How Big (Small?) Are Fiscal Multipliers*

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Abstract

The effect of fiscal policy on economic performance has been intensely debated in recent years. We contribute to this discussion by showing that the impact of a shock to government expenditures depends crucially on the economic context. We present a novel quarterly data set of government expenditure in 44 countries. Using these new data, we find that government consumption has a smaller short-run effect on output and a less persistent one in developing than in high-income countries. The short-run effect of government consumption shocks is small on impact, but the long run fiscal multiplier varies considerably. In economies closed to trade or operating under fixed exchange rates we find a substantial long-run effect of government consumption on GDP. In contrast, in economies open to trade or operating under flexible exchange rates, a fiscal expansion leads to no significant output gains. Further, fiscal stimulus may be counterproductive in highly-indebted countries; in developing countries with debt levels as low as 50% of GDP, government consumption shocks may have strong negative effects on output.

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As fiscal stimulus packages were hastily put together around the world last spring, one could not have been blamed for thinking that there must be some broad agreement in the profession regarding the size of the fiscal multipliers. Far from it. In a January 2009 Wall Street Journal op-ed piece, Robert Barro argued that peacetime fiscal multipliers are essentially zero. At the other extreme, Christina Romer, Chair of President Obama’s Council of Economic Advisers, used multipliers as high as 1.6 in estimating the job gains that will be generated by the $787 billion stimulus package approved by Congress last February. The difference between Romer’s and Barro’s views of the world amounts to a staggering 3.7 million jobs by the end of 2010.

If anything, the uncertainty regarding the size of fiscal multipliers in developing and emerging markets is even greater. Data is more scarce and often of dubious quality. A history of fiscal profligacy and spotty debt repayments calls into question the sustainability of any fiscal expansion. How does this financial fragility affect the size of fiscal multipliers? Does the exchange regime matter? What about the degree of openness? There is currently little empirical evidence to inform these critical policy questions.

A big hurdle in obtaining precise estimates of fiscal multipliers has been data availability. Most studies have relied on annual data, which makes it difficult to obtain precise estimates. To address this shortcoming, we have put together a novel quarterly dataset for 44 countries (20 high-income and 24 developing). The coverage, which varies across countries, spans from as early as 1960:1 to as late as 2007:4. We have gone to great lengths to ensure that only data originally collected on a quarterly basis is included (as opposed to interpolated based on annual data). Using this unique database, we have estimated fiscal multipliers for different groups of countries in our sample.

The paper’s main results may be summarized as follows

- In developing countries, the response of output to increases in government consumption is negative on impact. It is smaller by a statistically significant margin from both zero and the same response in high income countries. The response is also considerably less persistent than in high income countries. In contrast to high income countries, where output responds positively to government expenditure shocks, output’s response to a government spending shock in developing countries becomes negative in the medium run (after approximately three years).
• The degree of *exchange rate flexibility* is a critical determinant of the size of fiscal multipliers. Economies operating under predetermined exchange rate regimes have long-run multipliers are larger than one in some specifications, but economies with flexible exchange rate regimes have essentially zero multipliers. The fiscal multiplier in countries with predetermined exchange rates is statistically different from zero and from the multiplier in countries with flexible exchange arrangements at almost any forecast horizon.

• The degree of *openness to trade* (measured as exports plus imports as a proportion of GDP) is another critical determinant. Relatively closed economies have long-run multipliers of around 1.6, but relatively open economies have very small or zero multipliers. In closed economies the multiplier is statistically different from zero and from the multiplier in open economies at any forecast horizon. The multiplier in open economies is negative and significantly lower than zero in a statistical sense on impact. It is not distinguishable from zero in longer horizons.

• In developing countries with relatively high levels of debt (comprising more than 50 percent of gross domestic product), the fiscal multiplier is negative on impact and may be very negative in the long run.

• We do not find that the multiplier on government investment is significantly higher than that of government consumption in a statistical sense in most country groupings. An exception is in developing countries, where the multiplier on government investment is positive, close to 1 in the medium term, and statistically different from the multiplier on government consumption at forecast horizons of up to two years. This indicates that the composition of expenditure may play an important role in assessing the effect of fiscal stimulus in developing countries. Our point estimate of the fiscal multiplier on government investment is larger than that of government consumption in high-income countries as well, but this difference is not statistically significant.
1 Methodology

1.1 Identification of Fiscal Shocks

In addition to the existing debate on the size of the fiscal multipliers, there is substantial disagreement in the profession regarding how one should go about identifying fiscal shocks. This identification problem arises because there are two possible directions of causation: (i) government spending could affect output or (ii) output could affect government spending (through, say, automatic stabilizers and implicit or explicit policy rules). How can we make sure that we are isolating the first channel and not the second?

There have been two main approaches to addressing this identification problem: (i) the Structural Vector Autoregression approach (SVAR), first used for the study of fiscal policy by Blanchard and Perotti (2002) and (ii) the “natural experiment” of large military buildups first suggested by Barro (1981) and further developed by Ramey and Shapiro (1998). Rather than using military buildups per se to identify fiscal shocks, Ramey and Shapiro (1998) use news of impending military buildups (through reporting in Business Week) as the shock variable.

The basic assumption behind the SVAR approach is that fiscal policy requires some time (which is assumed to be at least one-quarter) to respond to news about the state of the economy. After using a VAR to eliminate predictable responses of the two variables to one another, it is assumed that any remaining correlation between the unpredicted components of government spending and output is due to the impact of government spending on output. The possible objection is that these identified shocks, while unpredicted by the econometrician, may have been known to private agents.

The natural experiment approach relies on the fact that it is very unlikely that military buildups may be caused by the state of the business cycle, and thus are truly exogenous fiscal shocks. The objections to this approach are (i) military buildups occur during or in advance of wars, which might have a macroeconomic impact of their own and (ii) in the United States, two military buildups (WWII and the Korean war) dwarf all other military spending, so that in practice, this instrument may be viewed as consisting of only two observations (see Hall (2009)).

The existing range of estimates in the SVAR literature varies considerably, in the few
OECD countries that have been studied so far. Specifically, Blanchard and Perotti (2002) find a multiplier of close to 1 in the United States for government purchases. Perotti (2004a, 2007), however, shows that estimates vary greatly across (five OECD) countries and across time, with a range of -2.3 to 3.7. Other estimates for the United States—using slight variations of the standard SVAR identifying assumption—yield values of 0.65 on impact but -1 in the long run (Mountford and Uhlig (2008)) and larger than one (Fatas and Mihov (2001)).

In the “natural experiment” literature, Ramey (2009) recently extended and refined the Ramey and Shapiro (1998) study using richer narrative data on news of military buildups and finds a multiplier of close to 1. She also shows that SVAR shocks are predicted by professional forecasts and Granger-caused by military buildups, a critique of the SVAR approach. Using a similar approach, Barro and Redlick (2009) find multipliers on government consumption ranging from 0.6 to 1. Fisher and Peters (2009), on the other hand, address possible anticipation effects using stock prices of military suppliers as an instrument for military spending, and find a multiplier of 1.5.

In this paper, we employ the SVAR approach as in Blanchard and Perotti (2002) and elsewhere. We do so not to take sides in the identification debate, but rather because the military buildup approach is not practical for our purposes. While U.S. wars have been fought primarily on foreign soil and have not involved significant direct losses of productive capital, this is certainly not the case in developing or smaller developed countries. The main cause for military buildups are wars or the anticipation of wars; but in most countries wars have had devastating direct macroeconomic effects. Identifying government consumption through military purchases risks conflating the effects of government consumption on output with those of war, risking significant misestimation of fiscal multipliers in developing countries.

1.2 Estimation Methodology

Following Blanchard and Perotti (2002), our objective is to estimate the parameters of the following system of equations:

\[ AY_{n,t} = \sum_{k=1}^{K} C_k Y_{n,t-k} + B u_{t,k}, \]  

(1)
where $Y_{n,t}$ is a vector of variables—government expenditure variables, GDP, and other endogenous variables—for a given quarter $t$ and country $n$. $C_k$ is a matrix of the own- and cross-effects of the $k^{th}$ lag of the the variables on their current observations. The matrix $B$ is diagonal, so that the vector $u_t$ is a vector of orthogonal, i.i.d. shocks to government consumption and output. Finally, the matrix $A$ allows for the possibility of simultaneous effects between the endogenous variables $Y_{n,t}$. We assume that the matrices $A$, $B$, and $C_k$ are invariant across time and countries. In section 3.4 we allow for variability in the autoregressive process across both time and countries to assess the effects of government debt on fiscal multipliers. In additional regressions (not reported) have allowed for variability across countries to ensure that our results are robust to assuming heterogeneity across countries in autoregressive process.\(^1\)

In our standard specification that assumes homogeneity in the model’s parameters, (1) can be estimated through using an panel OLS regression.\(^2\) OLS provides us with estimates of the matrices $A^{-1}C_k$. As is usual in SVAR estimation of this system, additional identification assumptions are required to estimate the coefficients in $A$ and $B$. In our benchmark regressions—bivariate regressions where $Y_{n,t} = \begin{pmatrix} g_{n,t} \\ y_{n,t} \end{pmatrix}$, and where $g_t$ and $y_t$ are government consumption and output, respectively, we follow Blanchard and Perotti (2002) in assuming that changes in government consumption require at least one quarter to respond to innovations in output. This is equivalent to a Cholesky decomposition with $g_t$ ordered before $y_t$ or the assumption that $A$ takes the form $A = \begin{pmatrix} 1 & 0 \\ a_{21} & 1 \end{pmatrix}$.

We choose to pool the data across countries rather than provide estimates on a country-by-country basis. As we discuss in Section 2, with the exception of a handful of countries, the sample for a typical country is of approximately ten years, giving approximately forty observations. Estimates of fiscal multipliers for individual countries are therefore very inaccurate. Instead, we exploit the larger sample size—almost always exceeding one thousand observations—delivered from pooling the data. We divide the sample in to a number of country–observation groupings: high income vs. developing, predetermined vs. flexible ex-

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\(^1\)Formally, we used the Mean Group estimator of Pesaran and Smith (1995) and obtained similar results to the ones reported here.

\(^2\)Formally, we use an OLS regression with fixed effects. All results are robust to using a GLS estimator allowing for different cross-sectional weights.

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change arrangements, open vs. closed. We then estimate and compare the fiscal multiplier across categories.

1.3 Lag Structure

In choosing $K$, the number of lags included in (1), we conducted a number of specification tests, whose results are summarized in Table 1. As is often the case, and as evident from Table 1, the optimal number of lags varies greatly across country-groups and tests, ranging from 2 to 8. For simplicity, and for comparability across regressions, we set $K = 4$ in all reported results. All the paper’s results are robust to choosing any of the alternative number of lags instead.

Table 1: Optimal Number of Lags Based on Specification Tests

<table>
<thead>
<tr>
<th>Criteria</th>
<th>High Income</th>
<th>Developing</th>
<th>Fixed</th>
<th>Flex</th>
<th>Open</th>
<th>Closed</th>
<th>HighLow Debt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Akaike</td>
<td>$\text{4}$</td>
<td>$\text{4}$</td>
<td>$\text{4}$</td>
<td>$\text{4}$</td>
<td>$\text{4}$</td>
<td>$\text{4}$</td>
<td>$\text{4}$</td>
</tr>
<tr>
<td>Schwartz</td>
<td>$\text{4}$</td>
<td>$\text{4}$</td>
<td>$\text{4}$</td>
<td>$\text{4}$</td>
<td>$\text{4}$</td>
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<td>$\text{4}$</td>
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<tr>
<td>Hannan Quinn</td>
<td>$\text{4}$</td>
<td>$\text{4}$</td>
<td>$\text{4}$</td>
<td>$\text{4}$</td>
<td>$\text{4}$</td>
<td>$\text{4}$</td>
<td>$\text{4}$</td>
</tr>
</tbody>
</table>

1.4 Fiscal Multipliers: Definitions

As there are several ways to measure the fiscal multiplier, a few definitions are useful. In general, the definition of the fiscal multiplier is the change in GDP or other output variable (in real currency units) caused by a one unit increase in a fiscal variable. For example, if a one dollar increase in government consumption in the United States causes a fifty cent increase in U.S. GDP, then the government consumption multiplier is 0.5 in the United States.

Multipliers may differ greatly across forecast horizons. We therefore focus on two specific fiscal multipliers. The Impact Multiplier is defined as

$$\text{Impact Multiplier} = \frac{\Delta y_0}{\Delta g_0},$$

giving the change in output to a change in government expenditure at the time of the impulse to government expenditure (if $y$ and $g$ are in currency units). In order to assess the effect of
fiscal policy at longer forecast horizons, we also report the *Cumulative Multiplier* at time $T$, defined as

$$\text{Cumulative Multiplier} (T) = \frac{\sum_{t=0}^{T} \Delta y_t}{\sum_{t=0}^{T} \Delta g_t},$$

giving the cumulative change in output per unit of additional government expenditure, from the time of the impulse to government expenditure to the reported horizon. A cumulative multiplier that is of specific interest is the *Long Run Multiplier* defined as the cumulative multiplier as $T \to \infty$.

2 Data

To our knowledge, this paper involved the first attempt to catalogue available quarterly data on government consumption in a broad set of countries. Until recently, only a handful of countries (the Australia, Canada, the U.K. and the U.S.) collected government expenditure data at quarterly frequency, and classified data into functional categories such as government consumption and government investment.

The use of quarterly data that is collected at a quarterly frequency is of essence for the validity of the identifying assumptions used in a Blanchard-Perotti SVAR. First, while it is reasonable to assume that fiscal authorities require a quarter to respond to output shocks, it is unrealistic to assume that an entire year is necessary. For example, many countries, including developing countries, responded with discretionary measures as early as the first quarter of 2009 to the economic fallout following the collapse of Lehman Brothers and AIG in the fourth quarter of 2008. While in this particular instance the shock and response happen to have occurred in different calendar years, it indicates that an assumption that government’s require an entire year to respond to the state of the economy is not generally valid. Second, data reported at a quarterly frequency but collected at annual frequency may lead to spurious regression results. One common method of interpolating government expenditure data that was collected at annual frequency is to use the quarterly pattern of revenue collection as a proxy for the quarterly pattern of government expenditure (tax revenues are more frequently collected at quarterly frequency).³ As tax revenues are highly procyclical, this method of interpolation creates a strong correlation between government expenditure and output by

³Source: conversations with officials at numerous statistical agencies.
construction. An attempt to identify fiscal shocks with an SVAR, using data constructed in such a manner will obviously give results that are meaningless in an economic sense.

This paper exploits the fact that a larger number of countries have begun to collect fiscal data at a quarterly frequency. Two recent changes made high-frequency fiscal data available for a broader set of countries. First, the adoption in 1996 of a common statistical standard in the European Monetary Union, the ESA95 encouraged Eurozone countries, and countries aspiring to enter the Eurozone, to collect and classify fiscal data at quarterly frequency.\(^4\) In its 2006 *Manual on Non-Financial Accounts for General Government*, Eurostat reports that more than all Eurozone countries comply with the ESA95, with quarterly data based on direct information available from basic sources, representing for each expenditure category comprising at least 90% of the amount in that category.\(^5\) Second, the International Monetary Fund adopted the Special Data Dissemination Standard (SDDS) in 1996. Subscribers to this standard are required to collect and report central government expenditure data at annual frequency, with quarterly frequency recommended. A number of SDDS subscribers have begun collecting fiscal data at quarterly frequency and classifying expenditure data in to functional categories at that frequency.

With these institutional changes, a decade of quarterly data is now available for a cross section of 44 countries, of which 24 are developing countries (based on World Bank income classifications). (We ended the dataset at the forth quarter of 2007 as data from 2008-9 may still be subject to significant revisions.) While ten years (40 observations) of data are hardly enough to estimate the effect of fiscal policy on output for an individual country, the pooled data contains more than 2,500 observations—an order of magnitude greater than used in VAR studies of fiscal policy to date.

A country-by-country description of the data is available in the data appendix. Here we address the use of the data in the empirical analysis that follows. The main specification includes real government consumption and GDP. Other specifications include additional variables including real government investment, the ratio of the current to GDP, and the real effective exchange rate. Nominal data was deflated using a corresponding deflator, when available, and using the CPI index when such a deflator was not available. We took natural logarithms of all government expenditure and GDP data. The data shows strong seasonal


\(^5\)Austria was an exception with a coverage of 89.6%.
patterns. Our selected de-seasonalization method was the SEATS algorithm (see Gómez and Maravall (2000)). In an earlier version of this study we used the X-11 algorithm and obtained similar results. All variables were non-stationary. The data used in the reported regressions are deviations of the variables from their quadratic trend. Using a linear trend yielded similar results. After detrending the data, the series were stationary, as evidenced from the unit root tests reported in Table 2.

Table 2: Unit Root Tests

<table>
<thead>
<tr>
<th>Test</th>
<th>Government Consumption</th>
<th>GDP</th>
<th>Government Investment</th>
<th>CA/GDP</th>
<th>REER</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADF-Fischer Chi Square Stat</td>
<td>201.1</td>
<td>170.5</td>
<td>330.2</td>
<td>190.5</td>
<td>178.4</td>
</tr>
<tr>
<td>Im. Pesaran and Shin W-Stat</td>
<td>-121.8</td>
<td>-5.95</td>
<td>-13.8</td>
<td>-6.8</td>
<td>-6.8</td>
</tr>
</tbody>
</table>

In all tests the null hypothesis of a unit root is rejected at the 99% confidence level.

3 Results

3.1 High income and developing countries

To exploit the largest possible sample of our newly assembled government consumption data, we begin with a simple specification of a bivariate Panel VAR where $Y_{n,t} = \left( g_{n,t} \right)$, and where $g_{n,t}$ is real government consumption and $y_{n,t}$ is real GDP. As a first cut at the data, we divided the sample into high income and developing countries. Figures 1 and 2 show the impulse responses to a 1 percent shock to government consumption at time 0 in the first column, and to output in the second column. Figure 1 gives responses for high-income countries and Figure 2 for developing countries.

The response of output to government consumption is in the lower left-hand panel of each figure. Two differences stand out between the impulse responses. First, the impact response

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6We use the World Bank classification of high income countries in 2000, and include all other countries in the category "developing". The marginal countries are the Czech Republic, defined as developing in 2000, but high-income in 2006; and Slovenia, categorized as high-income in 2000, but as "upper-middle income" (and thus developing by our typology) before 1997. Excluding or reclassifying these two countries does not alter the results. Israel is classified as high income, based on this definition, but was categorized as an "emerging market" in J.P. Morgan’s EMBI index. Excluding or reclassifying Israel does not alter the results.
of output to government spending is positive in high income countries (0.04 percent), but is negative in developing countries (-0.3 percent). Both are statistically significant from zero and from each other. Second, the output response to a shock in government consumption is significantly less persistent than that of high income countries. Indeed, while the output response for high income countries remains significantly positive for the 24 quarters covered in the plot, it becomes zero (statistically speaking) for developing countries after only six quarters, in only four of which output is positive. It then becomes negative again after approximately three years.

Based on the impulse responses depicted in Figures 1 and 2, we can compute the corresponding fiscal multipliers, using the definitions of Section 1.4. The impact multiplier for high income countries is 0.20. In other words, an additional dollar of government spending will deliver only 20 cents of additional output in the quarter in which it is implemented. This effect of government consumption, while small, is statistically significant from zero. For developing countries, the impact multiplier is negative at -0.19 and statistically significant from zero. The difference between the impact multiplier in the two groups of countries is statistically significant at the 99% confidence level.

Focusing on the impact multiplier, however, may be misleading because fiscal stimulus packages can only be implemented over time and there may be lags in the economy’s response. To account for these factors, Figure 3 shows the cumulative multipliers for both high income and developing countries at forecast horizons ranging from 0 to 24 quarters. For example, a value of 0.5 in quarter 3 would indicate that, after 3 quarters, the cumulative increase in output, in dollar terms, is half the size of the cumulative increase in government consumption. The plots also report the value of the impact and long-run cumulative multipliers. Dashed lines give the 90% confidence intervals, based on Monte Carlo estimated standard errors, with 500 repetitions.

We can see that the cumulative multiplier for high income countries rises from an initial value of 0.20 (the impact effect) to a long-run value of 0.85. Hence, even after the full impact

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7The data is in natural logarithms, so that the ratio $\frac{\Delta y}{\Delta g}$ gives the ratio of the percent change in output and the percent change in government consumption. To renormalize this to units of "multiplier" we then divide this ratio by the average ratio of government consumption to output in the sample of countries in the studied group. The ratio of government consumption to GDP varies from 9.6% in Peru to 28% for Israel. The average and median ratios are 17.7% and 19.1%, respectively. Variation within groups is significantly smaller. In high-income countries the average and median ratios of government consumption to GDP are 20.7% and 19.6%, respectively. In developing countries these are 16.5% and 16.9%, respectively.
of a fiscal expansion is accounted for, output has risen less than the cumulative increase in
government consumption, implying some crowding out of output by government consumption
at every time horizon. The multiplier is statistically different from zero at every horizon,
with the exception of a dip in the first quarter. On the other hand, the cumulative long-run
multiplier for developing countries is just 0.37. In other words, in the long run, almost two
thirds of the increase in government consumption is crowded out by some other component
of GDP (investment, consumption, or net exports).

3.2 Exchange Rate Regime

As a second cut at the data, we divided our sample of 44 countries into episodes of predeter-
mined exchange rates and those with more flexible exchange rate regimes.\footnote{More speci-
cally, we divided the sample into country-episodes of predetermined exchange rates. We
took each country’s longest continuous experience with a predetermined exchange rate as a "fixed" episode
and its longest experience with flexible exchange rates as "flex", insofar as a sufficient number of consecutive
observations in either category existed.} We use the de
facto classification of Ilzetzki, Reinhart, and Rogoff (2008) to determine the exchange rate
regime of each country in each quarter. The cumulative impulse responses, shown in Figure
4, suggest that the exchange rate regime matters a great deal. Under predetermined ex-
change rates, the impact multiplier is 0.2 (and statistically significantly different from zero)
and rises all the way to 1.6 in the long-run. Under flexible exchange rate regimes, however,
the multiplier is indistinguishable from zero both on impact and in the long-run. The dif-
ference between the two results is statistically significant at almost every forecast horizon.
The results are robust to dividing the sample by country, with each country classified based
on the exchange rate regime it maintained for the majority of the period.

These results are, in principle, consistent with the Mundell-Fleming model, one of the
workhorses of modern open economy macroeconomics, which would predict that fiscal pol-
icy is more effective in stimulating output under predetermined exchange rates than under
flexible exchange rates. In this model, the initial effect of a fiscal expansion is to increase
output and raise interest rates, which tends to appreciate the domestic currency. Under
predetermined exchange rates, the monetary authority must expand the money supply to
prevent this appreciation. Such monetary policy accommodation provides an additional
boost to output. Under flexible exchange rates, however, the monetary authority keeps a lid
on the money supply, which cuts short any further output expansion. The model, however, would find it difficult to explain no change in output or a negative multiplier under flexible exchange rates, as our findings suggest.

These results relate, more generally, to the notion that monetary accommodation plays an important role in determining the expansionary effect of fiscal policy. Davig and Leeper (2009), for example, show in a DSGE model with nominal rigidities that the effect of fiscal policy differs greatly depending on whether monetary policy is active or passive.

### 3.3 Openness to trade

Next, we divide our sample of 44 countries into “open” and “closed” economies. For our purposes, we defined as “open” a country whose foreign trade (imports plus exports) exceeds 60 percent of GDP. If foreign trade is less than 60 percent of GDP, we defined the country as closed. (Minor variations of this definition did not significantly affect our results.) Using this criterion, 28 countries are classified as open and the remaining 16 are classified as closed. The cumulative responses, shown in Figure 5, indicate that the degree of openness is a critical determinant of the size of the fiscal multiplier. For the closed economies, the impact response is 0.12 and reaches 1.6 in the long run. For the open economies, the impact was negative and the long-run response is not significantly different from zero. The difference between the two country-groupings is statistically significant at every forecast horizon.

### 3.4 Financial Fragility

Our final cut at the data was to divide developing countries into episodes of high debt and those of low debt. As several countries have been teetering on the verge of default during the current financial crisis, it is reasonable to ask whether a government’s level of debt plays a role in the effect of government consumption on output.

A difficulty we confronted, however, was that the debt-to-GDP ratio of individual developing countries differed greatly from period to period. We therefore would like to allow multipliers (and therefore regression coefficients) to vary both across time and across country, depending on the level of debt.
To address this issue, we augment the VAR system of (1) in the following way:

\[ AY_{n,t} = \sum_{k=1}^{K} \left[ \tilde{C}_k Y_{n,t-k} D_{n,t-k} + C_k Y_{n,t-k} (1 - D_{n,t-k}) \right] + B u_{t,k} \]  

(2)

where \( D_{n,t} \) is a scalar dummy variable taking the value of one whenever a county’s ratio of debt to GDP exceeds a certain threshold. The matrix \( C_k \) now gives an estimate of the average autoregressive process of \( Y_t \), when debt is low and \( \tilde{C}_k \) gives the evolution of endogenous variables when debt is high. The system (2) assumes that the contemporaneous relations between the variables in \( Y_{n,t} \) do not depend on whether debt was high or low. This assumption is crucial to allow estimation of (2) using an OLS regression. This additional restriction pits the odds against finding differences between fiscal multipliers in highly-indebted countries and those with low levels of debt. With these assumptions, \( C_k \) and \( \tilde{C}_k \) can be estimated using OLS, while \( A \) and \( B \) can be estimated using the SVAR decomposition discussed in Section 1.2.

Figure 6 shows the resulting cumulative multiplier in countries with low- and high-levels of debt. The threshold for \( D_{n,t} = 1 \) is that the ratio of debt to GDP is 50 percent or greater. For countries with low levels of debt, the cumulative multipliers on impact and in the long run are similar to those estimated for the average developing country in Figure 4. In the lower of panel of Figure 6 the cumulative multiplier for highly indebted country-episodes is shown. Recall that the impact multiplier is identical to that in low-debt countries, by the assumption of homogeneous \( A \) and \( B \). In the long run, however, the multiplier declines and limits to \(-2\). While the error bands are admittedly broad, the point estimate is in general consistent with the notion that attempts at fiscal stimulus in highly indebted countries may be greatly counter-productive and their effects are very uncertain. We are reassured that this result is not spurious by the fact that this long run multiplier remains negative when the threshold is to 60 or 70 percent of GDP, while it becomes positive for debt-to-GDP ratios of 30 or 40 percent.

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\(^9\)We thank Tomasz Wieladek, who suggested this methodology. 
\(^10\)When the threshold is 50 percent of GDP \( D_{n,t} = 1 \) for 28% of developing country observations. 
\(^11\)Kelejian (1974) discusses the theoretical limits to assumptions on heterogeneity in estimating a panel with heterogeneous slopes.
4 Extensions and Robustness

4.1 Government Investment

While our focus so far has been on government consumption—partially due to limited availability of government investment data—it is nevertheless interesting to see whether the effects of government investment differ from those of government consumption. To explore this question, we estimate (1), this time with

$$Y_{n,t} = \begin{bmatrix} g_{n,t}^I \\ g_{n,t}^g \\ y_t \end{bmatrix},$$

where $g_{n,t}^I$ is real government investment, and $g_{n,t}^g$ and $y_t$ are real government consumption and real GDP as before. We follow Perotti (2004b) in ordering government investment before government consumption in the Cholesky decomposition, although results are not affected by this assumption. The number of countries in the sample declines when including government investment, but the results on government consumption of section 3 hold for this sub-sample as well.

Figure 7 shows the cumulative government investment multiplier for high income countries. The smaller sample size yields estimates are admittedly less accurate. But the estimated impact- and long-run government investment multipliers are substantially higher than those on government consumption. However, the results in Figure 7 are somewhat misleading. As Figure 8 shows, government consumption responds strongly to government investment, so that the multiplier calculated in Figure 7 is attributing the entire increase in output to the increase in government investment, while ignoring the increase in government consumption.\(^\text{12}\)

To address this issue, we estimate the multiplier to "pure" government investment multipliers, as suggested by Perotti (2004b). This is done by estimating the full system with the three endogenous variables, but setting all values of $g_{n,t} = 0$ in our forecasts of $g_{n,t}^I$ and $y_t$. The resulting cumulative multipliers for high-income countries and developing countries are presented in Figure 9. The estimates of the government investment multiplier remain highly uncertain in high-income countries, in the upper panel of this figure. But their point estimates at all horizons are slightly larger, but similar to the government consumption

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\(^{12}\)This is true of the response of government investment to government consumption. However, the omission of the latter from the regressions of section 3 does not have a significant impact on the estimate government consumption multipliers. This is because government investment is in all countries in our sample a small fraction of government consumption.
multipliers presented in Figure 3. We thus have no robust evidence that government investment is more productive in its simulative effect on output in high income countries. This is consistent with the findings of Perotti (2004b).

In developing countries, in contrast, whose government investment multiplier is in the lower panel of Figure 9, the impact multiplier is 0.6 and statistically significantly larger than zero. While our estimates have little power to predict the long-run effects of a shock to government investment in developing countries, we can reject at the 95% confidence level the hypothesis that the effect of government investment is no higher than that of government consumption. Put differently, it appears that the composition of government purchases are an important determinant of the impact of government spending shocks on output in developing countries.

Figures 10 and 11 repeat the comparison between predetermined and flexible exchange rates and open and closed economies, respectively, for government investment. As in the case of high-income countries, we find no significant difference between the impact of government consumption and government investment in the long run. Short run impacts do appear greater in the case of government investment, particularly in open economies and economies with flexible exchange arrangements. Figures 10 and 11 show that the multiplier on government investment, like the multiplier on government consumption, is larger in countries with predetermined-, relative to countries with flexible exchange rates; and in closed economies relatively to open economies (with the latter result statistically significant at forecast horizons of up to four years).

4.2 Multivariate Regressions

We have so far primarily estimated bivariate panel VARs with real government consumption and real GDP as the endogenous variables. In this section we show that the results reported here are robust to a expanded VAR system, including the real effective exchange rate and the ratio of the current account balance to GDP. As before, our identifying assumption calls for ordering government consumption before GDP. As for the ordering of the newly added variables, we follow Kim and Roubini (2008) and numerous other studies in ordering the remaining variables after GDP and ordering the current account balance before the real effective exchange rate.
The results are presented in Figures 12, 13 and 14, comparing the cumulative multiplier on government consumption in high income vs. developing countries, predetermined vs. flexible exchange rates, and open vs. closed economies, respectively. The results are almost identical to those in Figures 3-5. All the reported results are robust to the multivariate specification.

5 Conclusions

This paper is an empirical exploration of one of the central questions in macroeconomic policy in the past few years: what is the effect of government purchases on economic activity? We use panel SVAR methods and a novel data set to explore this question. All in all, our findings suggest that drawing sweeping generalizations on the size of fiscal multipliers is probably an exercise in futility. Our most robust results point to the fact that the size of the fiscal multipliers critically depends on key characteristics of the economy or on the type of fiscal aggregate being considered.

In general, we have found that the effect of government consumption is very small on impact, with estimates clustered close to zero. This supports the notion that fiscal policy (particularly on the expenditure side) may be rather slow in impacting economic activity. The medium- to long-run effects of increases in government consumption vary considerably. In particular, in economies closed to trade or operating under fixed exchange rates we find a substantial long-run effect of government consumption on economic activity. In contrast, in economies open to trade or operating under flexible exchange rates, a fiscal expansion leads to no significant output gains. Further, fiscal stimulus may be counterproductive in highly-indebted countries; in developing countries with debt levels as low as 50% of GDP, government consumption shocks may have strong negative effects on output.

Finally, the composition of government expenditure does appear to impact its stimulative effect, particularly in developing countries. While increases in government consumption decrease output on impact in developing countries, increases in government investment cause an increase in GDP.

Since, over the last decades, many emerging countries have become more open to trade and moved towards greater exchange rate flexibility (typically in the context of inflation targeting regimes), our results suggest that seeking the holy grail of fiscal stimulus is likely
to be counterproductive, with little benefit in terms of output and potential long-run costs due to larger stocks of public debt.

On the other hand, emerging countries – particularly large economies with some degree of “fear of floating” – would be well served if they stopped pursuing procyclical fiscal policies. Indeed, emerging countries have typically increased government consumption in good times and reduced it in bad times, thus amplifying the underlying business cycle – what Kaminsky, Reinhart, and Végh (2004) have dubbed the “when it rains, it pours” phenomenon. The inability to save in good times greatly increases the probability that bad times will turn into a full-fledged fiscal crisis. Given this less-than-stellar record in fiscal policy, even an acyclical fiscal policy – whereby government consumption and tax rates do not respond to the business cycle – would represent a major improvement in macroeconomic policy. While occasional rain may be unavoidable for emerging countries, significant downpours would be relegated to the past.

References


Data Appendix

The greatest challenge of this high-frequency study of fiscal policy in a large number of countries was collecting and vetting the data. We have gone to great lengths to ensure that data included in the dataset was originally collected at a quarterly frequency, covered a large proportion of the government expenditure category studied. Tables A1 and A2 summarize the sources, time frame, and definitions of the two main government expenditure categories studied. In all cases, the integrity of the data was confirmed directly through correspondence or conversation with national statistical agencies, central banks, or fiscal authorities. While some of the time series extend to 2008 or 2009, data from these last two years were not used in the empirical analyses in this paper, as recent data may still be subject to significant revisions.

One inconsistency across countries in the data set is in the level of government included. In most cases, data for the general government was available, but in some cases, only the expenditures of the central government were available. The exclusion of regional government consumption risks biasing our results, as fiscal multipliers may be overstated or understated, depending on whether the excluded expenditures are positively or negatively correlated with central government consumption, and whether they have similar effects on economic activity. We opted to keep coverage as broad as possible and included all countries in the sample, regardless of the level of government for which data was available. The results reported in this paper did not change when only countries for whom general government consumption data was available.

Another possible concern is that in some cases data was deflated directly by the local statistical agencies. In other cases, we deflated the data using a CPI deflator. This both creates an inconsistency across countries, but moreover raises the question of whether consumer prices are the appropriate measure of the ratio between the nominal value of government purchases and their real value. Finding an appropriate government consumption deflator is not a simple task, but we were reassured by the fact that in countries where more than one deflator was available (e.g. GDP deflator, CPI, or a government consumption deflator) the correlation of the series when deflated using different price indexes was close to 1.

Other variables are as follows.
**Gross Domestic Product** Whenever possible, GDP data are taken from the same data source as the government expenditure data. Elsewhere, IFS series 99B was used for developing countries and real GDP from OECD Statistics was used for high income countries.

**Consumer Price Index** IFS series 64.

**Real Effective Exchange Rate** A CPI-based real exchange rate was used. Wherever available, the narrow real exchange rate index of the Bank for International Settlements was used. Otherwise, the broad index was used.\(^\text{13}\) Elsewhere, IFS series RECZF was used.

**Current Account** OECD Statistics, when available, and IFS series 75 elsewhere.

\(^{13}\)The broad index includes more countries, but has a shorter time coverage.
<table>
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### Table A1: Government Consumption

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Figure 1: Impulse responses in high-income countries

1% Shock to G  

1% Shock to GDP

Responses are G in the first row and GDP in the second. 90% confidence intervals in dashed lines.
Figure 2: Impulse responses in developing countries

1% Shock to G

1% Shock to GDP

Responses are G in the first row and GDP in the second. 90% confidence intervals in dashed lines.
Figure 3: Cumulative multiplier—high income and developing countries

High income countries in top panel, developing countries in lower panel. 90% confidence intervals in dashed lines.
Figure 4: Cumulative multiplier—predetermined (fixed) and flexible (flex) exchange arrangements

90% confidence intervals in dashed lines
Figure 5: Cumulative multiplier—open and closed economies

90% confidence intervals in dashed lines.
Figure 6: Cumulative multiplier—developing countries: low and high debt

Top panel is debt/GDP < 50%, lower panel is debt/GDP > 50%. 90% confidence intervals in dashed lines.

Top panel: Long run: 0.4, Impact: -0.23
Bottom panel: Long run: -2, Impact: -0.23
Figure 7: Cumulative government investment multiplier

High-income countries; includes indirect effects of government consumption

90% confidence intervals in dashed lines.

Long Run: 2.5

Impact: 0.38
Figure 8: Responses to a 1% government investment shock
Figure 9: Cumulative multiplier to a “pure” government investment shock: high-income and developing countries

High income countries in top panel, developing countries in lower panel. 90% confidence intervals in dashed lines.
Figure 10: Cumulative multiplier to a “pure” government investment shock: predetermined (fixed) and flexible (flex) exchange arrangements
Figure 11: Cumulative multiplier to a “pure” government investment shock: open and closed economies
Figure 12: Cumulative multiplier—high income and developing countries

Multivariate Regression

High income countries in top panel, developing countries in lower panel. 90% confidence intervals in dashed lines.
Figure 13: Cumulative multiplier—predetermined (fixed) and flexible (flex) exchange rates

Multivariate Regression

90% confidence intervals in dashed lines.
Figure 14: Cumulative multiplier—open and closed economies

Multivariate Regression

90% confidence intervals in dashed lines.