

# Fiscal Multipliers in Recessions and Expansions

## Does It Matter Whether Government Spending Is Increasing or Decreasing?

*Daniel Riera-Crichton*

*Carlos A. Vegh*

*Guillermo Vuletin*



**WORLD BANK GROUP**

Development Research Group

Macroeconomics and Growth Team

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## Abstract

Using non-linear methods, this paper finds that existing estimates of government spending multipliers in expansion and recession may yield biased results by ignoring whether government spending is increasing or decreasing. For industrial countries, the problem originates in the fact that, contrary to one's priors, it is not always the case that government spending is going up in recessions (i.e., acting countercyclically). In almost as many cases, government spending is actually going down (i.e., acting procyclically).

Since the economy does not respond symmetrically to government spending increases or decreases, the "true" long-run multiplier for bad times (and government spending going up) turns out to be 2.3 compared to 1.3 if we just distinguish between recession and expansion. In the case of developing countries, the bias results from the fact that the multiplier for recessions and government spending going down (the "when-it-rains-it-pours" phenomenon) is larger than when government spending is going up.

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# **Fiscal Multipliers in Recessions and Expansions: Does It Matter Whether Government Spending Is Increasing or Decreasing?**

Daniel Riera-Crichton  
*Bates College*

Carlos A. Vegh  
*Johns Hopkins University and NBER*

Guillermo Vuletin  
*Brookings Institution*

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# 1 Introduction

The recent global financial crisis and ensuing recession triggered major fiscal stimulus packages throughout the industrial world as well as in several emerging markets. The effectiveness of these fiscal packages remains, however, an open question. In fact, the size of the government spending multipliers in the academic literature has varied widely, from negative values to positive values as high as 4.

Why do estimates vary so widely? An obvious explanation is the use of different methodologies. Indeed, there has been an intense debate in the literature regarding the proper identification of fiscal shocks. The widely-used identification method of Blanchard and Perotti (2002) in the context of structural vector-autoregressions models (SVAR), which relies on the existence of a one-quarter lag between output and a fiscal response, has been called into question by Ramey (2011) on the basis that what is an orthogonal shock for an SVAR may not be so for private forecasters. In other words, there seems to be, at least for the United States, a non-trivial correlation between orthogonal innovations in an SVAR and private forecasts. To remedy this, Barro and Redlick (2011) and Romer and Romer (2010) have suggested, respectively, the use of a “natural experiment approach” (military buildups in the United States) or a narrative approach for the case of taxes.

Another reason for different estimates could be that the size of fiscal multipliers may depend on various characteristics of the economy in question, including degree of openness, exchange rate regime, and the state of the business cycle.<sup>1</sup> The latter factor appears as particularly relevant for policy makers since, in practice, fiscal stimulus is only undertaken in bad times in most industrial countries and hence, one could argue, the relevant multiplier is not an “average” multiplier over the business cycle but the one that applies in bad times. In the same vein, since most expansionary policies take place during booms in developing countries

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<sup>1</sup>See Auerback and Gorodnichenko (2010, 2012) and Ilzetzki, Mendoza, and Vegh (2013).

(i.e., the well-known procyclical fiscal behavior), low multipliers in developing countries could reflect that such expansionary policies have low impact in booms.<sup>2</sup> There is thus reason to believe that, in both industrial and emerging countries, the size of fiscal multipliers could well depend on the economic cycle.

From a technical standpoint, dividing the classical SVAR regression samples into expansions and recessions could severely compromise the number of observations used in the analysis as well as miss inherent non-linearities in the economy's response to fiscal stimulus. A potential solution is the use of non-linear, regime-switching type regressions, which have been used in some studies for the United States and other industrial countries. Specifically, Fazzari *et al.* (2012) extend Chan and Tong's (1986) early work on Threshold Autorregressive Models (TAR) to a multivariate setting in order to create a Threshold SVAR (TSVAR) model. In a TSVAR, the parameters are allowed to switch according to whether a threshold variable crosses an estimated threshold (capacity utilization in this case). A possible drawback of this methodology lies in the potential arbitrariness of the threshold selection. In Fazzari *et al.* (2012), the threshold is estimated from the data but it could still be argued that the selection of the threshold variable itself is arbitrary.

In a related, but different, approach, Auerbach and Gorodnichenko (AG) (2010) solve the issue of threshold selection by extending early work by Granger and Teravistra (1993) on Smooth Transition Autoregressive models (STAR) in order to accommodate simultaneous equation analysis in a Smooth Transition Vector Autoregressive model (STVAR). In this model the transition across states is controlled by an underlying smooth logistic distribution with a weight (or probability) given by a moving average of real GDP growth. For the United States, Auerbach and Gorodnichenko (2010) conclude that the spending multiplier is around zero in expansions and 1.5-2.0 in recessions. Using a linear model, the estimate would be

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<sup>2</sup>On procyclical fiscal policy in developing countries, see Kaminsky, Reinhart, and Vegh (2004), Ilzetzki and Vegh (2008), and the references therein.

around one, thus underestimating it for recessions and overestimating it for expansions. In Auerbach and Gorodnichenko (2012), they resort to an alternative methodology – advocated by Jorda (2005) and Stock and Watson (2007) – that relies on running a separate regression for each horizon and then constructing the impulse response function. This direct projection method does not impose the dynamic restrictions implicitly embedded in VARs and can easily accommodate non-linearities in the response function. They conclude, for a panel of OECD countries, that the multiplier is around 3.5 during recessions and essentially zero during expansions.

This paper tackles the same question (do fiscal multipliers depend on the state of the business cycle?) but brings into the picture a new dimension, which we believe is critical for evaluating the size of fiscal multipliers in good and bad times.<sup>3</sup> The new dimension is whether government spending is going up or down. To understand intuitively why this may be a critical dimension, notice that when we talk about fiscal multipliers in good and bad times, the implicit world that we have in mind is one in which fiscal policy is countercyclical (i.e., government spending increases in bad times and falls in good times), as has traditionally been the case for industrial countries.<sup>4</sup> As illustrated in Table 1, however, this is not true about 44 percent of the time.<sup>5</sup> Specifically, by combining good or bad times with government spending going up or down, Table 1 tells us how much time the economy spends, on average, in each of the possible four states of the world (top figures in every cell, which add up to 100 percent). For example, cell (1,1) indicates that industrial countries spend, on average, 29 percent of the time in good times with government spending going down. The table thus tells us that industrial countries spend, on average, 56 percent of the time in countercyclical states of the world; that is, the sum of cells (1,1) and (2,2). The rest of the time (44 percent),

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<sup>3</sup>Our sample includes 52 countries (21 industrial and 31 developing) for the period 1971-2011.

<sup>4</sup>Of course, the current austerity programs in the Eurozone constitute procyclical fiscal policy, which had traditionally been observed only in developing countries.

<sup>5</sup>We are, of course, implicitly assuming that causation goes from the cycle to fiscal policy to tell our story. Our estimates below will, in principle, control for this.

government spending is either going down in bad times (cell (2,1)) or going up in good times (cell (1,2)), which would constitute procyclical fiscal policy.

Furthermore, conditional on being in bad times, government spending is going down 46 percent of the time (bottom figure in cell (1,2)). Hence, when we compute a multiplier for bad times, we are putting in the same bag very different situations: the case of government spending going up in bad times (our implicit scenario) and the case of government spending going down in bad times (or procyclical fiscal policy). If government spending going up or down did not matter for the size of the multiplier, then this would not be a problem. If it does matter (as we will show), then we would be biasing our estimate.<sup>6</sup> Instead of estimating the multiplier for cell (2,2), so to speak, we would be estimating an average of the multiplier for cells (2,1) and (2,2).

Our results confirm our intuition. When we compute multipliers for industrial countries for each of the four states of the world captured in Table 1, we find that the largest multiplier (after 2 and 4 semesters) corresponds to cell (2,2), reaching 2.3 after four semesters. If we ignore the distinction of government spending going up or down, the resulting multiplier is just 1.3. The bias comes from the fact that the long-run multiplier for cell (2,1) is not significantly different from zero. Hence, ignoring whether government spending is going up or down implicitly gives us an “average” of cells (2,1) and (2,2).

While our distinction between government spending going up or down continues to matter for developing countries, the direction of the bias is different. In contrast to industrial countries, we find that the multiplier obtained for the situation captured in cell (2,1) is significantly different from zero at all time horizons. In contrast, the multiplier for the case of cell (2,2) is not significantly different from zero on impact and becomes insignificant again

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<sup>6</sup>A simple theoretical example where it would matter is a situation of full employment (i.e., “good times”) in a sticky-prices model. In such a case, we would expect an increase in government spending to have no effect on output (i.e., a zero multiplier) while a reduction in government spending would lead to a positive multiplier (whatever this may be). In AG’s (2010, 2012) view of the world, these two multipliers are implicitly assumed to be the same.

after about five quarters.

All the results reported so far refer to fiscal multipliers computed for the “median” expansion and recession. We also looked, however, at what happens in “extreme” booms and recessions. For industrial countries, we find that the multiplier in extreme recessions is much larger than in typical recessions (almost 70 percent higher). But perhaps the most striking result when considering extreme recessions is that lower government spending reduces output for any time horizon and, more importantly, the multiplier is always larger than one. In particular, the long-run multiplier (i.e., after 4 semesters) reaches 1.69. In terms of the current debate on austerity in the Eurozone, our results would indicate that the remedy could be worse than the disease in the sense that debt-to-GDP ratios would actually increase (even after 2 years) as a result of a fiscal contraction.

The paper proceeds as follows. Section 2 discusses the data and our methodology that follows the direct projection method mentioned above. Section 3 presents our estimates in the following order: (i) single (or non-linear) multipliers; (ii) multipliers in expansions and recessions; (iii) multipliers when government spending is going up and down; and (iv) multipliers taking into account both recession/expansion and government spending going up or down. Section 4 presents our estimates for extreme recessions or booms and compares them with our previous estimates (which apply to the median recession or boom). Section 5 concludes.

## 2 Data and methodology

### 2.1 Data

For OECD countries we use semiannual data on seasonally-adjusted real government spending, seasonally-adjusted real GDP, and government spending forecast errors ( $FE^G$ ) computed as the difference between forecast series prepared by professional forecasters and actual, first-



release series of the government spending growth rate.<sup>7 8</sup> As discussed in detail in AG (2010, 2012),  $FE^G$  provides a convenient way to identify unanticipated government purchases, which enables us to appropriately estimate fiscal multipliers. This surprise government spending shock captures unanticipated innovations in spending.

Given the absence of readily available government spending forecast error data in developing countries, we use – as has been typical in the SVAR literature – quarterly data on seasonally-adjusted real government spending as well as the identifying assumption that while contemporaneous changes in government spending can affect output in the same quarter, the opposite is not true (i.e., it takes output changes at least one quarter to affect government spending). We also use quarterly seasonally-adjusted real GDP.<sup>9 10</sup>

## 2.2 Methodology

We follow the single-equation approach advocated by Jorda (2005) and Stock and Watson (2007), which does not impose the dynamic restrictions implicitly embedded in the SVAR methodology and can conveniently accommodate nonlinearities in the response function. For this purpose, linear “local projections” (LP) of output growth on lags and current change of government expenditure and other controls are used for the construction of impulse response functions (IRF). As discussed in Jorda (2005), there are multiple advantages in the use of LP. In particular, LP (i) can be estimated by single-regression techniques (least-squares dummy

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<sup>7</sup>The list of OECD countries comprises Australia, Austria, Belgium, Canada, Chile, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Korea, Rep., Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Spain, Sweden, Turkey, United Kingdom, and United States. The sample periods covers 1986-2008.

<sup>8</sup>The sources of data for government spending and GDP (for both OECD and developing countries) are IFS (IMF), Global Financial Data, Datastream, as well as local sources such as Central Banks.

<sup>9</sup>The list of developing countries comprises Argentina, Botswana, Bulgaria, Chile, China, Cyprus, Czech Republic, Ecuador, Egypt, Hungary, India, Korea, Rep., Latvia, Lithuania, Malta, Mauritius, Mexico, Paraguay, Philippines, Poland, Romania, Russia, Singapore, Slovak Republic, Slovenia, South Africa, Thailand, Turkey, Uruguay, and Venezuela. The sample period covers 1970-2011.

<sup>10</sup>For consistency with our methodology for developing countries, we also computed all multipliers for OECD countries using the same frequency and methodology (described below) that we use for developing countries. The results (not reported for the sake of brevity) are qualitatively the same, though the estimated multipliers are smaller and with larger standard error bands.

variables or LSDV in our case), (ii) are more robust to potential misspecifications, and (iii) can easily accommodate highly non-linear and flexible specifications that may be impractical in a multivariate SVAR context.

While we use simple non-linear specifications to estimate the different multipliers under expansionary or contractionary fiscal policy and along the economic cycle, regime transition in non-linear models can be problematic. By estimating the multipliers individually under each regime, the risk of bias in the coefficients follows from the implicit assumption that the economy never changes regimes. In line with AG (2010), however, we sidestep the problems derived from assuming discrete changes in regimes by using a smooth (continuous) transition model. In that case, and while one regime (recession) has a relatively small number of observations, the smooth transition model allows us to effectively pool more information taking advantage of the variation in the degree of a particular regime so that estimation and inference for each regime is based on a larger set of observations. Since we estimate properties of a given regime using in part information from another regime, our estimates may be biased. Nevertheless, it is important to note that the bias in our estimates will be toward not finding different fiscal multipliers across regimes.

In all of our regression analysis, we use robust Driscoll and Kraay (1998) standard errors to correct for potential heteroskedasticity, autocorrelation in the lags, and error correlation across panels.

In our basic linear specification (Section 3.1), the response of output growth at the horizon  $h$  is estimated from the following regression:

$$\Delta Y_{i,t+h} = \alpha_{i,h} + \beta_h FE_{i,t}^G + \lambda_h(L)\Delta Y_{i,t-1} + \Psi_h(L)\Delta G_{i,t-1} + \varphi_1 T_{t,h} + \varphi_2 T_{t,h}^2 + \mu_{i,t,h}, \quad (1)$$

where  $i$  and  $t$  index countries and time, respectively,  $\alpha_i$  is the country fixed effect, and  $Y$  and  $G$  are the logarithms of real GDP and real government spending. Therefore,  $\Delta Y$  and

$\Delta G$  capture standard percentage changes (on the left-hand side, the change in  $Y$  is of course indexed by  $h$  because it is calculated for each horizon  $h$ ). As in Owyang, Ramey, and Zubairy (2013),  $T$  controls for potential time trends. It is important to note that, in this approach, each time horizon in the IRF (captured by  $h$ ) is obtained from a different individual equation. We thus obtain the IRF values directly from the  $\beta_h$  estimated coefficients. Unlike a VAR specification, the estimated coefficients contained in  $\lambda(L)$  and  $\Psi(L)$  are not used directly to build the IRF values but only serve as controls, “cleaning” the  $\beta_h$  from the dynamic effects of output and the effects of past government expenditure changes. Following standard practice, spending multipliers are then constructed by multiplying the IRF values by the mean value of  $Y/G$ .

We then follow AG (2012) and compute non-linear fiscal multipliers in economic expansions and recessions for OECD countries (Sections 3.2 and 4). For this purpose, we modify our linear specification (1) as follows:

$$\begin{aligned}
\Delta Y_{i,t+h} = & \alpha_{i,h} + (1 - I(x_{i,t-1})) \beta_{E,h} FE_{i,t}^G + I(x_{i,t-1}) \beta_{R,h} FE_{i,t}^G + \\
& + (1 - I(x_{i,t-1})) \lambda_{E,h}(L) \Delta Y_{i,t-1} + I(x_{i,t-1}) \lambda_{R,h}(L) \Delta Y_{i,t-1} + \\
& + (1 - I(x_{i,t-1})) \Psi_{E,h}(L) \Delta G_{i,t-1} + I(x_{i,t-1}) \Psi_{R,h}(L) \Delta G_{i,t-1} + \\
& + \varphi_1 T_{t,h} + \varphi_2 T_{t,h}^2 + \mu_{i,t}, \tag{2}
\end{aligned}$$

with

$$I(x_{i,t}) = \frac{e^{-\gamma x_{i,t}}}{1 + e^{-\gamma x_{i,t}}}, \quad \gamma > 0.$$

Following AG (2012),  $I(\cdot)$  is a transition function for each country that ranges between 0 (largest expansion) and 1 (deepest recession).  $x_{i,t}$  is a normalized variable measuring the state of the business cycle which, using the 7-quarter moving average of the growth rate

of output, is then normalized such that  $E(x_{i,t}) = 0$  and  $Var(x_{i,t}) = 1$  for each  $i$ .<sup>11</sup> The common practice in this emerging literature (e.g., Owyang, Ramey, and Zubairy (2013)) has been to evaluate the size of the spending multipliers under what we call “extreme” business cycle conditions. That is to say, the impact of fiscal policy is evaluated for the largest expansion (i.e.,  $I(.) = 0$ ) and the deepest recession (i.e.,  $I(.) = 1$ ). While relevant under some particular historical circumstances (like the deep recessions currently underway in several Eurozone countries), these extreme conditions are, by definition, rather infrequent and do not capture normal expansions or recessions. For this reason, in Section 3.2 we first compute the multipliers for what we call typical (or, more precisely, median) expansions and recessions. Defining a typical recession or expansion is by no means a trivial matter, as we would need to use weighted averages of  $\beta_{E,h}$  and  $\beta_{R,h}$  in the construction of the IRF and multiplier. Based on the median value of  $x$  during expansions and recessions, we capture the median recession using  $I(.) = 0.7$  (and, thus,  $1 - I(.) = 0.3$ ). By the same token, we capture the median expansion using  $1 - I(.) = 0.7$  (and, thus,  $I(.) = 0.3$ ).<sup>12</sup> In Section 4, we will then compare the multipliers obtained under typical expansions and recessions with those obtained under extreme expansions and recessions (i.e., for the cases in which  $I(.) = 0$  and  $I(.) = 1$ , respectively).

To fix ideas, we now report some numbers regarding the typical and extreme business cycle conditions in OECD and developing countries. In all cases, these figures refer to median values in each group of countries. In OECD countries, the 7-quarter moving average of the growth rate of output in a typical recession is 0.3 percent, compared to -1.0 percent in an extreme recession. The corresponding figures for a typical and extreme expansion are 0.9 and 3.2

<sup>11</sup>As in AG (2012), we calibrate  $\gamma = 1.5$ . Results hold for small variations in the value of  $\gamma$ .

<sup>12</sup>Although the point estimates of the IRF and multipliers are straightforward to calculate (we use the weighted average of  $\beta_{E,h}$  and  $\beta_{R,h}$ ), standard errors also need to account for the covariance between  $\beta_{E,h}$  and  $\beta_{R,h}$ . We use the following formulation for the weighted average of the standard errors:  $\sigma_{a\beta_E + b\beta_R} = \sqrt{a^2\sigma_{\beta_E}^2 + b^2\sigma_{\beta_R}^2 + 2ab\sigma_{\beta_E,\beta_R}^2}$ , where  $a$  and  $b$  represent the weights and  $\sigma_{\beta_E}^2$ ,  $\sigma_{\beta_R}^2$ ,  $\sigma_{\beta_E,\beta_R}^2$  are drawn from the variance-covariance matrix of the regression.

percent, respectively. In developing countries, the 7-quarter moving average of the growth rate of output in a typical recession is 0.4 percent compared to -2.3 percent in an extreme recession. The corresponding figures for a typical and extreme expansion are 1.6 and 7.7 percent, respectively. As will become clear below, important policy implications will arise from comparing typical and extreme business cycle conditions, particularly regarding (i) the expansionary effect of government spending under alternative recessionary environments, and (ii) how the effectiveness of austerity packages may crucially depend upon the severity of the recessionary environment.

One of the main novelties of this paper is to assess potential asymmetric effects on output of government spending depending on whether government spending is increasing or decreasing. Before interacting this new dimension with the stance of the business cycle, we first evaluate in Section 3.3 whether the size of the fiscal multiplier may depend on whether government spending is going up or down (without considering the stance of the business cycle). For this purpose, we modify our linear specification (1) splitting each variable depending on whether forecast errors have positive ( $FE^{GPOS}$ ) or negative ( $FE^{GNEG}$ ) values:<sup>13</sup>

$$\begin{aligned} \Delta Y_{i,t+h} = & \alpha_{i,h} + \beta_h^{POS} FE_{i,t}^{GPOS} + \beta_h^{NEG} FE_{i,t}^{GNEG} + \lambda_h^{POS}(L) \Delta Y_{i,t-1}^{POS} + \lambda_h^{NEG}(L) \Delta Y_{i,t-1}^{NEG} + \\ & + \Psi_h^{POS}(L) \Delta G_{i,t-1}^{POS} + \Psi_h^{NEG}(L) \Delta G_{i,t-1}^{NEG} + \varphi_1 T_{t,h} + \varphi_2 T_{t,h}^2 + \mu_{i,t,h}. \end{aligned} \quad (3)$$

Finally, we look into the possible interaction between recession/expansion and government spending going up or down in Section 3.4 (for typical expansions and recessions) and in Section 4 (for extreme expansions and recessions). For this purpose, we modify our linear specification

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<sup>13</sup>In other words,  $\Delta Y^{POS}$  ( $\Delta Y^{NEG}$ ) equals  $\Delta Y$  if  $FE^G > 0$  ( $FE^G < 0$ ) and zero otherwise. Similarly,  $\Delta G^{POS}$  ( $\Delta G^{NEG}$ ) equals  $\Delta G$  if  $FE^G > 0$  ( $FE^G < 0$ ) and zero otherwise.

(1) by including the underlying elements of specifications (2) and (3):

$$\begin{aligned}
\Delta Y_{i,t+h} = & \alpha_{i,h} + (1 - I(x_{i,t-1})) \beta_{E,h}^{POS} FE_{i,t}^{GPOS} + I(x_{i,t-1}) \beta_{R,h}^{POS} FE_{i,t}^{GPOS} + \\
& + (1 - I(x_{i,t-1})) \beta_{E,h}^{NEG} FE_{i,t}^{GNEG} + I(x_{i,t-1}) \beta_{R,h}^{NEG} FE_{i,t}^{GNEG} + \\
& + (1 - I(x_{i,t-1})) \lambda_{E,h}^{POS}(L) \Delta Y_{i,t-1}^{POS} + I(x_{i,t-1}) \lambda_{R,h}^{POS}(L) \Delta Y_{i,t-1}^{POS} + \\
& + (1 - I(x_{i,t-1})) \lambda_{E,h}^{NEG}(L) \Delta Y_{i,t-1}^{NEG} + I(x_{i,t-1}) \lambda_{R,h}^{NEG}(L) \Delta Y_{i,t-1}^{NEG} + \\
& + (1 - I(x_{i,t-1})) \Psi_{E,h}^{POS}(L) \Delta G_{i,t-1}^{POS} + I(x_{i,t-1}) \Psi_{R,h}^{POS}(L) \Delta G_{i,t-1}^{POS} + \\
& + (1 - I(x_{i,t-1})) \Psi_{E,h}^{NEG}(L) \Delta G_{i,t-1}^{NEG} + I(x_{i,t-1}) \Psi_{R,h}^{NEG}(L) \Delta G_{i,t-1}^{NEG} + \\
& + \varphi_1 T_{t,h} + \varphi_2 T_{t,h}^2 + \mu_{i,t,h}.
\end{aligned} \tag{4}$$

We now proceed to report the estimates of the fiscal multipliers for both OECD and developing countries using the four empirical specifications just outlined.

### 3 Estimates of spending multipliers

We first present estimates for the linear (single) multiplier, then for multipliers in recession and expansion, then for multipliers that differentiate between increases and decreases in government spending, and finally for multipliers that take into account both expansion/recession and government spending going up or down.

#### 3.1 Linear multiplier

As a natural first step – and following specification (1) – we compute the cumulative fiscal multiplier for OECD countries, which is illustrated in Figure 1, panel A. The multiplier is 0.31 on impact (and significantly different from zero), reaches a peak of 0.41 after one semester and remains significantly different from zero after four semesters with a value of 0.38.

What happens in developing countries? Figure 1, panel B shows the multiplier for this

group of countries. The multiplier is 0.26 on impact (and significantly different from zero), reaches a peak of 0.60 after three quarters, but then becomes insignificant after about seven quarters.

This linear (or single) multiplier provides us with a benchmark to first revisit the AG exercise of computing multipliers in expansions and recessions and later examining whether it matters if government spending is going up or down.

### **3.2 Multipliers in recession and expansion**

Based on specification (2), we now compute the fiscal multipliers in economic expansions and recessions for OECD countries. The multipliers associated with expansion and recession are illustrated in Figure 2, panels A and B.

As in AG (2012) we find that the fiscal multiplier in recessions is larger than in expansions. In the case of recessions, the multiplier is 0.73 on impact (and significantly different from zero) and reaches a peak of 1.28 after four semesters. In contrast, in expansions the multiplier is 0.09 (and not significantly different from zero) on impact and remains insignificant for any horizon.

The nice point to emerge out of this exercise of is that one can think of the single multiplier illustrated in Figure 1, panel A, as an “average” of panels A and B in Figure 2 that masks the estimate that we are presumably most interested in (i.e., the multiplier during recessions when policy makers are trying to stimulate the economy in order to raise output and employment).

Taken at face value, the policy implication of this finding is clear: increasing government spending in periods of recessions (as Keynesian considerations would call for) would stimulate output whereas increasing it in times of expansion would have essentially no effects. Further, since we have made no distinction between increases and decreases in government spending, it would also follow that reducing government spending in recessions (as many developing countries have historically done and many industrial countries are currently doing) would be

quite contractionary whereas reducing spending in good times would have little, if any, effect.

What happens in developing countries? Figure 3, panels A and B, shows the fiscal multipliers associated with expansion and recession. In line with our findings for OECD countries, the fiscal multiplier in recessions is larger than in good times (particularly in the medium and long run). Specifically, the impact multiplier in recessions and expansions is fairly similar at, respectively, 0.24 and 0.21, and significantly different from zero. However, the peak multiplier during recessions (0.81) is two times and a half as high as the peak multiplier during expansions (0.32). Furthermore, the multiplier during expansions becomes insignificantly different from zero after 4 quarters, whereas the multiplier during recessions remains significantly different from zero throughout our estimated horizon.

### 3.3 Multipliers when government spending is increasing/decreasing

Following the empirical specification (3), we will first evaluate whether government spending going up or down matters for the size of the fiscal multiplier (i.e., even before taking into account the stance of the business cycle). For the case of industrial countries, Table 1 indicates that government spending is above the long-term trend 48 percent of the time and below such trend 52 percent of the time.

Figure 4 shows the fiscal multipliers associated with government spending decreases (panel A) and increases (panel B). Interestingly enough, we find that the fiscal multiplier associated with increases in government spending is larger than the one associated with decreases in government spending. In fact, the multiplier for government spending increases is 0.48 on impact (and significantly different from zero) and reaches a maximum of about 1.36 after four semesters. In sharp contrast, the multiplier when government spending falls is never significantly different from zero.

When comparing these multipliers to the ones obtained in section 3.2, interesting similarities emerge. The profile obtained for the fiscal multiplier in periods of expansion (Figure 2,



panel A) is similar to the fiscal multiplier associated with decreases in government spending (Figure 4, panel A). Both multipliers are not significantly different from zero. By the same token, the profile obtained for the fiscal multiplier in recessions (Figure 2, panel B) is similar to the fiscal multipliers associated with increases in government spending (Figure 4, panel B). Both fiscal multipliers have initial values that are less than 1 (but significantly different from zero) and long-run values that are larger than 1.

A somewhat different picture emerges for developing countries. The multiplier when government spending goes up (Figure 5, panel B) is barely significant on impact, reaches a peak of 0.64 after 3 quarters but becomes insignificant after around 4 quarters. Hence, increasing government spending seems much less effective in developing countries compared to industrial countries. As discussed below, this could be due to the fact that we see much less countercyclical fiscal policy in developing countries compared to industrial countries.<sup>14</sup>

A similar pattern emerges for the multiplier when government spending is falling (Figure 5, panel A). While the impact multiplier is 0.37 (and significantly different from zero), it becomes insignificant after four quarters.

### **3.4 Fiscal multipliers in recessions and expansions: Does it matter whether government spending is increasing or decreasing?**

Motivated by the findings from Sections 3.2 and 3.3, we now follow specification (4) and look into the possible interaction between recession/expansion and government spending increasing or decreasing.

Since we know from Figure 4 that, all else equal, the multiplier is higher when government spending is going up than down, one would conjecture that we are underestimating the mul-

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<sup>14</sup>Recall that if we define countercyclical fiscal policy as being in cell (1,1) or (2,2) in Table 1 or 2 (that is, contractionary policy in good times and expansionary policy in bad times), we can see that while industrial countries have spent 56 percent of the time in those cells, developing countries have spent only 36 percent of the time. The other side of the coin, of course, is that developing countries have spent 64 percent of the time pursuing procyclical fiscal policy – capture by cells (2,1) and (1,2) – compared to 44 percent of the time for industrial countries.

multiplier in recessions because, on many occasions, government spending is going down instead of up (which is the implicit expectation). To correct for this “bias”, one should compute the multiplier only in situations of recessions and government spending going up.

To this effect, Figure 6 depicts the multiplier for OECD countries for each of the four possible categories: (i) expansion and reduction in government spending (panel A); (ii) expansion and increase in government spending (panel B); (iii) recession and reduction in government spending (panel C); and (iv) recession and increase in government spending (panel D).

Perhaps not surprisingly, the largest multiplier (in the medium and long run) corresponds to category (iv); that is, recession and increase in government spending (Figure 6, panel D). In this case, the impact multiplier is 0.66 (and significantly different from zero) and reaches 2.32 after four semesters. The long-run (i.e., after 4 semesters) fiscal multiplier in this scenario is almost twice as large (2.32 versus 1.28) than the one found in Figure 2, panel B when we just focused on recessions without distinguishing between government spending going up or down. In sum, we see that, by not differentiating between increases or reductions in government spending, we are underestimating the value of the multiplier when government spending increases in bad times, which is presumably the case that we care about the most. Conceptually, the multiplier shown in Figure 2, panel B is an “average” of panels C and D in Figure 6.

In contrast, the long-run implications of reducing government spending in a recession (Figure 6, panel C) are not significantly different from zero. In other words, the long term effects of fiscal austerity packages that emphasize government spending cuts seem to be relatively small (particularly when executed under typical recessionary environments). The impact multiplier, however, is 0.78 (and significantly different from zero) and reaches a peak of 0.83 (and significantly different from zero) after 2 semesters. But after around 3 semesters, the multiplier becomes insignificant. This implies that the short and medium term effects of fiscal austerity packages that emphasize government spending cuts are not trivial (this result emerges only

when distinguishing government increases from decreases). In other words, and all else equal, this implies that the debt-to-GDP ratio will, in principle, barely improve (at least in the short and medium term) as a one dollar spending cut will reduce GDP by around 80 cents within a one year framework. These results are consistent with the “short-run pain, long-run gain” arguments often made when considering the implications of austerity packages. As we will see in Section 4, this is not the case when evaluating the implications of fiscal austerity packages in the context of extreme recessionary environments, where the remedy could actually be worse than the disease, and debt to GDP ratios could worsen as a consequence of fiscal tightening at all time horizons.

A similar situation arises when considering expansions, as illustrated in Figure 6, panel A and B. Recall that when we do not differentiate whether government spending is going up or down, the multiplier is zero (Figure 2, panel A). Once one makes this distinction, the multiplier when government spending is going up becomes significantly different from zero after about 1 semester, eventually reaching 1.13, as follows from Figure 6, panel B. In contrast, panel A indicates that the fiscal multiplier is essentially zero at all horizons in the case that government spending is falling during a recession.

Table 3 summarizes our results in the 2x2 matrix discussed in the introduction. As discussed above, the largest peak multiplier (2.31) is by far the one that applies to cell (2,2) where the government is pursuing countercyclical fiscal policy in bad times.

What happens in developing countries? Results are shown in Figure 7. In contrast to the case of industrial countries, the fiscal multiplier obtained for recessions when government spending is going down (panel C) is significantly different from zero at all time horizons.<sup>15</sup> The multiplier is 0.51 on impact, reaches a peak of 0.90 after three quarters and a value of 0.78 in the long run (i.e., after 8 quarters). On the other hand, the multiplier in recessions

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<sup>15</sup>This provides empirical support to the “when-it-rains-it-pours” phenomenon” identified by Kaminsky, Reinhart, and Vegh (2004).

and government spending going up (panel D) is not significantly different from zero on impact and becomes insignificant again after about five quarters. In sum, the significant multiplier observed in recessions (Figure 3, panel B) seems to be mostly explained by the case in which government spending is contracting (procyclical fiscal policy).

When it comes to expansions, the fiscal multiplier is statistically zero at all times horizons when government spending is contracting (panel A) and becomes insignificant after only three quarters when government spending is increasing (panel B).

Table 4 summarizes our multiplier results for developing countries in the 2x2 matrix discussed in the introduction. As argued above, the most relevant multiplier appears to be the one corresponding to cell (2,1), which is the case of procyclical fiscal policy (contractionary fiscal policy in bad times).

In sum, the picture that emerges for developing countries appears to be that countercyclical fiscal policy is rather ineffective whereas procyclical fiscal policy in bad times is particularly damaging.

## 4 Typical versus extreme business cycles

This section evaluates the size of fiscal multipliers in more severe/extreme recessions (like the ones recently experienced in some OECD countries) or, alternatively, during extreme booms.<sup>16</sup> First, what happens when we do not differentiate between increases and decreases in government spending? Like in typical expansions, the multiplier in extreme expansions is not significantly different from zero on impact and remains insignificant for any horizon (Figure 8, panel A). In contrast, however, the fiscal multiplier in extreme recessions (panel B) is much larger than in typical recessions; almost 70 percent higher. On impact, the fiscal multiplier is smaller than one (0.73) in a typical recession but greater than one (1.21) in an

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<sup>16</sup>Recall from Section 2 that we define extreme expansions and recessions as those computed for the cases in which  $I(.) = 0$  and  $I(.) = 1$ , respectively, where  $I(.)$  is the transition function for each country.

extreme recession. In the long run, while the fiscal multiplier is 1.28 in a typical recession, it is 2.13 in an extreme recession. In other words, the size of the fiscal multiplier significantly increases with the severity of the recession but remains zero during booms.

A similar pattern emerges during recessions in developing countries (Figure 9, panel B). While the impact effect remains essentially the same (0.24 in typical recessions versus 0.26 in extreme recessions), the peak effect increases almost 50 percent (from 0.81 to 1.18) and the long term effect increases by about 85 percent (from 0.39 to 0.72). Still, like in Section 3.2, the multipliers for developing countries are smaller than those observed in the industrial world.

What happens if we also differentiate between increases and decreases in output? Figure 10 shows the results for OECD countries. Two results are worth noting. First, the size of the fiscal multiplier associated with spending increases in extreme recessions (Figure 10, panel D) is almost 40 percent larger than in typical recessions (Figure 6, panel D): the impact effect increases from 0.66 to 0.90 and the long term effect increases from 2.32 to 3.20. Maybe even more strikingly, the implications of spending cuts significantly change. While, as discussed in section 3.4, our findings for typical recessions were consistent with the “short-run pain and long-run gain” arguments often heard when considering the implications of austerity packages, this is not the case when focusing on extreme recessions.

In extreme recessions, cutting spending reduces output for any time horizon (Figure 10, panel C) and, more importantly, such effect is always larger than one. While, on impact, the size of the fiscal multiplier associated with a spending decrease is, for a typical recession, 0.78, it reaches 1.27 in an extreme recession. Moreover, the long run effect reaches 1.69. In other words, the remedy could be worse than the disease, and debt to GDP ratios could worsen as a consequence of fiscal tightening at all time horizons as the denominator decreases at a faster rate than the numerator. This result is consistent with the recent evidence observed in Greece where in spite of strong fiscal cuts, the debt-to-GDP ratio has increased rather than

decreased.

We see a similar change in the size of fiscal multipliers in developing countries (Figure 11). The peak effect associated with an increase in government spending in an extreme recession (panel D) increases 40 percent (from 0.78 to 1.1). In the same vein, the contractionary effect of a spending cut in extreme recessions (panel C) increases by about 35 percent on impact (from 0.51 to 0.68) and 65 percent in the long run (from 0.78 to 1.29).

## 5 Conclusions

This paper has shown that when computing fiscal multipliers in expansion and recession, it is critical also to distinguish between times in which government spending increases and times in which government spending decreases. In the case of industrial countries, failure to do so introduces a downward bias in the estimation of the multiplier in recession because it includes cases in which government spending has gone down in bad times, which in and of itself results in a much lower multiplier in the long run. Specifically, the long-run multiplier for recession and government spending going down is 2.3 compared to 1.3 when we just distinguish between recession and expansion.

For developing countries, we find that ignoring whether government spending is going up or down also biases the estimation but for different reasons. In this case, the larger multiplier obtains for the case of recession and government spending decreases, which implies that the traditionally procyclical fiscal policy followed by developing countries has amplified the business cycle in the downturn (the “when-it-rains-it-pours phenomenon”).

When computing multipliers for extreme booms and recessions, we find that, in extreme recessions, cutting spending reduces output for any time horizon, with a long-run multiplier of 1.69. Applied to the current debate on austerity in the Eurozone, this would imply that debt-to-GDP ratios would *increase* in response to cuts in fiscal spending.

In general, our findings raise some intriguing analytical questions. The main question would be why changes in government spending may have an asymmetric effect in recession. Understanding why the effect may be asymmetric in good times is, in principle, much easier because in a situation of full employment, increases in government spending should have no effect whereas reductions should. A second analytical question would be how to explain the different responses to fiscal contraction in industrial and developing countries.

In terms of policy prescriptions, our findings stress the importance of computing the fiscal multiplier in recession and when government spending is going up (which is presumably the most relevant scenario for policy makers). Failure to do so may greatly bias the relevant estimate and hence misinform policy makers in their decision process.

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**Table 1. OECD countries. Using cyclical components of GDP and government spending**

		Spending policy		<i>Total</i>
		Contractionary	Expansionary	
Stance of the economy	Expansion	29% <u>59%</u>	21% <u>41%</u>	50% <u>100%</u>
	Recession	23% <u>46%</u>	27% <u>54%</u>	50% <u>100%</u>
Total		52%	48%	100%

The economy is defined as being in an expansion (recession) if real GDP is above (below) trend. The same definition applies to government spending. Trends were calculated using the HP filter.

**Table 2. Developing countries. Using cyclical components of GDP and government spending**

		Spending policy		<i>Total</i>
		Contractionary	Expansionary	
Stance of the economy	Good time	18% <u>38%</u>	31% <u>62%</u>	49% <u>100%</u>
	Bad time	33% <u>65%</u>	18% <u>35%</u>	51% <u>100%</u>
Total		51%	49%	100%

The economy is defined as being in an expansion (recession) if real GDP is above (below) trend. The same definition applies to government spending. Trends were calculated using the HP filter.

**Table 3. Multipliers (typical expansions and recessions).  
OECD countries. Using spending forecast errors**

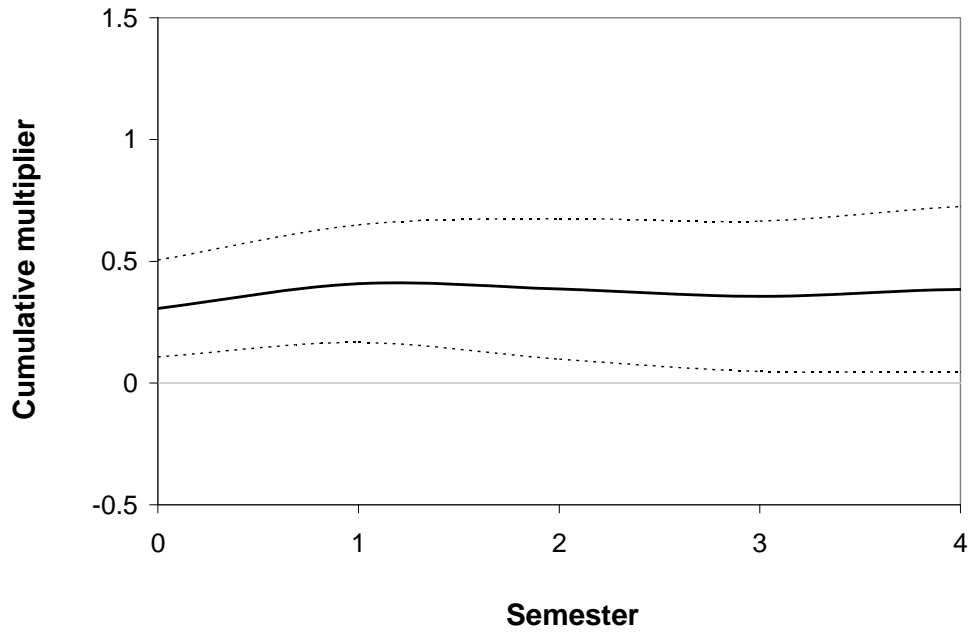
		Spending policy	
		Contractionary	Expansionary
Stance of the economy	Good time	impact: $\approx 0$ peak: $\approx 0$	impact: $\approx 0$ peak: 1.13
	Bad time	impact: 0.77 peak: $\approx 0$	impact: 0.66 peak: 2.31

**Table 4. Multiplier (typical expansions and recessions).  
Developing countries. Using spending growth rate**

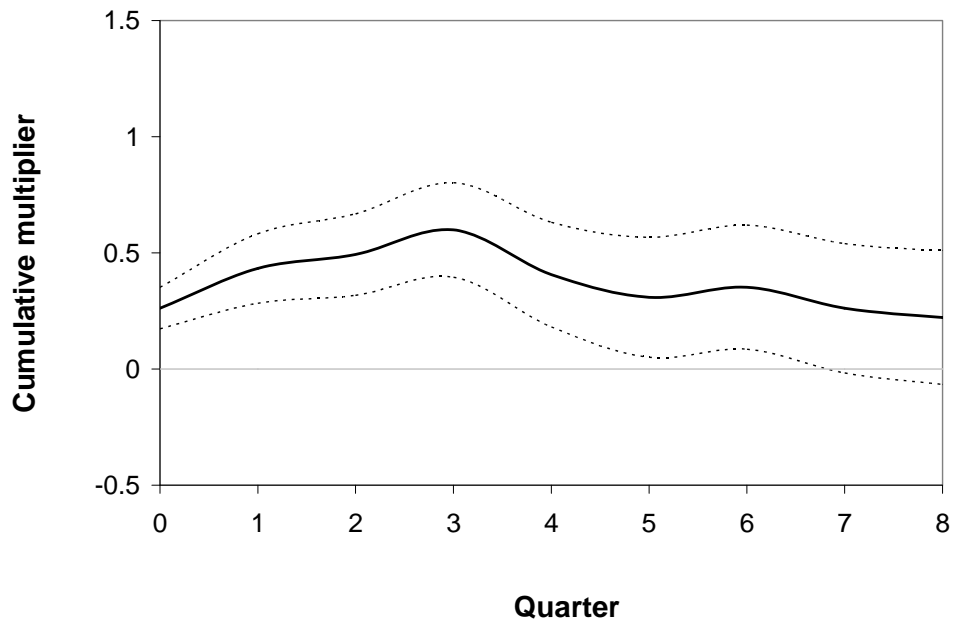
		Spending policy	
		Contractionary	Expansionary
Stance of the economy	Good time	impact: $\approx 0$ peak: $\approx 0$	impact: $\approx 0$ peak: 0.34
	Bad time	impact: 0.55 peak: 0.77	impact: $\approx 0$ peak: 0.77

**Figure 1. Cumulative spending multiplier +/- 90 confidence intervals.  
Single multiplier. OECD countries.**

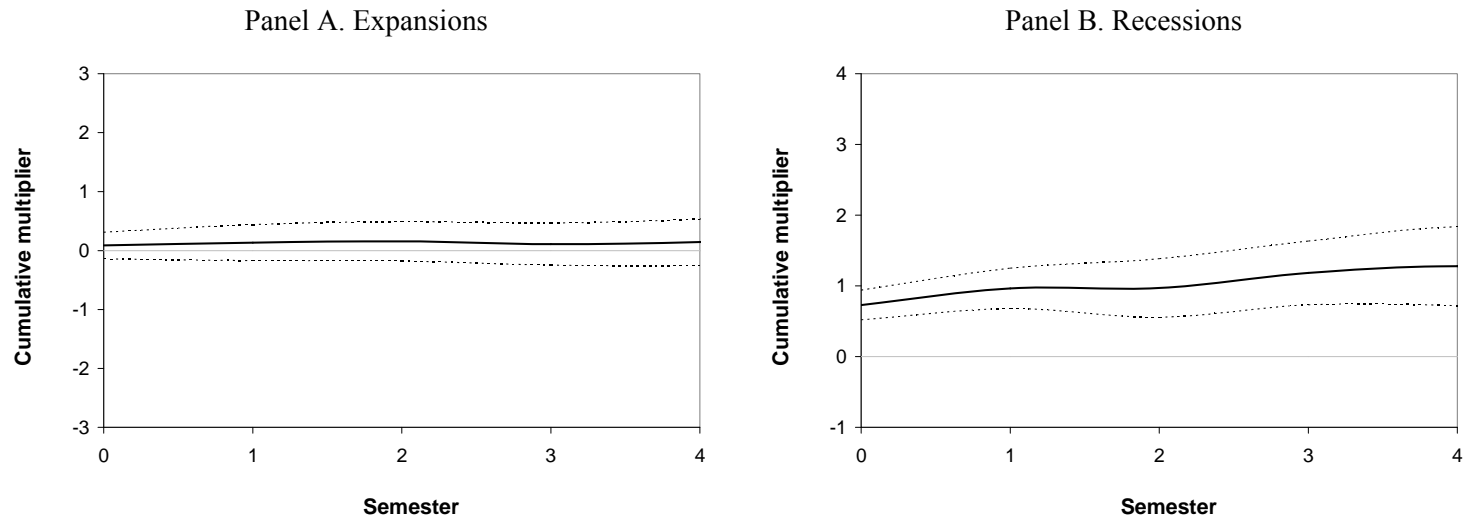
Panel A. OECD countries. Using spending forecast errors



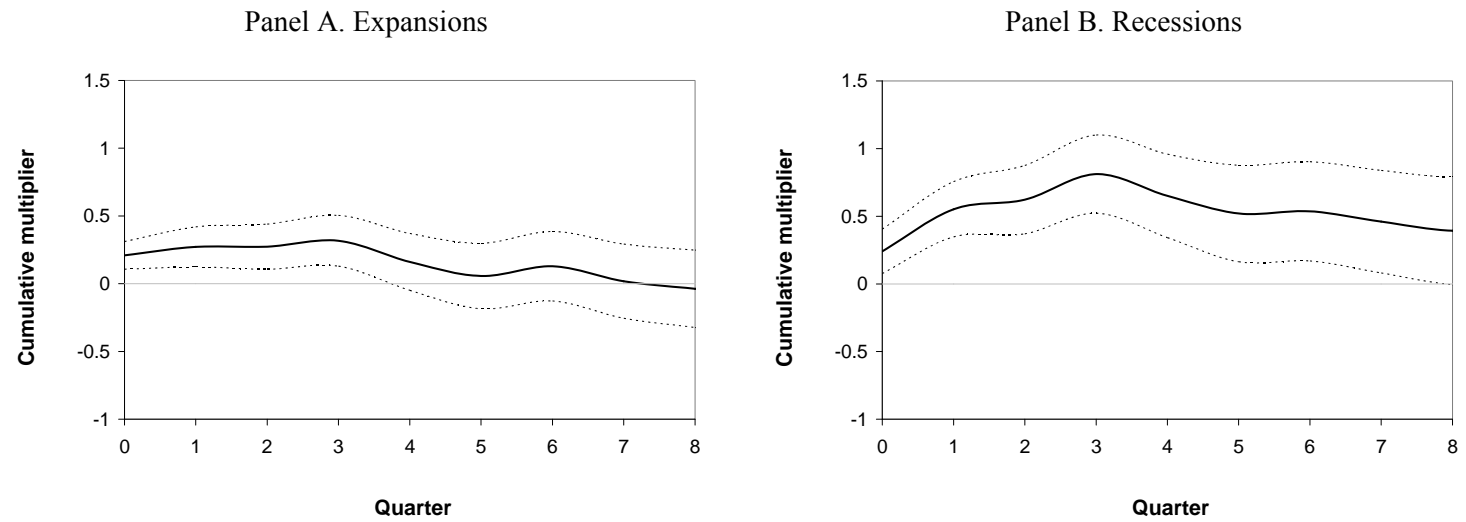
Panel B. Developing countries. Using spending growth rate



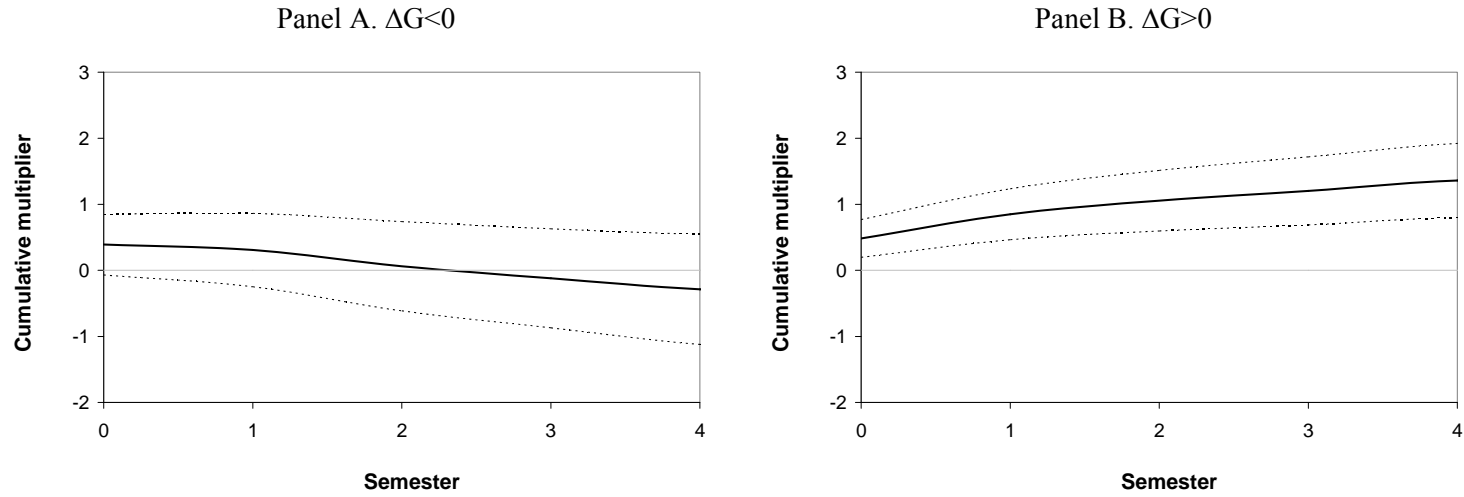
**Figure 2. Cumulative spending multiplier +/- 90 confidence intervals.  
Using spending forecast errors. Typical economic expansions versus recessions. OECD countries**



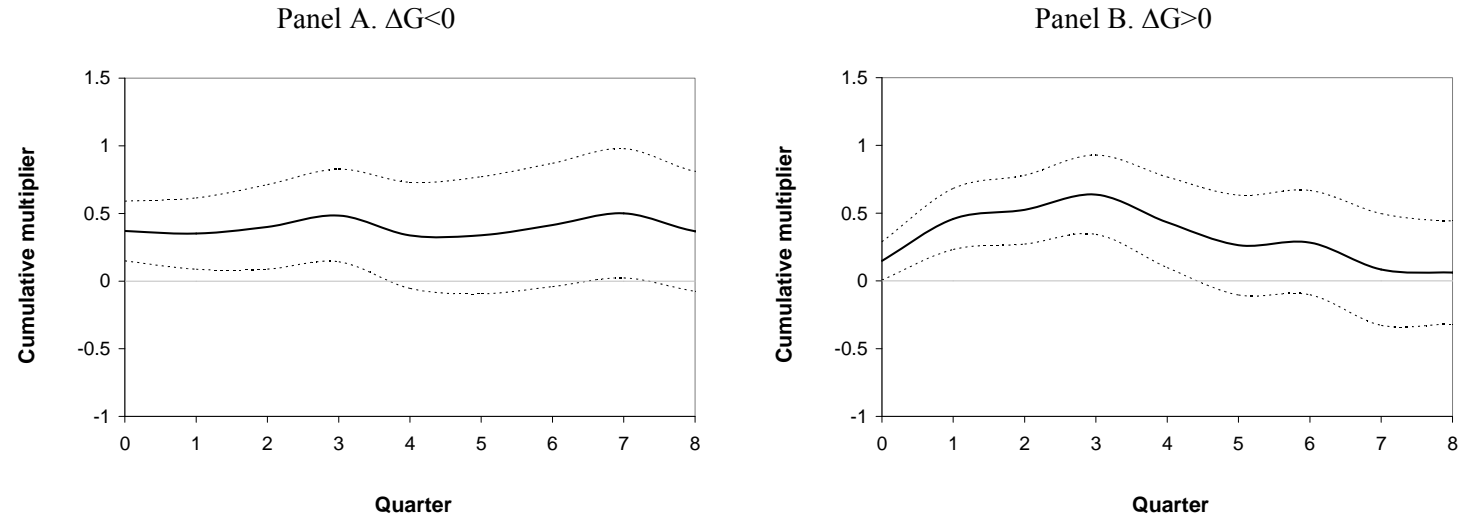
**Figure 3. Cumulative spending multiplier +/- 90 confidence intervals.  
Using spending growth rate. Typical economic expansions versus recessions. Developing countries.**



**Figure 4. Cumulative spending multiplier +/- 90 confidence intervals. Using spending forecast errors. Increases ( $\Delta G > 0$ ) versus decreases ( $\Delta G < 0$ ) in spending. OECD countries**

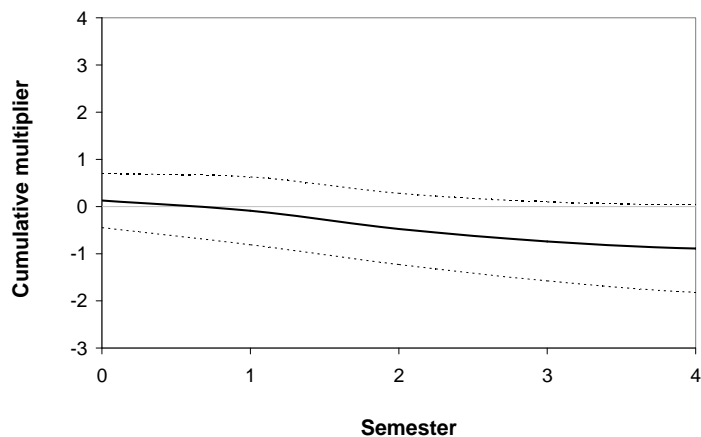


**Figure 5. Cumulative spending multiplier +/- 90 confidence intervals. Using spending growth rate. Increases ( $\Delta G > 0$ ) versus decreases ( $\Delta G < 0$ ) in spending. Developing countries.**

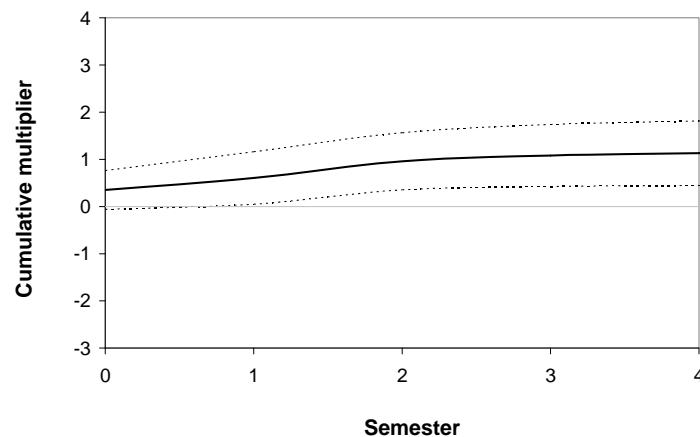


**Figure 6. Cumulative spending multiplier +/- 90 confidence intervals. Using spending forecast errors. Typical economic expansions versus recessions, and increases ( $\Delta G > 0$ ) versus decreases ( $\Delta G < 0$ ) in spending. OECD countries.**

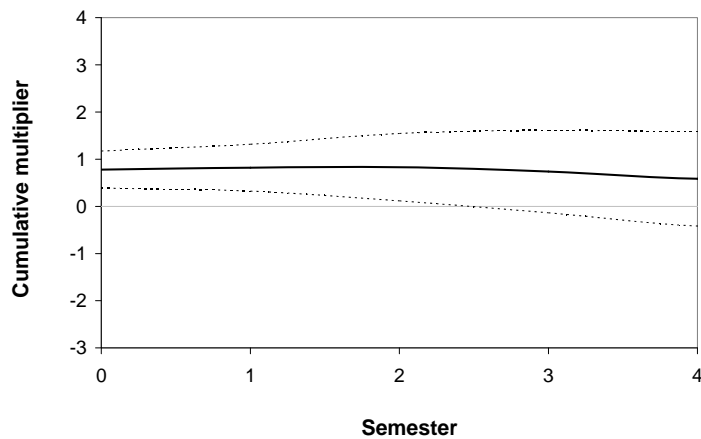
Panel A. Expansions &  $\Delta G < 0$



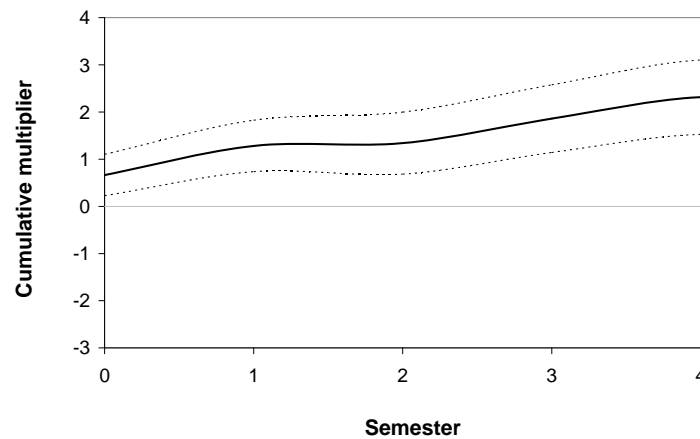
Panel B. Expansions &  $\Delta G > 0$



Panel C. Recessions &  $\Delta G < 0$

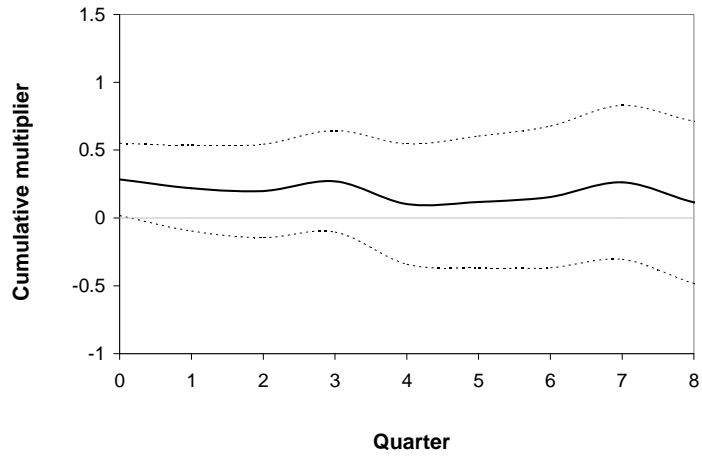


Panel D. Recessions &  $\Delta G > 0$

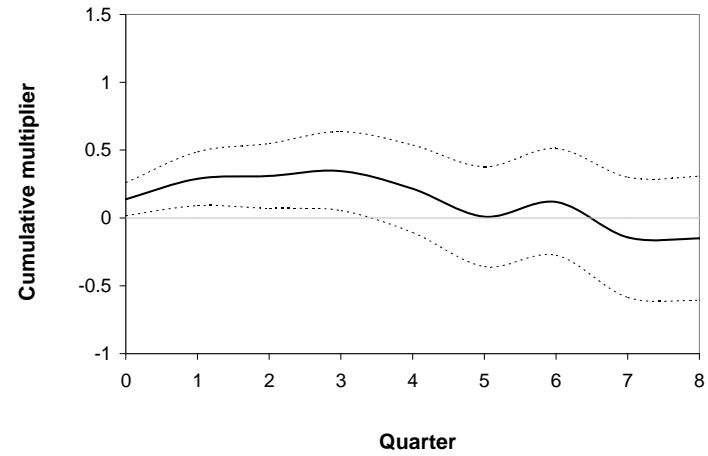


**Figure 7. Cumulative spending multiplier +/- 90 confidence intervals. Using spending growth rate. Typical economic expansions versus recessions, and increases ( $\Delta G > 0$ ) versus decreases ( $\Delta G < 0$ ) in spending. Developing countries.**

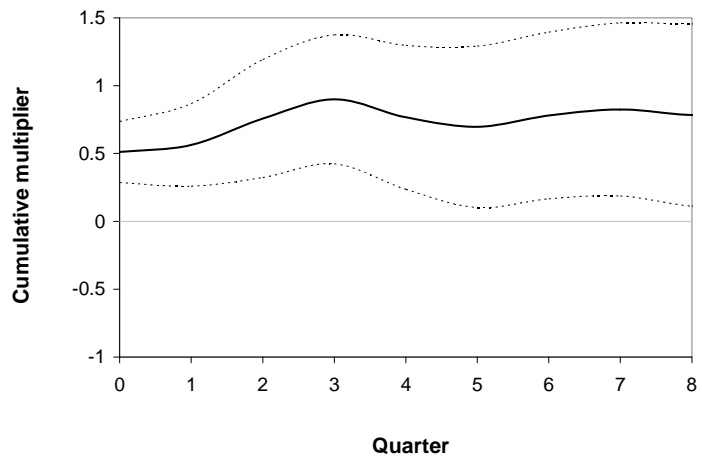
Panel A. Expansions &  $\Delta G < 0$



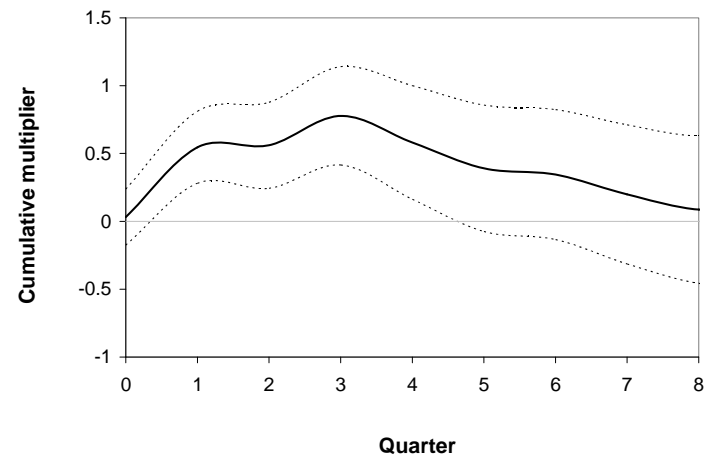
Panel B. Expansions &  $\Delta G > 0$



Panel C. Recessions &  $\Delta G < 0$

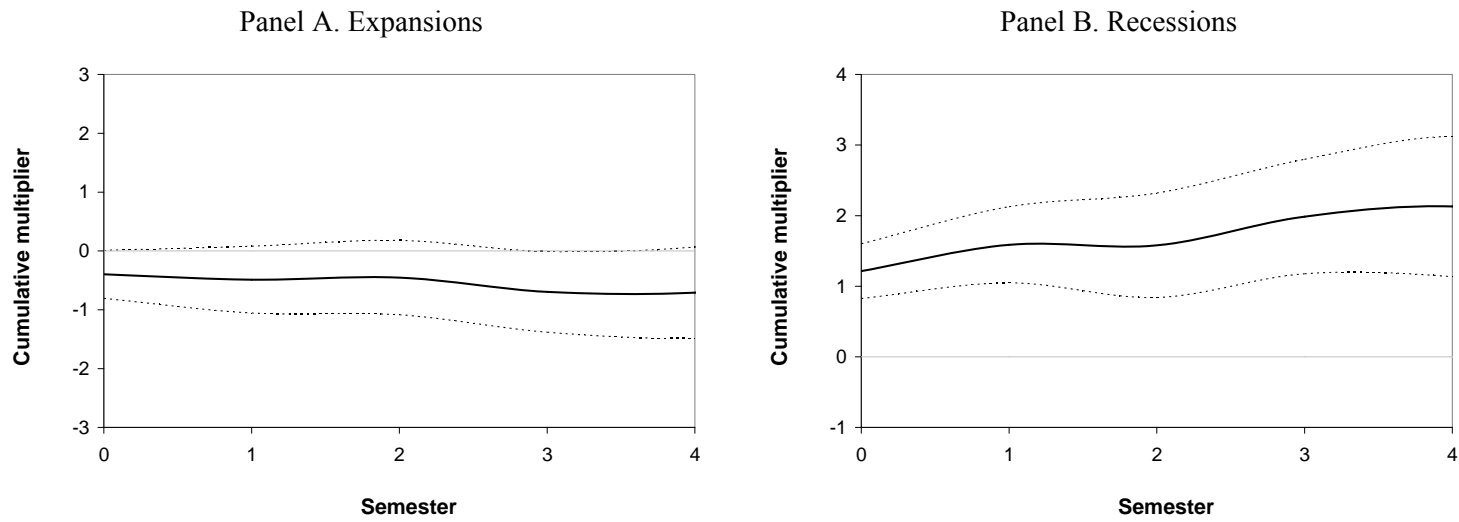


Panel D. Recessions &  $\Delta G > 0$

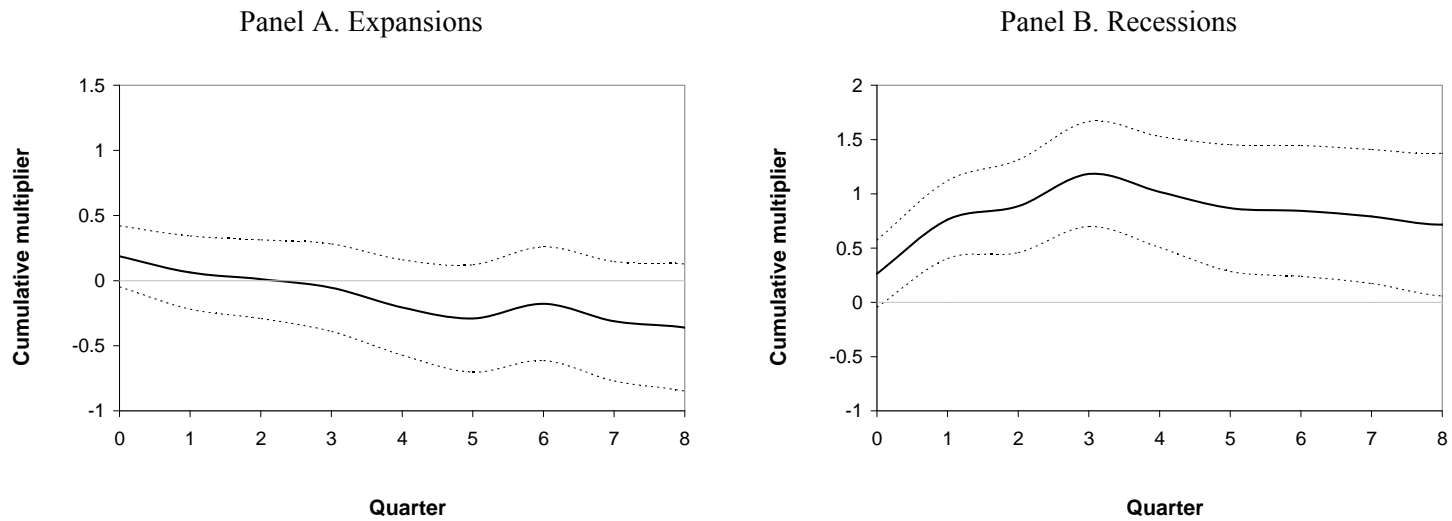




**Figure 8. Cumulative spending multiplier +/- 90 confidence intervals.**  
**Using spending forecast errors. Extreme economic expansions versus recessions. OECD countries**

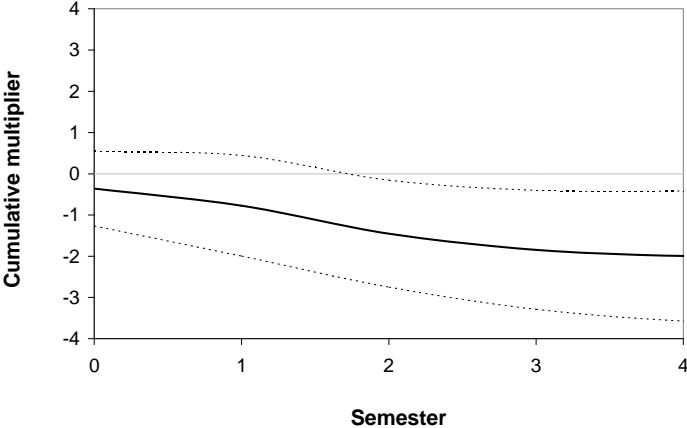


**Figure 9. Cumulative spending multiplier +/- 90 confidence intervals.**  
**Using spending growth rate. Extreme economic expansions versus recessions. Developing countries**

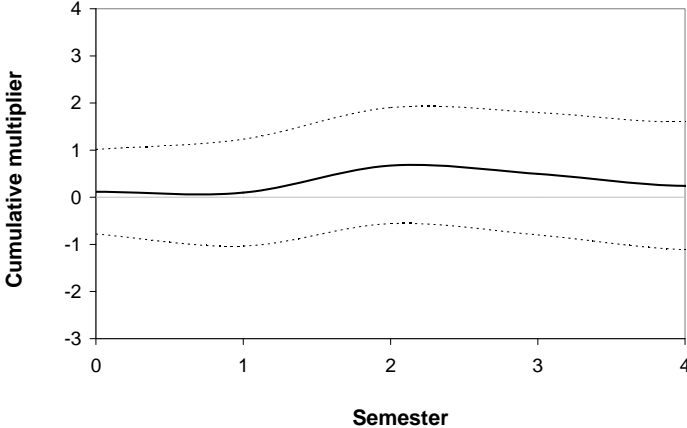


**Figure 10. Cumulative spending multiplier +/- 90 confidence intervals. Using spending forecast errors. Extreme economic expansions versus recessions, and increases ( $\Delta G > 0$ ) versus decreases ( $\Delta G < 0$ ) in spending. OECD countries.**

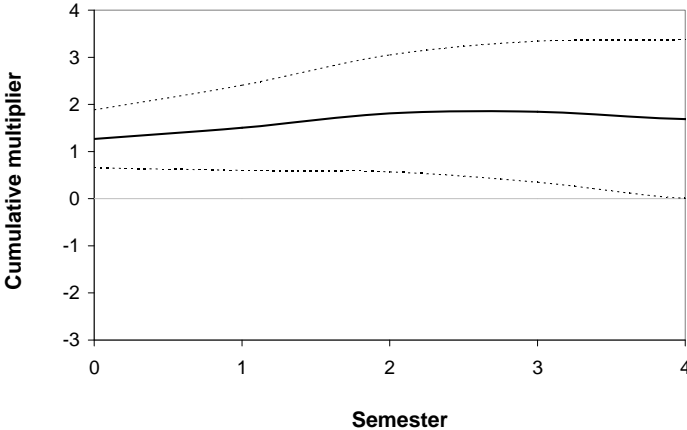
Panel A. Expansions &  $\Delta G < 0$



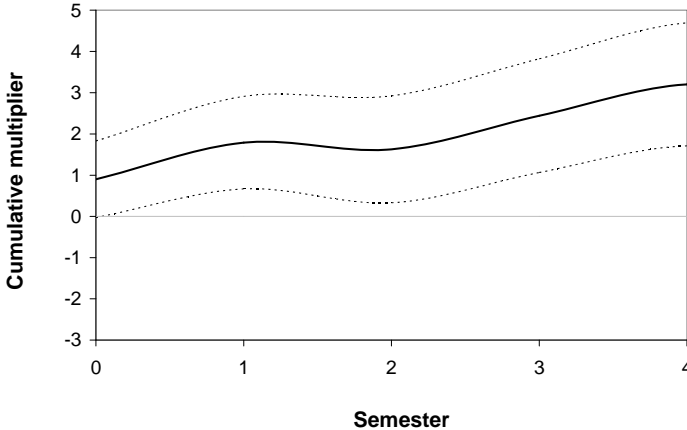
Panel B. Expansions &  $\Delta G > 0$



Panel C. Recessions &  $\Delta G < 0$

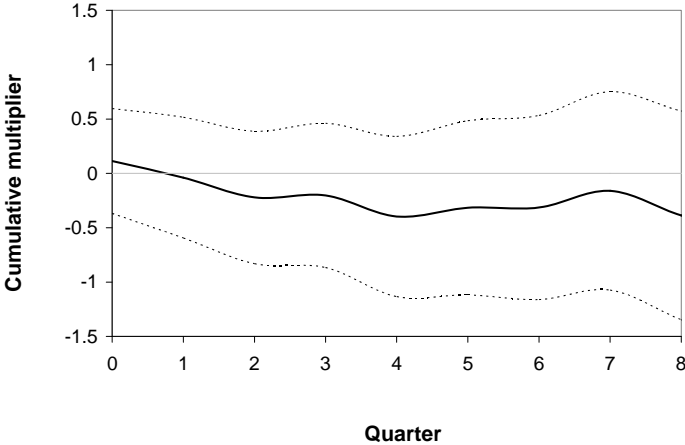


Panel D. Recessions &  $\Delta G > 0$

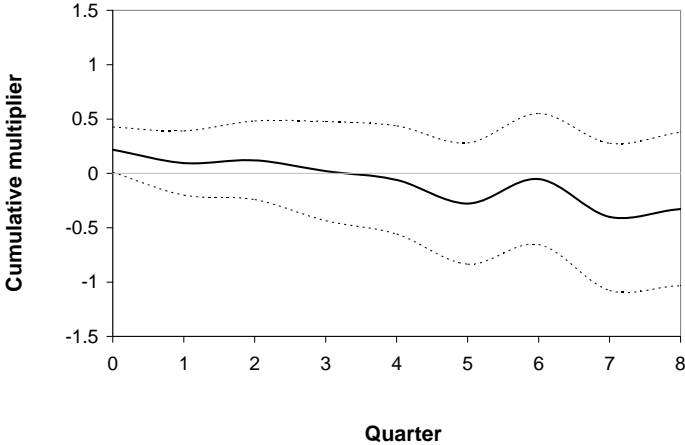


**Figure 11. Cumulative spending multiplier +/- 90 confidence intervals. Using spending growth rate. Extreme economic expansions versus recessions, and increases ( $\Delta G > 0$ ) versus decreases ( $\Delta G < 0$ ) in spending. Developing countries.**

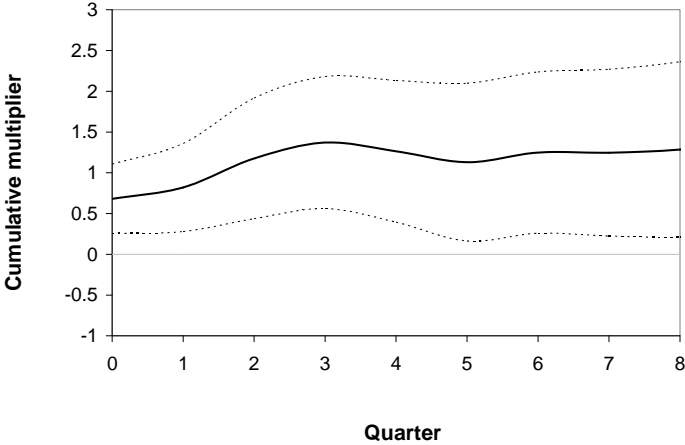
Panel A. Expansions &  $\Delta G < 0$



Panel B. Expansions &  $\Delta G > 0$



Panel C. Recessions &  $\Delta G < 0$



Panel D. Recessions &  $\Delta G > 0$

