0.464	0.995	0.375
Obs	664	622	580	541	502	465
Countries	34	34	33	33	32	30
<b>Panel C: Government Investment</b>						
<b>C.1 Linear Specification</b>	0.312** (0.126)	0.827*** (0.236)	0.802*** (0.237)	0.726*** (0.270)	0.549** (0.266)	0.514 (0.343)
<b>C.2 Expansion</b>	0.320* (0.177)	0.887*** (0.283)	0.761** (0.357)	0.635* (0.373)	0.505 (0.481)	0.533 (0.530)
<b>C.3 Recession</b>	0.462* (0.267)	1.344*** (0.348)	1.312*** (0.345)	1.386*** (0.535)	1.145* (0.625)	1.462* (0.849)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	0.765	2.177	1.913	1.117	0.536	1.696
$p$ -value	0.382	0.140	0.167	0.291	0.464	0.193
Obs	671	627	583	542	501	461
Countries	35	35	34	34	33	30

Notes: Table A.10 reports the results of the robustness test in which we control for institutions (government stability, corruption, and law and order). The multipliers reported are the estimated cumulative output multipliers for OECD countries when the measure of government expenditure is the compensation of government employees (panel A), expenditure on goods and services (panel B), and government investment (panel C). The horizon (top row) is in years after the shock. The linear model specification presents the multipliers by estimating (A.1), and the specification in expansion and recessions present multipliers by estimating (A.2). Each panel also reports tests of the null of equality of the multipliers across states of the economy and their associated  $p$ -values. The rob04a spans the period 1991-2017. Standard errors (in parentheses) are clustered at the country level, with \*, \*\* and \*\*\* denoting significance at the 10%, 5% and 1% level respectively.

Table A.11: Cumulative Government Spending Multipliers for Non-OECD Economies – Controlling for Institutions

	Horizon (years after the shock)					
	0	1	2	3	4	5
<b>Panel A: Compensation of Government Employees</b>						
<b>A.1 Linear Specification</b>	-0.0532 (0.262)	-0.394* (0.234)	-0.635** (0.286)	-0.460 (0.377)	-0.289 (0.451)	-0.297 (0.464)
<b>A.2 Expansion</b>	0.237 (0.287)	-0.107 (0.319)	-0.625 (0.440)	-0.548 (0.568)	-0.442 (0.727)	-0.748 (0.911)
<b>A.3 Recession</b>	1.092** (0.525)	0.121 (0.393)	-0.447 (0.435)	-0.0929 (0.470)	-0.0169 (0.489)	0.0225 (0.503)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	2.747	0.783	0.189	1.209	0.829	2.081
<i>p</i> -value	0.0974	0.376	0.664	0.272	0.363	0.149
Obs	386	339	297	259	223	196
Countries	37	36	33	30	26	25
<b>Panel B: Expenditure on Goods and Services</b>						
<b>B.1 Linear Specification</b>	0.0485 (0.115)	0.0643 (0.141)	0.119 (0.181)	0.337* (0.199)	0.612** (0.246)	0.776*** (0.254)
<b>B.2 Expansion</b>	-0.206 (0.144)	-0.114 (0.184)	0.0338 (0.288)	0.391 (0.333)	0.860* (0.461)	1.371** (0.568)
<b>B.3 Recession</b>	-0.144 (0.174)	-0.212 (0.221)	-0.275 (0.339)	0.165 (0.402)	0.630 (0.574)	1.143 (0.744)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	1.657	0.390	1.956	0.728	0.871	1.253
<i>p</i> -value	0.198	0.532	0.162	0.393	0.351	0.263
Obs	386	339	297	259	223	196
Countries	37	36	33	30	26	25
<b>Panel C: Government Investment</b>						
<b>C.1 Linear Specification</b>	0.361** (0.171)	0.301 (0.240)	0.319 (0.519)	0.253 (0.822)	0.233 (1.217)	0.425 (1.198)
<b>C.2 Expansion</b>	-0.0329 (0.167)	-0.411* (0.234)	-0.762 (1.056)	-1.639 (1.960)	-2.207 (3.244)	-1.974 (4.487)
<b>C.3 Recession</b>	0.569* (0.329)	0.0504 (0.420)	-0.0728 (0.604)	-0.212 (0.789)	-0.159 (1.361)	0.414 (1.144)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	6.964	2.173	0.893	1.558	1.451	1.135
<i>p</i> -value	0.0083	0.140	0.345	0.212	0.228	0.287
Obs	366	317	276	241	208	183
Countries	37	35	31	28	24	23

Notes: [Table A.11](#) reports the results of the robustness test in which we control for institutions (government stability, corruption, and law and order). The multipliers reported are the estimated cumulative output multipliers for Non-OECD countries when the measure of government expenditure is the compensation of government employees (panel A), expenditure on goods and services (panel B), and government investment (panel C). See also notes for [Table A.10](#).

Table A.12: Cumulative Government Spending Multipliers of Social Benefits – Controlling for Institutions

	Horizon (years after the shock)					
	0	1	2	3	4	5
<b>Panel A: OECD Economies</b>						
<b>A.1 Linear Specification</b>	-0.209 (0.255)	-0.0449 (0.287)	0.0331 (0.316)	-0.0255 (0.268)	-0.0572 (0.246)	0.0255 (0.231)
<b>A.2 Expansion</b>	0.611* (0.317)	0.614 (0.404)	0.649 (0.427)	0.544 (0.400)	0.364 (0.348)	0.357 (0.305)
<b>A.3 Recession</b>	0.612 (0.438)	0.901** (0.445)	0.834* (0.465)	0.382 (0.380)	0.132 (0.387)	0.142 (0.403)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	4.306	1.680	0.846	0.0193	0.213	0.133
<i>p</i> -value	0.0380	0.195	0.358	0.890	0.644	0.715
Obs	597	559	521	485	449	413
Countries	34	34	33	33	32	30
<b>Panel B: Non-OECD Economies</b>						
<b>B.1 Linear Specification</b>	-0.0923 (0.102)	-0.215* (0.130)	-0.0725 (0.267)	-0.0262 (0.350)	-0.378 (0.365)	-0.514 (0.348)
<b>B.2 Expansion</b>	0.185 (0.182)	0.162 (0.180)	0.318 (0.439)	0.551 (0.621)	-0.104 (0.711)	-0.646 (0.866)
<b>B.3 Recession</b>	0.187 (0.227)	0.0313 (0.259)	0.105 (0.433)	0.165 (0.476)	-0.321 (0.374)	-0.611 (0.433)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	0.0900	0.396	0.628	0.698	0.368	0.545
<i>p</i> -value	0.764	0.529	0.428	0.404	0.544	0.460
Obs	353	308	267	228	195	170
Countries	37	36	33	28	24	23

Notes: [Table A.12](#) reports the results of the robustness test in which we control for institutions (government stability, corruption, and law and order). The multipliers reported are the estimated cumulative output multipliers for OECD and Non-OECD countries when the measure of government ‘expenditure’ is social benefits. See also notes for [Table A.10](#).



Table A.13: Cumulative Government Spending Multipliers for OECD Economies – Controlling for Openness

	Horizon (years after the shock)					
	0	1	2	3	4	5
<b>Panel A: Compensation of Government Employees</b>						
<b>A.1 Linear Specification</b>	0.678** (0.291)	0.640** (0.316)	0.814** (0.354)	0.826** (0.387)	0.786** (0.398)	0.875** (0.441)
<b>A.2 Expansion</b>	0.733** (0.326)	0.439 (0.353)	0.643 (0.410)	0.693 (0.470)	0.699 (0.541)	0.883 (0.580)
<b>A.3 Recession</b>	1.267** (0.521)	1.293*** (0.500)	1.478*** (0.449)	1.204*** (0.460)	0.979 (0.596)	1.563** (0.699)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	2.682	11.70	7.566	1.666	0.199	1.274
<i>p</i> -value	0.102	0.0006	0.0060	0.197	0.655	0.259
Obs	674	632	590	551	512	476
Countries	34	34	33	33	32	31
<b>Panel B: Expenditure on Goods and Services</b>						
<b>B.1 Linear Specification</b>	0.545* (0.284)	0.563* (0.334)	0.592 (0.395)	0.484 (0.367)	0.331 (0.355)	0.149 (0.332)
<b>B.2 Expansion</b>	0.606** (0.243)	0.595 (0.370)	0.329 (0.439)	0.222 (0.476)	0.0672 (0.519)	-0.0152 (0.503)
<b>B.3 Recession</b>	0.869 (0.579)	1.056* (0.607)	0.909 (0.611)	0.632 (0.476)	0.305 (0.442)	0.00256 (0.359)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	0.0553	0.944	1.442	1.156	0.382	0.0026
<i>p</i> -value	0.814	0.331	0.230	0.282	0.536	0.960
Obs	666	624	582	543	504	468
Countries	34	34	33	33	32	31
<b>Panel C: Government Investment</b>						
<b>C.1 Linear Specification</b>	0.312*** (0.116)	0.826*** (0.210)	0.835*** (0.215)	0.805*** (0.256)	0.684** (0.277)	0.714** (0.334)
<b>C.2 Expansion</b>	0.271 (0.174)	0.806*** (0.300)	0.662* (0.388)	0.524 (0.400)	0.377 (0.514)	0.517 (0.501)
<b>C.3 Recession</b>	0.383 (0.258)	1.270*** (0.329)	1.253*** (0.320)	1.372*** (0.471)	1.196** (0.593)	1.721** (0.781)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	0.773	2.041	2.410	1.742	1.245	4.748
<i>p</i> -value	0.379	0.153	0.121	0.187	0.264	0.0293
Obs	673	629	585	544	503	464
Countries	35	35	34	34	33	31

Notes: Table A.13 reports the results of the robustness test in which we control for trade openness. The multipliers reported are the estimated cumulative output multipliers for OECD countries when the measure of government expenditure is the compensation of government employees (panel A), expenditure on goods and services (panel B), and government investment (panel C). The horizon (top row) is in years after the shock. The linear model specification presents the multipliers by estimating (A.1), and the specification in expansion and recessions present multipliers by estimating (A.2). Each panel also reports tests of the null of equality of the multipliers across states of the economy and their associated *p*-values. The sample spans the period 1991-2017. Standard errors (in parentheses) are clustered at the country level, with \*, \*\* and \*\*\* denoting significance at the 10%, 5% and 1% level respectively.

Table A.14: Cumulative Government Spending Multipliers for Non-OECD Economies – Controlling for Openness

	Horizon (years after the shock)					
	0	1	2	3	4	5
<b>Panel A: Compensation of Government Employees</b>						
<b>A.1 Linear Specification</b>	0.226 (0.192)	-0.0770 (0.335)	-0.161 (0.468)	0.00609 (0.505)	0.101 (0.525)	0.00562 (0.474)
<b>A.2 Expansion</b>	0.582** (0.227)	0.152 (0.404)	-0.120 (0.594)	-0.0189 (0.671)	-0.0823 (0.731)	-0.473 (0.903)
<b>A.3 Recession</b>	0.621* (0.317)	-0.0437 (0.302)	-0.200 (0.452)	0.0733 (0.471)	0.0547 (0.411)	0.0398 (0.361)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	0.0780	0.532	0.0783	0.0670	0.118	0.738
<i>p</i> -value	0.780	0.466	0.780	0.796	0.731	0.390
Obs	463	402	351	308	266	231
Countries	45	42	38	36	33	31
<b>Panel B: Expenditure on Goods and Services</b>						
<b>B.1 Linear Specification</b>	-0.0378 (0.109)	-0.0341 (0.148)	-0.0464 (0.208)	0.00535 (0.273)	-0.000339 (0.368)	0.119 (0.388)
<b>B.2 Expansion</b>	-0.0915 (0.136)	-0.0356 (0.217)	0.0788 (0.308)	0.226 (0.343)	0.283 (0.484)	0.772 (0.552)
<b>B.3 Recession</b>	0.0202 (0.153)	-0.0266 (0.167)	-0.145 (0.220)	-0.0624 (0.281)	-0.0866 (0.363)	0.117 (0.460)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	2.043	0.0014	1.285	1.708	1.252	2.479
<i>p</i> -value	0.153	0.970	0.257	0.191	0.263	0.115
Obs	463	402	351	308	266	231
Countries	45	42	38	36	33	31
<b>Panel C: Government Investment</b>						
<b>C.1 Linear Specification</b>	0.360*** (0.133)	0.365* (0.197)	0.337 (0.296)	0.665 (0.622)	0.487 (0.652)	0.459 (0.692)
<b>C.2 Expansion</b>	0.0647 (0.115)	-0.0940 (0.229)	-0.169 (0.547)	-0.537 (1.483)	-1.179 (1.946)	-2.268 (4.050)
<b>C.3 Recession</b>	0.464** (0.181)	0.173 (0.240)	-0.0409 (0.309)	0.00712 (0.679)	-0.0978 (0.791)	-0.0355 (0.785)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	11.55	1.284	0.100	0.284	0.665	0.429
<i>p</i> -value	0.0007	0.257	0.751	0.594	0.415	0.513
Obs	447	383	332	290	251	218
Countries	46	42	37	34	31	29

Notes: Table A.14 reports the results of the robustness test in which we control for trade openness. The multipliers reported are the estimated cumulative output multipliers for Non-OECD countries when the measure of government expenditure is the compensation of government employees (panel A), expenditure on goods and services (panel B), and government investment (panel C). See also notes for Table A.13.

Table A.15: Cumulative Government Spending Multipliers of Social Benefits – Controlling for Openness

	Horizon (years after the shock)					
	0	1	2	3	4	5
<b>Panel A: OECD Economies</b>						
<b>A.1 Linear Specification</b>	-0.159 (0.265)	-0.0522 (0.307)	-0.0248 (0.341)	-0.136 (0.301)	-0.181 (0.302)	-0.0647 (0.293)
<b>A.2 Expansion</b>	0.700** (0.354)	0.586 (0.441)	0.563 (0.462)	0.375 (0.416)	0.206 (0.376)	0.271 (0.334)
<b>A.3 Recession</b>	0.623 (0.452)	0.863* (0.469)	0.753 (0.488)	0.230 (0.398)	-0.0321 (0.426)	0.00996 (0.451)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	5.169	1.696	0.856	0.0458	0.366	0.295
$p$ -value	0.0230	0.193	0.355	0.831	0.545	0.587
Obs	599	561	523	487	451	416
Countries	34	34	33	33	32	31
<b>Panel B: Non-OECD Economies</b>						
<b>B.1 Linear Specification</b>	0.0363 (0.0964)	-0.140 (0.120)	0.00482 (0.243)	0.00219 (0.302)	-0.401 (0.327)	-0.573** (0.286)
<b>B.2 Expansion</b>	0.384** (0.184)	0.189 (0.172)	0.232 (0.366)	0.202 (0.519)	-0.625 (0.503)	-1.230* (0.664)
<b>B.3 Recession</b>	0.181 (0.204)	-0.0469 (0.260)	0.0803 (0.410)	0.0879 (0.447)	-0.568 (0.383)	-0.829* (0.440)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	0.686	1.460	0.377	0.0828	0.0091	0.0070
$p$ -value	0.408	0.227	0.539	0.773	0.924	0.933
Obs	430	371	321	277	238	205
Countries	45	42	38	34	31	29

Notes: [Table A.15](#) reports the results of the robustness test in which we control for trade openness. The multipliers reported are the estimated cumulative output multipliers for OECD and Non-OECD countries when the measure of government 'expenditure' is social benefits. See also notes for [Table A.13](#).

Table A.16: Cumulative Government Spending Multipliers for OECD Economies – Controlling for Exchange Rate Regime

	Horizon (years after the shock)					
	0	1	2	3	4	5
<b>Panel A: Compensation of Government Employees</b>						
<b>A.1 Linear Specification</b>	0.607** (0.289)	0.575* (0.315)	0.740** (0.356)	0.730* (0.372)	0.674* (0.362)	0.729* (0.394)
<b>A.2 Expansion</b>	0.728** (0.327)	0.458 (0.360)	0.660 (0.423)	0.704 (0.467)	0.687 (0.516)	0.818 (0.539)
<b>A.3 Recession</b>	1.251** (0.520)	1.301*** (0.503)	1.481*** (0.459)	1.202*** (0.456)	0.946* (0.555)	1.403** (0.647)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	2.644	11.78	7.681	1.674	0.187	1.000
$p$ -value	0.104	0.0006	0.0056	0.196	0.665	0.317
Obs	674	632	590	551	512	476
Countries	34	34	33	33	32	31
<b>Panel B: Expenditure on Goods and Services</b>						
<b>B.1 Linear Specification</b>	0.546* (0.282)	0.560* (0.332)	0.576 (0.393)	0.460 (0.368)	0.302 (0.358)	0.117 (0.333)
<b>B.2 Expansion</b>	0.607** (0.245)	0.600 (0.375)	0.339 (0.445)	0.218 (0.485)	0.0524 (0.529)	-0.0436 (0.508)
<b>B.3 Recession</b>	0.864 (0.580)	1.045* (0.610)	0.915 (0.618)	0.632 (0.486)	0.303 (0.451)	-0.00828 (0.366)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	0.0629	0.888	1.437	1.207	0.424	0.0106
$p$ -value	0.802	0.346	0.231	0.272	0.515	0.918
Obs	666	624	582	543	504	468
Countries	34	34	33	33	32	31
<b>Panel C: Government Investment</b>						
<b>C.1 Linear Specification</b>	0.279** (0.117)	0.798*** (0.225)	0.806*** (0.232)	0.788*** (0.264)	0.682** (0.270)	0.699** (0.324)
<b>C.2 Expansion</b>	0.268 (0.172)	0.806*** (0.299)	0.674* (0.390)	0.558 (0.383)	0.406 (0.489)	0.519 (0.496)
<b>C.3 Recession</b>	0.336 (0.246)	1.259*** (0.331)	1.294*** (0.342)	1.488*** (0.488)	1.315** (0.575)	1.855** (0.747)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	0.344	1.908	2.576	1.949	1.430	4.439
$p$ -value	0.558	0.167	0.108	0.163	0.232	0.0351
Obs	672	628	584	543	503	464
Countries	35	35	34	34	33	31

Notes: Table A.16 reports the results of the robustness test in which we control for the exchange rate regime. The multipliers reported are the estimated cumulative output multipliers for OECD countries when the measure of government expenditure is the compensation of government employees (panel A), expenditure on goods and services (panel B), and government investment (panel C). The horizon (top row) is in years after the shock. The linear model specification presents the multipliers by estimating (A.1), and the specification in expansion and recessions present multipliers by estimating (A.2). Each panel also reports tests of the null of equality of the multipliers across states of the economy and their associated  $p$ -values. The sample spans the period 1991-2017. Standard errors (in parentheses) are clustered at the country level, with \*, \*\* and \*\*\* denoting significance at the 10%, 5% and 1% level respectively.

Table A.17: Cumulative Government Spending Multipliers for Non-OECD Economies – Controlling for Exchange Rate Regime

	Horizon (years after the shock)					
	0	1	2	3	4	5
<b>Panel A: Compensation of Government Employees</b>						
<b>A.1 Linear Specification</b>	0.105 (0.165)	-0.141 (0.294)	-0.232 (0.368)	-0.238 (0.399)	-0.244 (0.413)	-0.280 (0.373)
<b>A.2 Expansion</b>	0.588*** (0.212)	0.396 (0.412)	0.0527 (0.549)	-0.0934 (0.628)	-0.258 (0.765)	-0.964 (1.317)
<b>A.3 Recession</b>	0.709** (0.326)	0.366 (0.334)	0.293 (0.351)	0.316 (0.366)	0.182 (0.295)	0.177 (0.265)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	0.170	0.0089	0.949	1.567	0.953	1.299
<i>p</i> -value	0.680	0.925	0.330	0.211	0.329	0.254
Obs	468	405	351	303	261	226
Countries	48	45	41	36	33	31
<b>Panel B: Expenditure on Goods and Services</b>						
<b>B.1 Linear Specification</b>	0.0384 (0.120)	0.145 (0.193)	0.241 (0.174)	0.387** (0.189)	0.432* (0.240)	0.557** (0.259)
<b>B.2 Expansion</b>	-0.0268 (0.127)	0.0732 (0.275)	0.247 (0.220)	0.493** (0.241)	0.573 (0.403)	1.101** (0.496)
<b>B.3 Recession</b>	0.0116 (0.164)	0.0332 (0.288)	0.103 (0.313)	0.303 (0.360)	0.349 (0.354)	0.579 (0.409)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	1.011	0.0325	0.281	0.354	0.245	1.083
<i>p</i> -value	0.315	0.857	0.596	0.552	0.621	0.298
Obs	463	399	344	296	253	219
Countries	48	45	41	36	32	30
<b>Panel C: Government Investment</b>						
<b>C.1 Linear Specification</b>	0.413*** (0.137)	0.385* (0.201)	0.325 (0.317)	0.604 (0.714)	0.350 (0.768)	0.257 (0.866)
<b>C.2 Expansion</b>	0.138 (0.113)	-0.0968 (0.236)	-0.193 (0.554)	-0.669 (1.516)	-1.286 (2.042)	-2.227 (4.235)
<b>C.3 Recession</b>	0.544*** (0.183)	0.146 (0.253)	0.0459 (0.368)	0.102 (0.781)	0.102 (0.906)	0.403 (0.894)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	11.29	1.146	0.347	0.668	1.508	0.787
<i>p</i> -value	0.0008	0.284	0.556	0.414	0.219	0.375
Obs	443	377	323	278	238	206
Countries	49	45	39	34	30	28

Notes: Table A.17 reports the results of the robustness test in which we control for the exchange rate regime. The multipliers reported the estimated cumulative output multipliers for Non-OECD countries when the measure of government expenditure is the compensation of government employees (panel A), expenditure on goods and services (panel B), and government investment (panel C). See also notes for Table A.16.

Table A.18: Cumulative Government Spending Multipliers of Social Benefits – Controlling for Exchange Rate Regime

	Horizon (years after the shock)					
	0	1	2	3	4	5
<b>Panel A: OECD Economies</b>						
<b>A.1 Linear Specification</b>	-0.217 (0.254)	-0.0842 (0.290)	-0.0339 (0.313)	-0.119 (0.260)	-0.148 (0.253)	-0.0469 (0.254)
<b>A.2 Expansion</b>	0.680* -0.36	0.616 -0.442	0.625 -0.45	0.481 -0.398	0.318 -0.357	0.35 -0.32
<b>A.3 Recession</b>	0.605 (0.442)	0.872* (0.453)	0.781* (0.469)	0.292 (0.374)	0.0425 (0.399)	0.0591 (0.434)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	5.231	1.624	0.763	0.0669	0.385	0.321
<i>p</i> -value	0.0222	0.203	0.382	0.796	0.535	0.571
Obs	599	561	523	487	451	416
Countries	34	34	33	33	32	31
<b>Panel B: Non-OECD Economies</b>						
<b>B.1 Linear Specification</b>	-0.104 (0.107)	-0.232* (0.125)	0.0300 (0.239)	-0.0671 (0.324)	-0.502 (0.332)	-0.590* (0.321)
<b>B.2 Expansion</b>	0.357** (0.173)	0.211 (0.185)	0.386 (0.303)	0.251 (0.505)	-0.593 (0.534)	-0.918 (0.704)
<b>B.3 Recession</b>	0.0550 (0.191)	0.0334 (0.208)	0.346 (0.301)	0.167 (0.414)	-0.570 (0.390)	-0.619 (0.385)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	3.403	1.055	0.0101	0.0262	0.0890	0.0672
<i>p</i> -value	0.0651	0.304	0.920	0.871	0.765	0.795
Obs	430	369	316	266	228	196
Countries	48	45	41	33	30	28

Notes: [Table A.18](#) reports the results of the robustness test in which we control for the exchange rate regime. The multipliers reported the estimated cumulative output multipliers for OECD and Non-OECD countries when the measure of government ‘expenditure’ is social benefits. See also notes for [Table A.16](#).

Table A.19: Cumulative Government Spending Multipliers for OECD Economies – Controlling for Commodity Production

	Horizon (years after the shock)					
	0	1	2	3	4	5
<b>Panel A: Compensation of Government Employees</b>						
<b>A.1 Linear Specification</b>	0.690** (0.288)	0.676** (0.301)	0.863** (0.340)	0.853** (0.372)	0.791** (0.378)	0.824* (0.422)
<b>A.2 Expansion</b>	0.760** (0.330)	0.521 (0.346)	0.727* (0.420)	0.761 (0.477)	0.747 (0.537)	0.863 (0.572)
<b>A.3 Recession</b>	1.321** (0.529)	1.397*** (0.493)	1.640*** (0.442)	1.378*** (0.441)	1.127** (0.554)	1.591** (0.651)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	2.646	11.63	8.674	2.359	0.484	1.733
$p$ -value	0.104	0.0007	0.0032	0.125	0.487	0.188
Obs	664	622	584	545	506	470
Countries	34	34	33	33	32	31
<b>Panel B: Expenditure on Goods and Services</b>						
<b>B.1 Linear Specification</b>	0.561** -0.286	0.581* -0.338	0.607 -0.398	0.487 -0.371	0.33 -0.362	0.13 -0.339
<b>B.2 Expansion</b>	0.626** (0.252)	0.645* (0.373)	0.347 (0.460)	0.217 (0.504)	0.0554 (0.554)	-0.0452 (0.532)
<b>B.3 Recession</b>	0.875 (0.587)	1.056* (0.623)	0.963 (0.622)	0.669 (0.489)	0.335 (0.457)	0.00826 (0.370)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	0.0842	0.720	1.676	1.409	0.499	0.0197
$p$ -value	0.772	0.396	0.195	0.235	0.480	0.888
Obs	656	614	576	537	498	462
Countries	34	34	33	33	32	31
<b>Panel C: Government Investment</b>						
<b>C.1 Linear Specification</b>	0.298** (0.126)	0.777*** (0.215)	0.829*** (0.227)	0.799*** (0.263)	0.675*** (0.262)	0.719** (0.319)
<b>C.2 Expansion</b>	0.270 (0.185)	0.724*** (0.279)	0.662* (0.391)	0.528 (0.377)	0.387 (0.476)	0.554 (0.483)
<b>C.3 Recession</b>	0.375 (0.264)	1.235*** (0.326)	1.323*** (0.340)	1.489*** (0.497)	1.318** (0.576)	1.845** (0.725)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	0.762	2.606	2.871	2.073	1.430	4.762
$p$ -value	0.383	0.106	0.0902	0.150	0.232	0.0291
Obs	663	619	579	538	497	458
Countries	35	35	34	34	33	31

Notes: Table A.19 reports the results of the robustness test in which we control for commodity production. The multipliers reported are the estimated cumulative output multipliers for OECD countries when the measure of government expenditure is the compensation of government employees (panel A), expenditure on goods and services (panel B), and government investment (panel C). The horizon (top row) is in years after the shock. The linear model specification presents the multipliers by estimating (A.1), and the specification in expansion and recessions present multipliers by estimating (A.2). Each panel also reports tests of the null of equality of the multipliers across states of the economy and their associated  $p$ -values. The sample spans the period 1991-2017. Standard errors (in parentheses) are clustered at the country level, with \*, \*\* and \*\*\* denoting significance at the 10%, 5% and 1% level respectively.

Table A.20: Cumulative Government Spending Multipliers for Non-OECD Economies – Controlling for Commodity Production

	Horizon (years after the shock)					
	0	1	2	3	4	5
<b>Panel A: Compensation of Government Employees</b>						
<b>A.1 Linear Specification</b>	0.367 (0.250)	-0.0235 (0.315)	-0.240 (0.445)	-0.0781 (0.464)	0.101 (0.436)	0.148 (0.365)
<b>A.2 Expansion</b>	0.772*** (0.270)	0.340 (0.428)	-0.163 (0.569)	-0.0458 (0.618)	0.0553 (0.648)	0.135 (0.893)
<b>A.3 Recession</b>	0.743** (0.357)	0.135 (0.259)	-0.135 (0.381)	0.195 (0.348)	0.325 (0.284)	0.395 (0.264)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	0.0194	0.484	0.0018	0.652	0.897	0.987
<i>p</i> -value	0.889	0.487	0.966	0.419	0.344	0.320
Obs	443	385	339	300	257	222
Countries	45	42	39	37	33	30
<b>Panel B: Expenditure on Goods and Services</b>						
<b>B.1 Linear Specification</b>	-0.0783 (0.159)	0.128 (0.191)	-0.00702 (0.222)	0.0275 (0.290)	-0.0128 (0.400)	0.0979 (0.417)
<b>B.2 Expansion</b>	-0.105 (0.134)	0.250 (0.214)	0.103 (0.282)	0.220 (0.384)	0.314 (0.566)	0.855 (0.654)
<b>B.3 Recession</b>	0.0342 (0.168)	0.188 (0.231)	-0.106 (0.230)	-0.0615 (0.268)	-0.154 (0.312)	-0.0430 (0.358)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	4.037	0.0606	1.040	1.600	1.931	3.619
<i>p</i> -value	0.0445	0.806	0.308	0.206	0.165	0.0571
Obs	441	383	337	298	254	220
Countries	45	42	39	37	32	29
<b>Panel C: Government Investment</b>						
<b>C.1 Linear Specification</b>	0.450*** (0.143)	0.451** (0.209)	0.540 (0.346)	0.624 (0.525)	0.471 (0.673)	0.403 (0.706)
<b>C.2 Expansion</b>	0.0308 (0.117)	-0.112 (0.209)	-0.168 (0.578)	-0.440 (1.104)	-1.171 (1.608)	-1.261 (2.170)
<b>C.3 Recession</b>	0.449** (0.205)	0.125 (0.266)	0.0312 (0.430)	0.169 (0.527)	0.329 (0.744)	0.582 (0.715)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	10.09	0.945	0.168	0.572	2.139	1.252
<i>p</i> -value	0.0015	0.331	0.682	0.449	0.144	0.263
Obs	420	360	315	279	238	206
Countries	45	41	37	35	30	27

Notes: Table A.20 reports the results of the robustness test in which we control for commodity production. The multipliers reported are the estimated cumulative output multipliers for Non-OECD countries when the measure of government expenditure is the compensation of government employees (panel A), expenditure on goods and services (panel B), and government investment (panel C). See also notes for Table A.19.



Table A.21: Cumulative Government Spending Multipliers of Social Benefits – Controlling for Commodity Production

	Horizon (years after the shock)					
	0	1	2	3	4	5
<b>Panel A: OECD Economies</b>						
<b>A.1 Linear Specification</b>	-0.179 (0.264)	-0.0407 (0.299)	0.0260 (0.318)	-0.0642 (0.275)	-0.0930 (0.270)	-0.00843 (0.261)
<b>A.2 Expansion</b>	0.779** (0.370)	0.740* (0.445)	0.778* (0.429)	0.616 (0.391)	0.439 (0.366)	0.417 (0.338)
<b>A.3 Recession</b>	0.643 (0.454)	0.916* (0.468)	0.852* (0.470)	0.343 (0.381)	0.0990 (0.402)	0.0945 (0.434)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	5.690	1.171	0.559	0.204	0.571	0.383
$p$ -value	0.0171	0.279	0.455	0.651	0.450	0.536
Obs	593	555	521	485	449	414
Countries	34	34	33	33	32	31
<b>Panel B: Non-OECD Economies</b>						
<b>B.1 Linear Specification</b>	0.0170 (0.0915)	-0.137 (0.119)	-0.0158 (0.245)	0.0218 (0.295)	-0.246 (0.334)	-0.349 (0.311)
<b>B.2 Expansion</b>	0.426** (0.188)	0.259 (0.199)	0.260 (0.374)	0.359 (0.495)	-0.430 (0.546)	-0.998 (0.816)
<b>B.3 Recession</b>	0.114 (0.202)	-0.0366 (0.254)	0.108 (0.390)	0.162 (0.411)	-0.395 (0.391)	-0.552 (0.415)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	1.596	2.133	0.328	0.263	0.0314	0.0127
$p$ -value	0.206	0.144	0.567	0.608	0.859	0.910
Obs	408	352	307	267	228	196
Countries	44	41	38	34	30	27

Notes: [Table A.21](#) reports the results of the robustness test in which we control for commodity production. The multipliers reported are the estimated cumulative output multipliers for OECD and Non-OECD countries when the measure of government ‘expenditure’ is social benefits. See also notes for [Table A.19](#).

Table A.22: Cumulative Government Spending Multipliers for OECD Economies – Controlling for Monetary Policy

	Horizon (years after the shock)					
	0	1	2	3	4	5
<b>Panel A: Compensation of Government Employees</b>						
<b>A.1 Linear Specification</b>	0.684** (0.280)	0.656** (0.288)	0.787** (0.325)	0.726** (0.360)	0.614 (0.378)	0.584 (0.417)
<b>A.2 Expansion</b>	0.738** (0.321)	0.477 (0.336)	0.633 (0.386)	0.614 (0.437)	0.545 (0.495)	0.605 (0.516)
<b>A.3 Recession</b>	1.314** (0.525)	1.373*** (0.491)	1.472*** (0.462)	1.101** (0.500)	0.824 (0.643)	1.145 (0.770)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	2.467	10.87	6.154	1.244	0.227	0.838
<i>p</i> -value	0.116	0.0010	0.0131	0.265	0.634	0.360
Obs	665	623	581	542	504	468
Countries	34	34	33	33	32	31
<b>Panel B: Expenditure on Goods and Services</b>						
<b>B.1 Linear Specification</b>	0.589** (0.289)	0.635* (0.329)	0.735* (0.387)	0.660* (0.356)	0.520 (0.341)	0.331 (0.319)
<b>B.2 Expansion</b>	0.686*** (0.254)	0.780** (0.358)	0.668 (0.415)	0.659 (0.417)	0.511 (0.451)	0.408 (0.438)
<b>B.3 Recession</b>	0.888 (0.579)	1.055* (0.601)	0.953 (0.626)	0.662 (0.512)	0.346 (0.492)	0.00563 (0.430)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	0.273	0.213	0.176	0.0629	0.472	1.643
<i>p</i> -value	0.601	0.644	0.675	0.802	0.492	0.200
Obs	657	615	573	534	496	460
Countries	34	34	33	33	32	31
<b>Panel C: Government Investment</b>						
<b>C.1 Linear Specification</b>	0.275** (0.117)	0.763*** (0.207)	0.716*** (0.208)	0.604** (0.257)	0.480* (0.258)	0.437 (0.306)
<b>C.2 Expansion</b>	0.274 (0.189)	0.779** (0.306)	0.567 (0.375)	0.379 (0.347)	0.289 (0.424)	0.381 (0.450)
<b>C.3 Recession</b>	0.334 (0.249)	1.223*** (0.319)	1.196*** (0.332)	1.263** (0.542)	1.039* (0.595)	1.364* (0.734)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	0.268	1.990	2.529	1.625	0.952	2.411
<i>p</i> -value	0.605	0.158	0.112	0.202	0.329	0.120
Obs	663	619	575	534	495	456
Countries	35	35	34	34	33	31

Notes: Table A.22 reports the results of the robustness test in which we control for monetary policy. The multipliers reported are the estimated cumulative output multipliers for OECD countries when the measure of government expenditure is the compensation of government employees (panel A), expenditure on goods and services (panel B), and government investment (panel C). The horizon (top row) is in years after the shock. The linear model specification presents the multipliers by estimating (A.1), and the specification in expansion and recessions present multipliers by estimating (A.2). Each panel also reports tests of the null of equality of the multipliers across states of the economy and their associated *p*-values. The sample spans the period 1991-2017. Standard errors (in parentheses) are clustered at the country level, with \*, \*\* and \*\*\* denoting significance at the 10%, 5% and 1% level respectively.

Table A.23: Cumulative Government Spending Multipliers for Non-OECD Economies – Controlling for Monetary Policy

	Horizon (years after the shock)					
	0	1	2	3	4	5
<b>Panel A: Compensation of Government Employees</b>						
<b>A.1 Linear Specification</b>	0.247 (0.335)	-0.230 (0.390)	-0.452 (0.519)	-0.539 (0.564)	-0.537 (0.605)	-0.618 (0.628)
<b>A.2 Expansion</b>	1.159*** (0.387)	0.223 (0.421)	-0.338 (0.571)	-0.729 (0.645)	-1.209 (0.908)	-3.338 (3.811)
<b>A.3 Recession</b>	0.905* (0.542)	0.122 (0.342)	0.0173 (0.538)	0.204 (0.441)	-0.00561 (0.396)	-0.00233 (0.345)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	0.0131	0.0664	0.705	3.996	2.403	0.478
<i>p</i> -value	0.909	0.797	0.401	0.0456	0.121	0.489
Obs	294	257	225	196	168	147
Countries	28	27	25	23	20	19
<b>Panel B: Expenditure on Goods and Services</b>						
<b>B.1 Linear Specification</b>	0.253 (0.170)	0.311 (0.200)	0.450** (0.214)	0.584** (0.242)	0.756*** (0.289)	0.963*** (0.356)
<b>B.2 Expansion</b>	-0.0245 (0.159)	0.0738 (0.174)	0.218 (0.312)	0.367 (0.491)	0.742 (0.512)	1.621*** (0.569)
<b>B.3 Recession</b>	0.103 (0.249)	0.199 (0.321)	0.381 (0.409)	0.430 (0.522)	0.591 (0.504)	0.739 (0.553)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	1.373	0.248	0.301	0.112	0.0021	1.948
<i>p</i> -value	0.241	0.619	0.583	0.737	0.964	0.163
Obs	294	257	225	196	168	147
Countries	28	27	25	23	20	19
<b>Panel C: Government Investment</b>						
<b>C.1 Linear Specification</b>	0.774*** (0.198)	0.837** (0.373)	0.612 (0.571)	0.443 (0.756)	0.111 (1.060)	-0.318 (1.457)
<b>C.2 Expansion</b>	0.0988 (0.196)	0.156 (0.429)	-0.219 (0.853)	-0.869 (1.113)	-1.996 (2.085)	-3.300 (4.216)
<b>C.3 Recession</b>	0.762** (0.326)	0.448 (0.333)	0.0988 (0.540)	0.0488 (0.752)	-0.167 (1.026)	-0.339 (0.968)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	11.98	0.508	0.273	1.714	2.114	0.893
<i>p</i> -value	0.0005	0.476	0.601	0.191	0.146	0.345
Obs	273	234	203	177	152	133
Countries	28	26	23	21	18	17

Notes: Table A.23 reports the results of the robustness test in which we control for monetary policy. The multipliers reported are the estimated cumulative output multipliers for Non-OECD countries when the measure of government expenditure is the compensation of government employees (panel A), expenditure on goods and services (panel B), and government investment (panel C). See also notes for Table A.22.

Table A.24: Cumulative Government Spending Multipliers of Social Benefits – Controlling for Monetary Policy

	Horizon (years after the shock)					
	0	1	2	3	4	5
<b>Panel A: OECD Economies</b>						
<b>A.1 Linear Specification</b>	-0.214 (0.251)	-0.0806 (0.285)	-0.0315 (0.319)	-0.120 (0.292)	-0.158 (0.283)	-0.100 (0.272)
<b>A.2 Expansion</b>	0.695** (0.346)	0.633 (0.409)	0.630 (0.415)	0.453 (0.390)	0.266 (0.352)	0.238 (0.325)
<b>A.3 Recession</b>	0.607 (0.442)	0.870* (0.456)	0.781 (0.483)	0.298 (0.431)	0.0332 (0.443)	-0.00396 (0.457)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	5.363	1.418	0.733	0.0321	0.293	0.291
<i>p</i> -value	0.0206	0.234	0.392	0.858	0.588	0.589
Obs	595	557	519	483	447	412
Countries	34	34	33	33	32	31
<b>Panel B: Non-OECD Economies</b>						
<b>B.1 Linear Specification</b>	-0.111 (0.121)	-0.358 (0.222)	-0.680** (0.329)	-0.679* (0.388)	-0.919** (0.468)	-1.100** (0.503)
<b>B.2 Expansion</b>	0.394 (0.280)	0.217 (0.178)	-0.659 (0.403)	-0.655 (0.409)	-1.292*** (0.481)	-2.144*** (0.723)
<b>B.3 Recession</b>	-0.0446 (0.293)	-0.154 (0.303)	-0.859 (0.598)	-0.673* (0.399)	-1.225* (0.713)	-1.205* (0.716)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	1.799	2.243	0.810	0.233	0.730	0.291
<i>p</i> -value	0.180	0.134	0.368	0.629	0.393	0.589
Obs	266	231	200	170	145	126
Countries	28	27	25	21	18	17

Notes: [Table A.24](#) reports the results of the robustness test in which we control for monetary policy. The multipliers reported are the estimated cumulative output multipliers for OECD and Non-OECD countries when the measure of government ‘expenditure’ is social benefits. See also notes for [Table A.22](#).

Table A.25: Cumulative Government Spending Multipliers for OECD Economies – Controlling for Government Effectiveness

	Horizon (years after the shock)					
	0	1	2	3	4	5
<b>Panel A: Compensation of Government Employees</b>						
<b>A.1 Linear Specification</b>	1.296*** (0.401)	1.300*** (0.364)	1.395*** (0.372)	1.359*** (0.361)	1.245*** (0.390)	1.247*** (0.470)
<b>A.2 Expansion</b>	2.113*** -0.687	1.757*** -0.626	2.016*** -0.535	2.011*** -0.451	1.984*** -0.47	1.986*** -0.624
<b>A.3 Recession</b>	1.901*** (0.547)	2.054*** (0.454)	1.856*** (0.407)	1.362*** (0.400)	1.114** (0.476)	1.418** (0.607)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	0.0008	2.719	0.628	0.129	2.597	0.0425
<i>p</i> -value	0.978	0.0992	0.428	0.720	0.107	0.837
Obs	538	497	459	421	386	350
Countries	34	34	33	33	32	30
<b>Panel B: Expenditure on Goods and Services</b>						
<b>B.1 Linear Specification</b>	0.628 (0.500)	0.713 (0.606)	0.961 (0.644)	0.759 (0.561)	0.575 (0.517)	0.268 (0.446)
<b>B.2 Expansion</b>	0.958** (0.486)	0.972 (0.694)	1.575* (0.904)	1.421 (0.957)	1.204 (1.109)	1.161 (1.153)
<b>B.3 Recession</b>	0.630 (0.664)	0.885 (0.738)	1.141 (0.714)	0.799 (0.524)	0.530 (0.465)	0.108 (0.344)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	1.024	0.244	0.0944	0.0052	0.0825	1.155
<i>p</i> -value	0.312	0.621	0.759	0.943	0.774	0.283
Obs	536	495	457	419	384	348
Countries	34	34	33	33	32	30
<b>Panel C: Government Investment</b>						
<b>C.1 Linear Specification</b>	0.195 (0.140)	0.823*** (0.270)	0.781*** (0.276)	0.736** (0.366)	0.626** (0.317)	0.758** (0.308)
<b>C.2 Expansion</b>	0.314 (0.218)	1.191*** (0.416)	0.943* (0.566)	0.557 (0.601)	0.552 (0.812)	0.825 (0.796)
<b>C.3 Recession</b>	0.433* (0.254)	1.515*** (0.313)	1.418*** (0.330)	1.462*** (0.562)	1.043* (0.554)	1.409** (0.623)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	0.640	1.990	2.097	1.657	0.377	1.099
<i>p</i> -value	0.424	0.158	0.148	0.198	0.539	0.295
Obs	537	494	455	417	381	345
Countries	35	34	33	33	32	30

Notes: Table A.25 reports the results of the robustness test in which we control for government effectiveness. The multipliers reported are the estimated cumulative output multipliers for OECD countries when the measure of government expenditure is the compensation of government employees (panel A), expenditure on goods and services (panel B), and government investment (panel C). The horizon (top row) is in years after the shock. The linear model specification presents the multipliers by estimating (A.1), and the specification in expansion and recessions present multipliers by estimating (A.2). Each panel also reports tests of the null of equality of the multipliers across states of the economy and their associated *p*-values. The sample spans the period 1991-2017. Standard errors (in parentheses) are clustered at the country level, with \*, \*\* and \*\*\* denoting significance at the 10%, 5% and 1% level respectively.

Table A.26: Cumulative Government Spending Multipliers for Non-OECD Economies – Controlling for Government Effectiveness

	Horizon (years after the shock)					
	0	1	2	3	4	5
<b>Panel A: Compensation of Government Employees</b>						
<b>A.1 Linear Specification</b>	0.0475 (0.142)	-0.376 (0.276)	-0.785** (0.349)	-0.583 (0.401)	-0.468 (0.442)	-0.357 (0.460)
<b>A.2 Expansion</b>	0.434** (0.171)	-0.0625 (0.405)	-0.893 (0.566)	-0.665 (0.571)	-0.512 (0.610)	-0.518 (0.826)
<b>A.3 Recession</b>	0.798** (0.331)	0.129 (0.399)	-0.538 (0.519)	-0.0528 (0.490)	0.0140 (0.381)	0.190 (0.375)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	0.551	0.571	0.819	2.158	1.477	1.604
<i>p</i> -value	0.458	0.450	0.366	0.142	0.224	0.205
Obs	417	355	304	261	219	186
Countries	46	43	39	36	32	30
<b>Panel B: Expenditure on Goods and Services</b>						
<b>B.1 Linear Specification</b>	0.0619 (0.118)	0.226 (0.185)	0.252 (0.190)	0.408* (0.225)	0.563* (0.304)	0.793** (0.353)
<b>B.2 Expansion</b>	-0.00534 (0.152)	0.0777 (0.353)	0.126 (0.309)	0.218 (0.343)	0.256 (0.522)	1.013 (0.696)
<b>B.3 Recession</b>	0.0712 (0.224)	0.175 (0.418)	-0.0818 (0.393)	0.150 (0.368)	0.234 (0.445)	1.073* (0.610)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	1.216	0.103	0.498	0.104	0.0241	0.111
<i>p</i> -value	0.270	0.748	0.480	0.747	0.877	0.739
Obs	414	352	300	257	214	182
Countries	46	43	39	36	31	29
<b>Panel C: Government Investment</b>						
<b>C.1 Linear Specification</b>	0.391*** (0.134)	0.375* (0.211)	0.537 (0.490)	0.570 (0.846)	0.447 (1.106)	0.460 (1.311)
<b>C.2 Expansion</b>	0.0182 (0.142)	-0.366* (0.197)	-0.328 (0.947)	-0.991 (1.491)	-1.246 (2.144)	-1.114 (3.114)
<b>C.3 Recession</b>	0.512** (0.257)	0.221 (0.384)	0.508 (0.535)	0.662 (0.954)	0.891 (1.163)	1.449 (0.985)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	4.149	5.165	1.974	3.660	4.325	1.838
<i>p</i> -value	0.0416	0.0230	0.160	0.0557	0.0376	0.175
Obs	399	333	282	240	200	170
Countries	47	43	38	34	29	27

Notes: [Table A.26](#) reports the results of the robustness test in which we control for government effectiveness. The multipliers reported are the estimated cumulative output multipliers for Non-OECD countries when the measure of government expenditure is the compensation of government employees (panel A), expenditure on goods and services (panel B), and government investment (panel C). See also notes for [Table A.25](#).

Table A.27: Cumulative Government Spending Multipliers of Social Benefits – Controlling for Government Effectiveness

	Horizon (years after the shock)					
	0	1	2	3	4	5
<b>Panel A: OECD Economies</b>						
<b>A.1 Linear Specification</b>	-0.207 (0.289)	-0.0479 (0.316)	0.0696 (0.344)	-0.0299 (0.286)	-0.0713 (0.287)	0.00973 (0.305)
<b>A.2 Expansion</b>	0.913** (0.418)	0.730 (0.493)	0.846* (0.497)	0.658 (0.445)	0.374 (0.433)	0.239 (0.444)
<b>A.3 Recession</b>	0.593 (0.470)	0.892* (0.476)	0.855* (0.490)	0.334 (0.396)	0.0771 (0.407)	0.0890 (0.442)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	5.586	1.068	0.504	0.166	0.343	0.0337
<i>p</i> -value	0.0181	0.301	0.478	0.683	0.558	0.854
Obs	515	477	439	403	368	332
Countries	34	34	33	33	32	30
<b>Panel B: Non-OECD Economies</b>						
<b>B.1 Linear Specification</b>	-0.0679 (0.0962)	-0.236* (0.139)	-0.141 (0.303)	-0.166 (0.410)	-0.816* (0.435)	-0.822* (0.437)
<b>B.2 Expansion</b>	0.227 (0.162)	0.0711 (0.159)	0.0588 (0.408)	0.0983 (0.630)	-0.993 (0.653)	-1.219 (0.875)
<b>B.3 Recession</b>	0.0802 (0.166)	-0.0904 (0.251)	-0.0789 (0.438)	0.0145 (0.534)	-0.796 (0.513)	-0.671 (0.479)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	0.674	0.587	0.292	0.0440	0.0326	0.0131
<i>p</i> -value	0.412	0.444	0.589	0.834	0.857	0.909
Obs	392	331	282	239	201	171
Countries	46	42	38	33	29	27

Notes: [Table A.27](#) reports the results of the robustness test in which we control for government effectiveness. The multipliers reported are the estimated cumulative output multipliers for OECD and Non-OECD countries when the measure of government ‘expenditure’ is social benefits. See also notes for [Table A.25](#).

Table A.28: Cumulative Government Spending Multipliers for OECD Economies – All Extra Controls

	Horizon (years after the shock)					
	0	1	2	3	4	5
<b>Panel A: Compensation of Government Employees</b>						
<b>A.1 Linear Specification</b>	1.396*** (0.439)	1.161*** (0.378)	1.091*** (0.389)	0.774** (0.394)	0.483 (0.396)	0.330 (0.486)
<b>A.2 Expansion</b>	2.090*** (0.638)	1.337** (0.641)	1.347** (0.611)	0.805 (0.575)	0.554 (0.595)	0.398 (0.619)
<b>A.3 Recession</b>	1.904*** (0.553)	1.787*** (0.481)	1.417*** (0.484)	0.552 (0.541)	0.143 (0.556)	0.225 (0.733)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	0.0000	2.393	0.614	0.0118	0.618	0.0215
<i>p</i> -value	0.997	0.122	0.433	0.913	0.432	0.883
Obs	529	488	454	416	381	346
Countries	34	34	33	33	32	30
<b>Panel B: Expenditure on Goods and Services</b>						
<b>B.1 Linear Specification</b>	0.622 (0.511)	0.691 (0.607)	0.951 (0.638)	0.712 (0.547)	0.543 (0.498)	0.196 (0.385)
<b>B.2 Expansion</b>	1.042** (0.465)	1.199* (0.627)	1.876** (0.807)	1.700** (0.852)	1.453 (1.003)	1.099 (0.905)
<b>B.3 Recession</b>	0.630 (0.658)	0.845 (0.741)	1.050 (0.730)	0.607 (0.561)	0.329 (0.493)	-0.165 (0.328)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	1.491	0.0066	0.0338	0.518	0.918	2.819
<i>p</i> -value	0.222	0.936	0.854	0.472	0.338	0.0932
Obs	527	486	452	414	379	344
Countries	34	34	33	33	32	30
<b>Panel C: Government Investment</b>						
<b>C.1 Linear Specification</b>	0.251 (0.157)	0.797*** (0.284)	0.735** (0.325)	0.405 (0.490)	0.109 (0.460)	0.0732 (0.413)
<b>C.2 Expansion</b>	0.412 (0.268)	1.074** (0.452)	0.778 (0.622)	-0.252 (0.593)	-0.470 (0.824)	-0.358 (0.836)
<b>C.3 Recession</b>	0.447* (0.254)	1.342*** (0.304)	1.149*** (0.354)	0.846 (0.750)	0.171 (0.719)	0.117 (0.685)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	0.173	1.729	1.244	1.920	0.415	0.391
<i>p</i> -value	0.678	0.189	0.265	0.166	0.520	0.532
Obs	528	485	450	412	376	341
Countries	35	34	33	33	32	30

Notes: [Table A.28](#) reports the estimated cumulative output multipliers for OECD countries when the measure of government expenditure is the compensation of government employees (panel A), expenditure on goods and services (panel B), and government investment (panel C). The horizon (top row) is in years after the shock. The linear model specification presents the multipliers by estimating (A.1), and the specification in expansion and recessions present multipliers by estimating (A.2). Each panel also reports tests of the null of equality of the multipliers across states of the economy and their associated *p*-values. The sample spans the period 1991-2017. Standard errors (in parentheses) are clustered at the country level, with \*, \*\* and \*\*\* denoting significance at the 10%, 5% and 1% level respectively.



Table A.29: Cumulative Government Spending Multipliers for Non-OECD Economies - All Extra Controls

	Horizon (years after the shock)					
	0	1	2	3	4	5
<b>Panel A: Compensation of Government Employees</b>						
<b>A.1 Linear Specification</b>	-0.106 (0.310)	-0.747** (0.380)	-0.829* (0.479)	-1.076* (0.587)	-0.957 (0.713)	-1.199 (0.802)
<b>A.2 Expansion</b>	0.691** (0.350)	-0.467 (0.458)	-0.803 (0.535)	-1.314** (0.658)	-1.356 (0.856)	-2.421** (1.220)
<b>A.3 Recession</b>	1.518** (0.724)	-0.0183 (0.552)	-0.401 (0.508)	-0.864 (0.660)	-1.110 (0.793)	-1.502 (1.104)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	0.936	2.447	1.936	1.447	0.532	0.413
<i>p</i> -value	0.333	0.118	0.164	0.229	0.466	0.520
Obs	225	195	171	149	126	110
Countries	23	22	20	19	16	16
<b>Panel B: Expenditure on Goods and Services</b>						
<b>B.1 Linear Specification</b>	0.267* (0.159)	0.250 (0.261)	0.154 (0.344)	0.144 (0.406)	0.521 (0.386)	0.564 (0.355)
<b>B.2 Expansion</b>	-0.146 (0.180)	-0.229 (0.195)	-0.405 (0.314)	-0.384 (0.398)	-0.147 (0.675)	0.340 (0.676)
<b>B.3 Recession</b>	0.165 (0.211)	-0.0789 (0.280)	0.0335 (0.376)	0.189 (0.456)	0.473 (0.438)	0.564 (0.515)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	4.589	4.951	4.000	1.991	0.695	0.0764
<i>p</i> -value	0.0322	0.0261	0.0455	0.158	0.404	0.782
Obs	225	195	171	149	126	110
Countries	23	22	20	19	16	16
<b>Panel C: Government Investment</b>						
<b>C.1 Linear Specification</b>	0.653*** (0.229)	0.392 (0.327)	0.0636 (0.833)	-0.0278 (1.207)	-0.172 (1.767)	-0.387 (1.751)
<b>C.2 Expansion</b>	-0.0134 (0.231)	-0.445 (0.345)	-1.271 (1.017)	-2.840 (2.281)	-7.499 (10.95)	50.90 (586.0)
<b>C.3 Recession</b>	0.866** (0.419)	0.0656 (0.476)	0.0756 (0.777)	-0.120 (1.097)	0.0815 (1.446)	0.0293 (1.347)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	10.20	2.299	4.087	2.814	1.644	0.276
<i>p</i> -value	0.00141	0.129	0.0432	0.0934	0.200	0.599
Obs	205	173	150	131	111	97
Countries	23	21	18	17	14	14

Notes: Table A.29 reports the estimated cumulative output multipliers for Non-OECD countries when the measure of government expenditure is the compensation of government employees (panel A), expenditure on goods and services (panel B), and government investment (panel C). The horizon (top row) is in years after the shock. The linear model specification presents the multipliers by estimating (A.1), and the specification in expansion and recessions present multipliers by estimating (A.2). Each panel also reports tests of the null of equality of the multipliers across states of the economy and their associated *p*-values. The sample spans the period 1991-2017. Standard errors (in parentheses) are clustered at the country level, with \*, \*\* and \*\*\* denoting significance at the 10%, 5% and 1% level respectively.

Table A.30: Cumulative Government Spending Multipliers of Social Benefits – All Extra Controls

	Horizon (years after the shock)					
	0	1	2	3	4	5
<b>Panel A: OECD Economies</b>						
<b>A.1 Linear Specification</b>	-0.184 (0.289)	-0.119 (0.335)	-0.0679 (0.370)	-0.244 (0.325)	-0.325 (0.340)	-0.210 (0.346)
<b>A.2 Expansion</b>	0.858** (0.397)	0.584 (0.459)	0.656 (0.427)	0.398 (0.387)	0.119 (0.401)	0.0249 (0.424)
<b>A.3 Recession</b>	0.551 (0.496)	0.714 (0.526)	0.619 (0.545)	0.00638 (0.431)	-0.286 (0.435)	-0.226 (0.451)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	5.395	0.565	0.130	0.859	1.667	0.576
<i>p</i> -value	0.0202	0.452	0.719	0.354	0.197	0.448
Obs	507	469	435	399	364	329
Countries	34	34	33	33	32	30
<b>Panel B: Non-OECD Economies</b>						
<b>B.1 Linear Specification</b>	-0.256 (0.239)	-0.170 (0.315)	-0.285 (0.426)	-0.396 (0.503)	-0.682 (0.557)	-0.558 (0.435)
<b>B.2 Expansion</b>	0.240 (0.232)	0.243 (0.296)	-0.244 (0.482)	-0.474 (0.590)	-1.439* (0.868)	-1.982* (1.072)
<b>B.3 Recession</b>	-0.269 (0.237)	0.0947 (0.337)	-0.188 (0.374)	-0.354 (0.413)	-0.795 (0.626)	-0.622* (0.371)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	5.072	0.359	0.0001	0.0124	0.0045	0.341
<i>p</i> -value	0.0243	0.549	0.992	0.911	0.946	0.559
Obs	206	177	155	134	114	100
Countries	23	21	19	17	14	14

Notes: [Table A.30](#) reports the estimated cumulative output multipliers for OECD and Non-OECD countries when the measure of government 'expenditure' is social benefits. See also notes for [Table A.28](#).

Table A.31: Cumulative Government Spending Multipliers for OECD Economies - Sample up to 2007

	Horizon (years after the shock)					
	0	1	2	3	4	5
<b>Panel A: Compensation of Government Employees</b>						
<b>A.1 Linear Specification</b>	-0.0752 (0.197)	-0.264 (0.256)	-0.00922 (0.292)	0.0880 (0.353)	0.348 (0.408)	0.286 (0.294)
<b>A.2 Expansion</b>	0.103 (0.197)	-0.0802 (0.265)	0.284 (0.316)	0.358 (0.424)	0.506 (0.495)	0.304 (0.349)
<b>A.3 Recession</b>	-0.117 (0.273)	-0.802* (0.450)	-0.471 (0.580)	-0.628 (0.865)	0.528 (1.112)	0.961 (1.283)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	0.203	7.621	8.336	5.096	1.368	0.190
$p$ -value	0.653	0.00577	0.00389	0.0240	0.242	0.663
Obs	389	354	318	285	253	220
Countries	31	31	30	30	30	28
<b>Panel B: Expenditure on Goods and Services</b>						
<b>B.1 Linear Specification</b>	0.573*** (0.135)	0.479*** (0.168)	0.672** (0.290)	0.901** (0.379)	0.836** (0.403)	0.800** (0.345)
<b>B.2 Expansion</b>	0.534*** (0.160)	0.591*** (0.217)	0.482 (0.310)	0.596 (0.479)	0.649 (0.398)	0.704** (0.321)
<b>B.3 Recession</b>	1.029*** (0.370)	0.681 (0.496)	0.326 (1.179)	1.165 (1.868)	1.399 (4.018)	6.118 (20.73)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	0.0768	2.184	1.723	0.572	1.163	0.100
$p$ -value	0.782	0.139	0.189	0.450	0.281	0.751
Obs	381	346	310	277	245	212
Countries	31	31	30	30	30	28
<b>Panel C: Government Investment</b>						
<b>C.1 Linear Specification</b>	0.504** (0.206)	0.468 (0.289)	0.505 (0.410)	0.929* (0.492)	1.603*** (0.590)	1.692*** (0.527)
<b>C.2 Expansion</b>	0.583*** (0.194)	0.452 (0.290)	0.520 (0.543)	1.571* (0.814)	2.713*** (1.018)	2.638*** (0.998)
<b>C.3 Recession</b>	0.769* (0.420)	0.416 (0.565)	0.643 (0.754)	1.162 (0.841)	3.862** (1.588)	3.983** (1.760)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	0.0927	0.750	0.244	4.058	0.661	0.881
$p$ -value	0.761	0.387	0.622	0.0440	0.416	0.348
Obs	388	351	313	278	244	208
Countries	32	32	31	31	31	28

Notes: Table A.31 reports the estimated cumulative output multipliers for OECD countries when the measure of government expenditure is the compensation of government employees (panel A), expenditure on goods and services (panel B), and government investment (panel C). The horizon (top row) is in years after the shock. The linear model specification presents the multipliers by estimating (A.1), and the specification in expansion and recessions present multipliers by estimating (A.2). Each panel also reports tests of the null of equality of the multipliers across states of the economy and their associated  $p$ -values. The sample spans the period 1991-2017. Standard errors (in parentheses) are clustered at the country level, with \*, \*\* and \*\*\* denoting significance at the 10%, 5% and 1% level respectively.

Table A.32: Cumulative Government Spending Multipliers for Non-OECD Economies - Robustness: Sample up to 2007

	Horizon (years after the shock)					
	0	1	2	3	4	5
<b>Panel A: Compensation of Government Employees</b>						
<b>A.1 Linear Specification</b>	0.345 (0.263)	0.241 (0.336)	0.179 (0.338)	0.321 (0.258)	0.310 (0.203)	0.0989 (0.227)
<b>A.2 Expansion</b>	-0.0280 (0.312)	-0.445 (0.484)	-0.970* (0.515)	-0.800 (0.690)	-0.214 (0.865)	-0.966** (0.405)
<b>A.3 Recession</b>	0.400 (0.289)	-0.301 (0.305)	-0.641** (0.296)	-0.317 (0.341)	-0.0359 (0.343)	-0.559 (0.383)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	2.983	0.285	0.631	1.476	0.0598	0.449
$p$ -value	0.0841	0.593	0.427	0.224	0.807	0.503
Obs	202	168	138	105	88	73
Countries	29	27	24	15	13	11
<b>Panel B: Expenditure on Goods and Services</b>						
<b>B.1 Linear Specification</b>	-0.157 (0.180)	-0.298 (0.276)	-0.00794 (0.437)	-0.118 (0.605)	-0.0474 (0.600)	0.333 (0.586)
<b>B.2 Expansion</b>	-0.229 (0.195)	-0.556 (0.383)	-0.155 (0.647)	-0.672 (1.214)	-0.631 (0.992)	0.137 (0.997)
<b>B.3 Recession</b>	-0.246 (0.178)	-0.429 (0.319)	-0.149 (0.503)	-0.485 (0.647)	-0.781 (0.810)	-0.732 (1.038)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	0.437	0.450	0.0000416	0.0774	0.00241	0.799
$p$ -value	0.508	0.503	0.995	0.781	0.961	0.371
Obs	197	162	131	98	80	66
Countries	29	27	24	15	12	10
<b>Panel C: Government Investment</b>						
<b>C.1 Linear Specification</b>	0.242** (0.0964)	0.0304 (0.171)	-0.186 (0.218)	-2.803 (10.04)	0.323 (0.349)	0.704*** (0.231)
<b>C.2 Expansion</b>	0.117 (0.141)	-0.274 (0.315)	-0.513* (0.280)	-9.268 (19.66)	-0.292 (0.677)	-0.107 (0.765)
<b>C.3 Recession</b>	0.297 (0.214)	-0.606 (0.480)	-1.030 (0.646)	-44.68 (3041.0)	0.343 (0.873)	0.726 (0.849)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	1.099	1.258	0.145	0.000857	0.560	0.389
$p$ -value	0.294	0.262	0.704	0.977	0.454	0.533
Obs	186	151	123	93	76	64
Countries	28	25	22	14	11	10

Notes: [Table A.32](#) reports the estimated cumulative output multipliers for Non-OECD countries when the measure of government expenditure is the compensation of government employees (panel A), expenditure on goods and services (panel B), and government investment (panel C). The horizon (top row) is in years after the shock. The linear model specification presents the multipliers by estimating (A.1), and the specification in expansion and recessions present multipliers by estimating (A.2). Each panel also reports tests of the null of equality of the multipliers across states of the economy and their associated  $p$ -values. The sample spans the period 1991-2017. Standard errors (in parentheses) are clustered at the country level, with \*, \*\* and \*\*\* denoting significance at the 10%, 5% and 1% level respectively.

Table A.33: Cumulative Government Spending Multipliers of Social Benefits – Sample up to 2007

	<b>Horizon (years after the shock)</b>					
	0	1	2	3	4	5
<b>Panel A: OECD Economies</b>						
<b>A.1 Linear Specification</b>	-0.0879 (0.184)	0.0766 (0.257)	0.116 (0.246)	0.211 (0.305)	0.566 (0.364)	0.727** (0.344)
<b>A.2 Expansion</b>	0.0755 (0.228)	0.227 (0.336)	0.462 (0.339)	0.739 (0.454)	1.109** (0.546)	0.638 (0.442)
<b>A.3 Recession</b>	0.569 (0.355)	0.610 (0.492)	0.723 (0.479)	0.483 (0.569)	0.749 (0.730)	0.899 (0.797)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	3.775	2.684	0.204	1.329	0.584	0.00868
<i>p</i> -value	0.0520	0.101	0.651	0.249	0.445	0.926
Obs	314	283	251	221	191	159
Countries	31	31	30	30	29	26
<b>Panel B: Non-OECD Economies</b>						
<b>B.1 Linear Specification</b>	-0.0541 (0.122)	-0.214 (0.281)	-0.292 (0.342)	0.0543 (0.422)	0.331 (0.859)	0.464 (0.860)
<b>B.2 Expansion</b>	0.0731 (0.212)	-0.152 (0.526)	-1.173 (1.124)	0.275 (0.806)	1.386 (1.387)	0.218 (1.119)
<b>B.3 Recession</b>	-0.0497 (0.339)	-0.676 (0.817)	-0.624 (0.659)	0.664 (0.741)	1.617 (1.977)	-1.667 (1.755)
<b>Tests of Equality of Multipliers</b>						
$\chi^2(1)$	1.050	1.251	0.444	0.445	0.178	0.00447
<i>p</i> -value	0.305	0.263	0.505	0.505	0.673	0.947
Obs	166	134	104	68	54	42
Countries	28	27	24	12	10	8

Notes: [Table A.33](#) reports the estimated cumulative output multipliers for OECD and Non-OECD countries when the measure of government ‘expenditure’ is social benefits. See also notes for [Table A.31](#).

Table A.34: Cumulative Government Spending Multipliers for OECD Economies – Up to and from 2008 Onward

	Horizon (years after the shock)					
	0	1	2	3	4	5
<b>Panel A: Compensation of Government Employees</b>						
A.1 Linear up to 2007	-0.0518 (0.197)	-0.246 (0.240)	-0.00270 (0.296)	0.286 (0.327)	0.567* (0.341)	0.847** (0.353)
A.2 Linear After 2007	1.798*** (0.524)	2.016*** (0.404)	2.882*** (0.570)	3.723*** (0.867)	4.359*** (1.485)	7.896 (6.755)
Tests of Equality of Multipliers						
$\chi^2(1)$	3.605	25.85	22.10	14.96	7.121	1.747
<i>p</i> -value	0.0576	0.0000	0.0000	0.0001	0.0076	0.186
A.3 Expansion up to 2007	0.217 (0.212)	0.0201 (0.232)	0.337 (0.320)	0.618 (0.401)	0.790* (0.458)	0.940* (0.515)
A.4 Expansion After 2007	5.126*** (1.212)	8.028*** (1.982)	9.755*** (2.817)	10.10** (4.637)	9.958 (6.295)	5.870 (7.701)
Tests of Equality of Multipliers						
$\chi^2(1)$	7.288	4.454	1.826	0.603	0.916	0.0606
<i>p</i> -value	0.0069	0.0348	0.177	0.437	0.338	0.805
A.5 Recession up to 2007	0.152 (0.372)	-0.402 (0.501)	-0.207 (0.688)	0.257 (0.751)	1.193 (0.791)	2.546*** (0.967)
A.6 Recession After 2007	1.906*** (0.536)	4.430*** (0.744)	6.470*** (1.127)	7.468*** (1.681)	7.096* (3.677)	11.48 (9.770)
Tests of Equality of Multipliers						
$\chi^2(1)$	4.394	22.65	24.80	30.75	3.704	1.641
<i>p</i> -value	0.0361	0.0000	0.0000	0.0000	0.0543	0.200
<b>Tests of Equality of Multipliers (Expansion vs Recession)</b>						
Up to 2007						
$\chi^2(1)$	0.310	2.551	4.405	4.373	0.409	2.204
<i>p</i> -value	0.578	0.110	0.0358	0.0365	0.523	0.138
After 2007						
$\chi^2(1)$	2.293	0.00921	0.668	1.066	0.219	0.898
<i>p</i> -value	0.130	0.924	0.414	0.302	0.640	0.343
Obs	674	632	590	551	512	476
Countries	34	34	33	33	32	31

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Table A.34 – continued

	<b>Horizon (years after the shock)</b>					
	0	1	2	3	4	5
<b>Panel B: Expenditure on Goods and Services</b>						
B1. Linear up to 2007	0.482*** (0.126)	0.401** (0.160)	0.329 (0.247)	0.281 (0.284)	0.222 (0.312)	0.238 (0.310)
B.2 Linear After 2007	0.587 (0.563)	0.936 (0.648)	1.887* (0.969)	2.271** (1.096)	1.957 (1.326)	0.858 (1.275)
Tests of Equality of Multipliers						
$\chi^2(1)$	4.650	0.761	2.803	3.701	2.169	0.266
<i>p</i> -value	0.0311	0.383	0.0941	0.0544	0.141	0.606
B.3 Expansion up to 2007	0.477*** (0.142)	0.499** (0.226)	0.304 (0.292)	0.216 (0.353)	0.142 (0.367)	0.111 (0.339)
B.4 Expansion After 2007	1.417 (1.298)	4.777 (4.238)	11.52** (5.448)	12.46 (8.289)	11.62 (15.59)	5.927 (8.077)
Tests of Equality of Multipliers						
$\chi^2(1)$	0.0275	0.391	0.296	0.315	0.495	0.0852
<i>p</i> -value	0.868	0.532	0.586	0.575	0.482	0.770
B.5 Recession up to 2007	1.026** (0.399)	0.808 (0.534)	-0.182 (0.784)	-0.286 (0.903)	-0.567 (1.068)	0.317 (0.853)
B.6 Recession After 2007	0.740 (0.714)	2.650* (1.518)	4.967** (2.152)	5.351** (2.348)	4.776 (3.167)	1.480 (2.267)
Tests of Equality of Multipliers						
$\chi^2(1)$	0.0006	2.661	5.649	5.667	4.915	0.0793
<i>p</i> -value	0.980	0.103	0.0175	0.0173	0.0266	0.778
<b>Tests of Equality of Multipliers (Expansion vs Recession)</b>						
Up to 2007						
$\chi^2(1)$	0.439	0.185	4.171	2.782	2.645	0.0016
<i>p</i> -value	0.508	0.667	0.0411	0.0953	0.104	0.968
After 2007						
$\chi^2(1)$	0.104	0.716	0.735	0.873	0.844	0.0227
<i>p</i> -value	0.747	0.397	0.391	0.350	0.358	0.880
Obs	666	624	582	543	504	468
Countries	34	34	33	33	32	31

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Table A.34 – continued

	<b>Horizon (years after the shock)</b>					
	0	1	2	3	4	5
<b>Panel C: Government Investment</b>						
C.1 Linear up to 2007	0.487** (0.210)	0.506* (0.286)	0.500* (0.300)	0.436 (0.302)	0.536 (0.334)	0.772** (0.368)
C.2 Linear After 2007	0.117 (0.213)	1.392*** (0.329)	2.363*** (0.573)	5.935* (3.250)	59.41 (368.6)	98.84 (874.8)
Tests of Equality of Multipliers						
$\chi^2(1)$	4.716	4.241	7.652	3.079	0.0326	0.0107
<i>p</i> -value	0.0299	0.0395	0.0057	0.0793	0.857	0.918
C.3 Expansion up to 2007	0.639*** (0.224)	0.698** (0.319)	0.665* (0.381)	0.539 (0.427)	0.581 (0.436)	0.812* (0.444)
C.4 Expansion After 2007	-0.213 (0.228)	13.00** (6.324)	51.64 (73.17)	49.45 (70.92)	-17.61 (12.95)	-24.67 (24.55)
Tests of Equality of Multipliers						
$\chi^2(1)$	5.947	1.224	0.215	0.444	2.008	0.0719
<i>p</i> -value	0.0147	0.269	0.643	0.505	0.156	0.789
C.5 Recession up to 2007	0.712 (0.498)	0.433 (0.650)	0.442 (0.680)	0.706 (0.747)	2.024* (1.112)	3.573** (1.568)
C.6 Recession After 2007	0.217 (0.313)	3.907*** (0.940)	7.742*** (2.155)	26.17 (17.56)	16.01 (18.89)	11.48 (8.929)
Tests of Equality of Multipliers						
$\chi^2(1)$	1.324	0.904	0.0796	1.202	0.455	2.034
<i>p</i> -value	0.250	0.342	0.778	0.273	0.500	0.154
<b>Tests of Equality of Multipliers (Expansion vs Recession)</b>						
Up to 2007						
$\chi^2(1)$	0.816	2.099	0.855	0.472	1.105	0.903
<i>p</i> -value	0.366	0.147	0.355	0.492	0.293	0.342
After 2007						
$\chi^2(1)$	2.169	0.826	0.176	0.124	1.893	0.491
<i>p</i> -value	0.141	0.363	0.675	0.724	0.169	0.484
Obs	673	629	585	544	503	464
Countries	35	35	34	34	33	31

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Table A.34 – continued

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Notes: Table A.34 reports the estimated cumulative output multipliers for OECD countries when the measure of government expenditure is the compensation of government employees (panel A), expenditure on goods and services (panel B), and government investment (panel C). In this extension we test whether multipliers differ between the periods up to 2007 and from 2008 onward. The horizon (top row) is in years after the shock. The linear model specification presents the multipliers by estimating (A.1), and the specification in expansion and recessions present multipliers by estimating (A.2). Each panel also reports tests of the null of equality of the multipliers and their associated  $p$ -values across states of the economy, as well as up to 2007 and from 2008 onward for each state. The sample spans the period 1991-2017. Standard errors (in parentheses) are clustered at the country level, with \*, \*\* and \*\*\* denoting significance at the 10%, 5% and 1% level respectively.

Table A.35: Cumulative Government Spending Multipliers for Non-OECD Economies – Up to 2007 and from 2008 onward

	<b>Horizon (years after the shock)</b>					
	0	1	2	3	4	5
<b>Panel A: Compensation of Government Employees</b>						
A.1 Linear up to 2007	0.311 (0.216)	0.0829 (0.339)	0.0594 (0.504)	0.196 (0.526)	0.191 (0.503)	0.406 (0.428)
A.2 Linear After 2007	0.177 (0.218)	0.136 (0.370)	-0.230 (1.047)	0.961 (1.859)	3.664 (3.866)	5.216 (8.252)
Tests of Equality of Multipliers						
$\chi^2(1)$	1.463	0.0460	0.107	0.235	0.918	0.463
<i>p</i> -value	0.227	0.830	0.743	0.628	0.338	0.496
A.3 Expansion up to 2007	0.337 (0.312)	0.0320 (0.476)	-0.182 (0.805)	-0.283 (0.850)	-0.357 (0.860)	0.249 (0.771)
A.4 Expansion After 2007	0.704** (0.278)	4.231 (3.143)	2.324 (7.942)	17.49 (56.18)	-6.995 (9.351)	0.226 (3.087)
Tests of Equality of Multipliers						
$\chi^2(1)$	0.0763	1.137	0.0055	0.0283	0.277	1.068
<i>p</i> -value	0.782	0.286	0.941	0.866	0.599	0.301
A.5 Recession up to 2007	0.417 (0.321)	-0.389 (0.350)	-0.599 (0.499)	-0.479 (0.605)	-0.320 (0.500)	-0.0448 (0.549)
A.6 Recession After 2007	0.767* (0.426)	1.468 (1.325)	1.372 (3.325)	3.252* (1.898)	3.596 (2.331)	4.606** (2.098)
Tests of Equality of Multipliers						
$\chi^2(1)$	0.139	0.136	0.412	0.00130	1.259	1.796
<i>p</i> -value	0.709	0.713	0.521	0.971	0.262	0.180
<b>Tests of Equality of Multipliers (Expansion vs Recession)</b>						
Up to 2007						
$\chi^2(1)$	0.0689	1.332	0.688	0.0189	0.0262	0.166
<i>p</i> -value	0.793	0.248	0.407	0.891	0.871	0.684
After 2007						
$\chi^2(1)$	0.148	0.859	0.0063	0.0187	0.809	0.0283
<i>p</i> -value	0.701	0.354	0.937	0.891	0.368	0.866
Obs	487	421	365	317	274	238
Countries	48	45	41	37	34	32

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Table A.35 – continued

	<b>Horizon (years after the shock)</b>					
	0	1	2	3	4	5
<b>Panel B: Expenditure on Goods and Services</b>						
B1. Linear up to 2007	-0.183	-0.259	-0.165	-0.0969	-0.0234	0.0969
	-0.137	-0.236	-0.347	-0.407	-0.5	-0.54
B.2 Linear After 2007	0.195	0.867***	1.417***	2.364***	4.670***	3.904***
	(0.199)	(0.235)	(0.476)	(0.687)	(1.759)	(1.286)
Tests of Equality of Multipliers						
$\chi^2(1)$	0.0336	9.304	3.532	4.303	3.471	3.018
<i>p</i> -value	0.855	0.0023	0.0602	0.0380	0.0625	0.0824
B.3 Expansion up to 2007	-0.282	-0.478	-0.221	0.0409	0.358	0.791
	(0.191)	(0.333)	(0.451)	(0.500)	(0.593)	(0.657)
B.4 Expansion After 2007	0.231	2.348	2.825*	-46.10	-8.042	16.48
	(0.177)	(1.469)	(1.678)	(195.4)	(16.69)	(11.01)
Tests of Equality of Multipliers						
$\chi^2(1)$	0.0175	0.0132	0.0006	0.263	0.585	0.561
<i>p</i> -value	0.895	0.909	0.981	0.608	0.444	0.454
B.5 Recession up to 2007	-0.344*	-0.455*	-0.370	-0.238	-0.154	-0.0812
	(0.177)	(0.247)	(0.355)	(0.401)	(0.512)	(0.546)
B.6 Recession After 2007	0.760**	3.412**	4.977**	8.906***	8.708***	10.53***
	(0.352)	(1.681)	(2.296)	(3.224)	(3.165)	(3.863)
Tests of Equality of Multipliers						
$\chi^2(1)$	3.521	3.826	3.162	1.017	5.122	3.296
<i>p</i> -value	0.0606	0.0505	0.0754	0.313	0.0236	0.0695
<b>Tests of Equality of Multipliers (Expansion vs Recession)</b>						
Up to 2007						
$\chi^2(1)$	0.742	0.487	0.241	0.658	0.888	2.373
<i>p</i> -value	0.389	0.485	0.624	0.417	0.346	0.123
After 2007						
$\chi^2(1)$	1.021	1.431	1.349	0.411	2.554	0.999
<i>p</i> -value	0.312	0.232	0.245	0.521	0.110	0.318
Obs	482	415	358	310	266	231
Countries	48	45	41	37	33	31

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Table A.35 – continued

	<b>Horizon (years after the shock)</b>					
	0	1	2	3	4	5
<b>Panel C: Government Investment</b>						
C.1 Linear up to 2007	0.257*** (0.0943)	0.287* (0.166)	0.226 (0.287)	0.435 (0.832)	0.199 (0.703)	0.273 (0.622)
C.2 Linear After 2007	0.581*** (0.208)	0.772*** (0.291)	2.581*** (0.845)	6.686 (5.562)	5.957 (11.01)	-15.49 (76.18)
Tests of Equality of Multipliers						
$\chi^2(1)$	10.86	3.106	6.518	0.651	0.339	0.0311
<i>p</i> -value	0.0010	0.0780	0.0107	0.420	0.560	0.860
C.3 Expansion up to 2007	0.251* (0.146)	0.183 (0.206)	-0.0163 (0.358)	-0.338 (1.112)	-0.917 (1.326)	-1.458 (1.261)
C.4 Expansion After 2007	-0.0701 (0.212)	-0.721 (0.912)	-4.217 (37.77)	5.023 (27.98)	-3.085 (7.939)	-8.405 (41.28)
Tests of Equality of Multipliers						
$\chi^2(1)$	2.575	4.088	0.0020	0.306	0.0060	0.0614
<i>p</i> -value	0.109	0.0432	0.964	0.580	0.938	0.804
C.5 Recession up to 2007	0.504** (0.208)	0.0482 (0.382)	-0.450 (0.398)	-0.906 (1.666)	-0.374 (0.757)	-0.207 (0.860)
C.6 Recession After 2007	0.560* (0.306)	2.132 (1.578)	47.00 (320.1)	11.07 (18.93)	253.9 (7929.9)	9.782 (16.44)
Tests of Equality of Multipliers						
$\chi^2(1)$	0.480	4.083	0.0065	0.0167	0.0081	0.0244
<i>p</i> -value	0.488	0.0433	0.936	0.897	0.928	0.876
<b>Tests of Equality of Multipliers (Expansion vs Recession)</b>						
Up to 2007						
$\chi^2(1)$	2.582	0.567	0.0120	0.0962	0.0001	0.465
<i>p</i> -value	0.108	0.451	0.913	0.756	0.991	0.495
After 2007						
$\chi^2(1)$	9.809	4.019	0.0054	0.128	0.0072	0.0745
<i>p</i> -value	0.0017	0.0450	0.942	0.720	0.932	0.785
Obs	462	393	337	292	251	218
Countries	49	45	39	35	31	29

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Table A.35 – continued

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Notes: **Table A.35** reports the estimated cumulative output multipliers for Non-OECD countries when the measure of government expenditure is the compensation of government employees (panel A), expenditure on goods and services (panel B), and government investment (panel C). In this extension we test whether multipliers differ in the periods up to and after 2007. The horizon (top row) is in years after the shock. The linear model specification presents the multipliers by estimating (A.1), and the specification in expansion and recessions present multipliers by estimating (A.2). Each panel also reports tests of the null of equality of the multipliers and their associated  $p$ -values across states of the economy, as well as up to 2007 and from 2008 onward for each state. The sample spans the period 1991-2017. Standard errors (in parentheses) are clustered at the country level, with \*, \*\* and \*\*\* denoting significance at the 10%, 5% and 1% level respectively.

Table A.36: Cumulative Government Spending Multipliers of Social Benefits – Up to 2007 and from 2008 Onward

	Horizon (years after the shock)					
	0	1	2	3	4	5
<b>Panel A: OECD Economies</b>						
A.1 Linear Before 2007	-0.149 (0.145)	-0.0755 (0.190)	0.0466 (0.251)	0.134 (0.265)	0.202 (0.236)	0.414* (0.221)
A.2 Linear After 2007	0.0859 (0.375)	0.513 (0.388)	0.903 (0.631)	0.617 (0.681)	0.0714 (0.805)	-0.593 (1.248)
Tests of Equality of Multipliers						
$\chi^2(1)$	0.0168	2.803	2.330	0.737	0.0299	0.667
<i>p</i> -value	0.897	0.0941	0.127	0.391	0.863	0.414
A.3 Expansion Before 2007	0.107 (0.210)	0.204 (0.292)	0.458 (0.414)	0.567 (0.443)	0.513 (0.403)	0.573 (0.366)
A.4 Expansion After 2007	3.047*** (1.000)	4.935*** (1.574)	7.116*** (2.316)	5.993*** (2.307)	5.100* (2.638)	3.630 (3.910)
Tests of Equality of Multipliers						
$\chi^2(1)$	11.71	5.378	4.037	3.476	2.472	1.330
<i>p</i> -value	0.0006	0.0204	0.0445	0.0623	0.116	0.249
A.5 Recession Before 2007	0.924*** (0.348)	0.821* (0.488)	0.686 (0.566)	0.536 (0.556)	0.602 (0.581)	1.062* (0.606)
A.6 Recession After 2007	0.731 (0.522)	2.158** (0.948)	3.003** (1.494)	1.616 (1.570)	0.260 (2.176)	-0.776 (2.694)
Tests of Equality of Multipliers						
$\chi^2(1)$	10.07	0.0578	1.730	0.567	0.0119	0.207
<i>p</i> -value	0.0015	0.810	0.188	0.451	0.913	0.649
<b>Tests of Equality of Multipliers (Expansion vs Recession)</b>						
Before 2007						
$\chi^2(1)$	9.928	3.672	0.318	0.108	0.0227	0.230
<i>p</i> -value	0.0016	0.0553	0.573	0.743	0.880	0.631
After 2007						
$\chi^2(1)$	7.798	0.501	0.423	1.138	1.036	0.749
<i>p</i> -value	0.0052	0.479	0.515	0.286	0.309	0.387
Obs	599	561	523	487	451	416
Countries	34	34	33	33	32	31

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Table A.36 – continued

	<b>Horizon (years after the shock)</b>					
	0	1	2	3	4	5
<b>Panel B: Non-OECD economies</b>						
B1. Linear Before 2007	-0.0218	0.000167	0.0143	0.351	0.191	-0.242
	-0.105	-0.143	-0.235	-0.347	-0.548	-0.579
B.2 Linear After 2007	0.0479	-0.125	0.252	0.0941	-0.356	-0.217
	(0.125)	(0.216)	(0.611)	(1.285)	(1.466)	(1.569)
Tests of Equality of Multipliers						
$\chi^2(1)$	0.0345	0.239	0.158	0.0004	0.0367	0.0919
<i>p</i> -value	0.853	0.625	0.691	0.983	0.848	0.762
B.3 Expansion Before 2007	0.161	0.183	0.268	0.912	0.373	-0.326
	(0.187)	(0.219)	(0.397)	(0.698)	(0.806)	(0.927)
B.4 Expansion After 2007	0.623**	1.306	3.567	3.601	0.784	11.88
	(0.246)	(1.261)	(2.744)	(4.796)	(4.822)	(41.60)
Tests of Equality of Multipliers						
$\chi^2(1)$	0.558	3.911	2.384	0.150	0.188	0.820
<i>p</i> -value	0.455	0.0480	0.123	0.698	0.665	0.365
B.5 Recession Before 2007	-0.0611	-0.0191	0.113	0.971*	2.177*	0.963
	(0.228)	(0.310)	(0.471)	(0.561)	(1.203)	(1.091)
B.6 Recession After 2007	0.226	-0.356	0.103	-0.991	-3.777	-2.741
	(0.176)	(0.930)	(1.848)	(1.634)	(2.956)	(2.248)
Tests of Equality of Multipliers						
$\chi^2(1)$	0.0232	1.684	0.889	0.187	0.258	0.341
<i>p</i> -value	0.879	0.194	0.346	0.666	0.611	0.559
<b>Tests of Equality of Multipliers (Expansion vs Recession)</b>						
Before 2007						
$\chi^2(1)$	1.411	1.561	1.281	0.0304	0.869	1.149
<i>p</i> -value	0.235	0.211	0.258	0.862	0.351	0.284
After 2007						
$\chi^2(1)$	2.380	7.337	2.328	0.161	0.192	0.789
<i>p</i> -value	0.123	0.00676	0.127	0.689	0.661	0.374
Obs	446	382	327	277	238	205
Countries	48	45	41	34	31	29

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Table A.36 – continued

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Notes: Table A.36 reports the estimated cumulative output multipliers for OECD (Panel A) and Non-OECD (Panel B) countries when the measure of government expenditure is social benefits. In this extension we test whether multipliers differ between the periods of up to 2007 and from 2008 onward. The horizon (top row) is in years after the shock. The linear model specification presents the multipliers by estimating (A.1), and the specification in expansion and recessions present multipliers by estimating (A.2). Each panel also reports tests of the null of equality of the multipliers and their associated  $p$ -values across states of the economy, as well as up to 2007 and from 2008 onwards for each state. The sample spans the period 1991-2017. Standard errors (in parentheses) are clustered at the country level, with \*, \*\* and \*\*\* denoting significance at the 10%, 5% and 1% level respectively.



## B Data Sources

Table B.1: Data Sources and Definitions - Robustness Tests

Variable	Definition	Source
Crisis Dummy	Dummy that =1 when there is a debt, currency, or banking crisis and =0 otherwise	<a href="#">Laeven &amp; Valencia (2018)</a>
Institutions	Indexes that reflect Government Stability, Corruption, and Law and Order	International Country Risk Guide 2017, Published by The PRS Group, TABLE 3B: Researcher's Dataset
Openness	Total trade (% of GDP)	World Bank: World Development Indicators
Peg Dummy	Dummy that =1 when the exchange rate is pegged, and =0 otherwise	<a href="#">Ilzetzki et al. (2017)</a> , Categories 1-8 are defined as peg, Category 14 is defined as missing.
Commodity Production	Sum of: Agricultural raw materials exports + Food exports + Fuel exports + Ores and metals exports, expressed as % of GDP	World Bank: World Development Indicators
Interest Rate	Money Market, Percent per annum (Code: FIMM_PA) or Monetary Policy-Related Interest Rate, Percent per annum (Code: FPOLM_PA) or Short-Term Interest Rate, Percent per annum	IMF: International Financial Statistics (IFS), IMF: International Financial Statistics (IFS), OECD: Main Economic Indicators
Government Effectiveness	Index that reflects perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.	The Worldwide Governance Indicators, 2018 Update

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