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Procyclicality or Reverse Causality?

by

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Abstract[*]

There is a large literature showing that fiscal policy is either acyclical or countercyclical in industrial countries and procyclical in developing countries. Most of this literature is based on OLS regressions that focus on the correlation between a fiscal variable (usually the budget balance or expenditure growth) and either GDP growth or some measure of the output gap. This paper argues that such a methodology does not permit the identification of the effect of the business cycle on fiscal policy and hence cannot be used to estimate policy reaction functions. The paper proposes a new instrument for GDP growth and shows that, once GDP growth is properly instrumented, procyclicality tends to disappear.

JEL Codes: E62, E32, H62
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* Jaimovich is with the Research Department of the Inter-American Development Bank (email: danyj[at]iadb.org) and Panizza is with the Debt and Development Finance Branch of DGDS/UNCTAD (email: firstname.lastname@unctad.org). When we first found the results described in this paper, we thought that they did not make much sense and we would have never written the paper without the encouragement of Roberto Rigobón. We also received useful comments from Eduardo Borensztein, Eduardo Cavallo, Eduardo Levy-Yeyati, Roque Fernández, Alejandro Micco, and seminar participants at the Inter-American Development Bank and at Universidad Torcuato di Tella. The usual caveats apply.

1. Introduction

In an influential paper published in 1997, Michael Gavin and Roberto Perotti compared the main characteristics of fiscal policy in Latin America with the behavior of fiscal policy in the OECD countries. The main finding of Gavin and Perotti's work was that, when compared with industrial countries, fiscal policy in Latin America is volatile and procyclical. Several other authors have corroborated Gavin and Perotti's (1997) original results, extending them to other developing regions, and by now almost no one questions the fact that fiscal policy is procyclical in developing countries.[1] Kaminsky, Reinhart and Végh (2004), for instance, jointly examine the procyclicality of capital flows, monetary policy, and fiscal policy, and their results are on the whole consistent with those of Gavin and Perotti (1997). In particular, they find that macroeconomic policies tend to be either acyclical or countercyclical in industrial countries and procyclical in developing countries.

Given the consensus on the procyclicality of fiscal policies in developing countries, recent research has focused on its causes. Gavin and Perotti's (1997) original contribution argued that developing countries find it hard to follow a countercyclical policy because they lack access to international credit during recessions, suggesting that any explanation of the procyclical behavior documented above needs to keep into account the *precarious creditworthiness* of developing countries.[2] Kaminsky, Reinhart and Végh (2004) corroborate their results by showing that capital flows to developing countries tend to be procyclical.

A second class of explanations focuses on political rather than market failures. Tornell and Lane (1999) describe voracity effects that arise in the presence of various interest groups that compete for a share of tax revenues and treat the country's resources as a common pool. The presence of such groups generates procyclicality because, when there is a positive shock to the country's resources, no group will be willing to moderate its claims on the increased resources as it knows that the saved resources will be appropriated by another group. Talvi and Végh (2005) use a model that assumes that fiscal surpluses will generate political pressures for wasteful public spending and show that a benevolent social planner can limit wasteful public expenditure by

[1] Gavin and Perotti (1997) also emphasized that the difference between industrial countries and Latin America was particularly large during bad times. Some authors found asymmetries in industrial countries, with fiscal policies being countercyclical in bad times and acyclical or procyclical in good times (see Balassone and Francese, 2004, and Manasse, 2006). We discuss these issues in Section 6.

[2] Riascos and Végh (2003) and Caballero and Krishnamurthy (2004) emphasize market incompleteness and Alberola and Montero (2006) argue that procyclicality is linked to the perception of sustainability of public debt.

decreasing taxes during booms (and hence avoiding accumulating surpluses) and increasing taxes during recessions, Alesina and Tabellini (2005) show that this is an optimal behavior in the presence of voters with imperfect information and corrupt politicians. Alesina and Tabellini's (2005) empirical analysis is consistent with the main predictions of their model and shows that procyclicality is positively correlated with corruption. Calderón, Duncan, and Schmidt-Hebbel (2004) focus on 20 emerging market countries and also find that procyclicality depends on institutional quality (countries with higher levels of institutional quality are less procyclical). Akitoby et al. (2004) find that procyclicality tends to be lower in richer countries with less concentrated political power, lower institutional quality, and larger public sectors. Braun (2001) also finds that public sector size is an important determinant of procyclicality and that transfers act as automatic stabilizers and reduce procyclicality. Manasse (2006) finds that fiscal rules tend to reduce procyclicality but that this result is not robust to controlling for institutional quality.

A third possible explanation is that procyclicality occurs because fiscal outlays converge over time to a desired level determined by long-run fundamentals and that the speed of convergence increases with the distance between desired and actual spending. In this setting, procyclicality is generated by the fact that convergence is faster during booms than during recessions, suggesting that governments in economies in which public spending is below the optimal level are hard-pressed to spend whatever windfall they receive almost immediately (Galiani and Levy-Yeyati, 2006).

In this paper, we move one step back and check whether the standard procyclicality result is due to reverse causality. In particular, we recognize that when looking at the correlation between GDP growth and macroeconomic policies there is an important endogeneity problem and we address this problem with a new instrument for GDP growth.[3] We are not the first to raise this issue. Reverse causality was already mentioned by Gavin and Perotti (1997) and was explored by Galí and Perotti (2003) in their study of how the Maastricht treaty affected fiscal cyclicality in the euro area, and by Rigobón's (2004) discussion of Kaminsky, Reinhart and Végh (2004). However, we think that this paper is the first to explore the issue in detail and to use an instrument that can successfully deal with the reverse causality issue in a large sample of countries.

[3] We are grateful to Alejandro Micco for suggesting the use of this instrument.

The paper is organized as follows. Section 2 describes the data, and Section 3 runs a set of OLS regression and reproduces the standard result that the correlation between fiscal policy indicators and GDP growth is consistent with procyclicality in developing countries and countercyclicality or acyclicality in industrial countries. Section 4 discusses the endogeneity problem, while Section 5 discusses the validity of our instrument and reports our instrumental variable estimations. Section 6 analyzes the cyclicality of fiscal policy in good and bad times, and Section 7 concludes.

2. The Data

We study the cyclical properties of fiscal policy using an unbalanced panel covering 118 countries over the 1970-2003 period. Our data are drawn from publicly available sources (the International Financial Statistics and Government Finance Statistics produced by the International Monetary Fund) and focus on central government. Hence, they somewhat differ from those of Kaminsky, Reinhart, and Végh (2004), which are from International Monetary Fund's World Economic Outlook database (which is not publicly available), and those of Gavin and Perotti (1997), which focus on general government and include subnational governments and state-owned enterprises.

Table 1 describes our main variables, dividing the data into six (sometimes overlapping) groups of countries. The main country groups are industrial countries (23 countries for a total of 456 observations) and developing countries (95 countries for a total of 1514 observations), but we also follow Kaminsky, Reinhart, and Végh (2004) and split the developing countries group into three groups of countries classified according to their level of income. The middle-high income group includes 34 countries (472 observations), the middle-low income group includes 27 countries (505 observations) and the low income group includes 33 countries (527 observations).[4] Finally, we also report summary statistics for the sub-sample of 13 Latin American countries (200 observations) studied by Gavin and Perotti (1997).

Focusing on the budget balance, developing and industrial countries look similar (even though developing countries have a higher variance). Within developing countries, middle-high income countries tend to have the lowest average deficit (about 2 percent of GDP, but this is also

[4] We classify countries following a criterion similar to the one adopted by Kaminsky, Reinhart, and Végh (2004). Appendix A presents detailed definition of the variables and sources and a list of countries included in each group.

the group with the highest variance), and low income countries have the highest average deficit. The Latin American sample of Gavin and Perotti (1997) has characteristics similar to those of the middle-high income group. The second panel of Table 1 shows that the growth rate of public expenditure is higher in developing countries than in industrial countries and it reaches a maximum in the group of middle-high income countries. The third panel shows that GDP growth tends to be substantially higher in developing countries, a fact that could be partially explained by higher populations growth in these countries and by the presence of several fast-growing emerging market countries. The table also shows that GDP growth is more volatile in developing countries, as is the real external shock summarized in the last panel.[5]

3. Correlation between Fiscal Variables and GDP Growth

As one of the aims of this paper is to challenge the conventional wisdom that fiscal policy is procyclical in developing countries, we need to start by showing that our results are not driven by the fact that we do not use the same data or the same techniques used in previous studies. The objective of this section is thus to show that we can use our data and methodology to reproduce the standard results highlighted in the previous literature.

We start by following Gavin and Perotti (1997) and focus on the budget balance expressed as a share of GDP. Next, we recognize Kaminsky, Reinhart, and Végh's (2004) criticism of this measure and study procyclicality using government expenditure. All our specifications follow the standard approach of regressing a fiscal indicator on real GDP growth, the change in terms of trade, the lagged fiscal balance, and a set of country fixed effects.[6] Formally, we estimate the following regression:

$$FISC_{i,t} = \alpha_i + \beta GDP\_GR_{i,t} + \gamma \Delta TOT_{i,t} + \delta DEF_{i,t-1} + \varepsilon_{i,t} \qquad (1)$$

where *FISC* if a fiscal indicator, α is a country fixed effect, *GDP_GR* is real GDP growth, ΔTOT is the percentage change in terms of trade, and *DEF* is the deficit over GDP.[7] Within this set-up,

[5] We describe the construction of the external shock variable in Section 4.

[6] While this approach is rather standard, some authors (notably Kaminsky, Reinhart, and Végh, 2004) do not focus on regression analysis but on simple correlations based on detrended series. As our ultimate objective is to run an instrumental variable model, we do not focus on simple correlations, but show that equation 1 yields results that are comparable with those of Kaminsky, Reinhart, and Végh (2004).

[7] Other authors measure GDP and the fiscal indicators as deviations from their long-run trend, sometimes using the Hodrik-Prescott filter to detrend the original series. As detrending is always problematic (especially in developing countries, Aguiar and Gopinath, 2004) and as the two techniques yield similar results, we focus on this simpler

the degree of cyclicality of the fiscal variable is usually determined by looking at the sign and size of the coefficient β.

By running the above regression using as dependent variable the fiscal balance divided by GDP, Gavin and Perotti (1997) find that in industrial countries β is positive (with a value of approximately 0.37) and statistically significant. However, when the authors focus on Latin America, they find that β is close to zero and not statistically significant. They argue that the lack of a positive relationship between growth and the fiscal balance suggests that discretionary fiscal policies are procyclical because, in absence of such a procyclical response, the fiscal balance would automatically be positively correlated with growth.

As our dataset is slightly different from that of Gavin and Perotti, we start by replicating their results for the overall budget balance. Column 1 of Table 2 focuses on industrial countries and finds that β is equal to 0.312 (a bit lower than Gavin and Perotti's original estimate of 0.368) and significantly greater than zero. Column 2 focuses on the same sample of 13 Latin American countries studied by Gavin and Perotti and finds that the coefficient is 0.05 and not statistically significant (Gavin and Perotti found that the coefficient was 0.04 and not statistically significant). While our results are not *identical* to those of Gavin and Perotti, they are surprisingly close to their results (especially given the fact that we use different sources of data and focus on a longer period). In particular, we do reproduce the positive and significant correlation between GDP growth and budget balance in industrial counties and a smaller and not statistically significant correlation in Latin America.[8]

In column 3, we move beyond Latin America and estimate the model for the whole sample of developing countries for which we have data. We now find that β is positive and statistically significant but its magnitude is less than one third that of industrial countries. Furthermore, an F test rejects the null that the coefficient for industrial countries is equal to that of developing countries with a p-value of 0.0001. This confirms that industrial countries differ

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specification that does not require estimating a long-run trend. Note that, as we use country fixed effects, all the variables are to be interpreted as deviations from their long run average. In other words, our model is equivalent to: $\left(FISC_{i,t} - \overline{FISC}_i\right) = \beta\left(GDP\_GR_{i,t} - \overline{GDP\_GR}_i\right) + \gamma\left(\Delta TOT_{i,t} - \overline{\Delta TOT}_i\right) + \delta\left(DEF_{i,t-1} - \overline{DEF}_i\right) + \varepsilon_{i,t}$. As we express our variables in terms of growth rate, our technique is equivalent to the use of detrended series based on a log-linear trend.

[8] Note that the regressions of Table 2 are potentially biased because of the simultaneous inclusion of fixed effects and the lagged dependent variable. When we re-estimated our model using both difference and system GMM

from developing countries with respect to their correlation between GDP growth and budget balance.

In the last three columns, we follow Kaminsky, Reinhart, and Végh (2004) and split the developing country group into the three subsamples described in the previous section. We find that the correlation is the lowest (and not statistically significant) in the sample of middle-high income countries, the highest (about half that of industrial countries), and statistically significant in middle-low income countries, and intermediate (and marginally significant) in the sample of low income countries. These results are somewhat in contrast with those of Kaminsky, Reinhart, and Végh (2004), who find that procyclicality tends to reach a maximum in middle-income countries. This difference in results may be due to the fact that they focus on a different fiscal indicator, an issue to which we turn next.

Kaminsky, Reinhart, and Végh (2004) argue that it is impossible to establish whether policies are procyclical or countercyclical by regressing the budget balance over GDP growth.[9] To demonstrate their point, let us write the fiscal balance (expressed in terms of GDP) as:

$$\frac{BAL}{GDP} = \frac{TAXES - EXPENDITURES}{GDP} \qquad (2)$$

and recognize that taxes are equal to the tax rate (τ) multiplied by the tax base which, in turn, is a positive function of GDP: $TAXES = \tau * BASE = \tau * f(GDP)$ (with $f'>0$). Taking the derivative of $\frac{BAL}{GDP}$ with respect to GDP and assuming that fiscal policy is acyclical (i.e., $\frac{\partial \tau}{\partial GDP} = \frac{\partial EXPENDITURE}{\partial GDP} = 0$) we obtain:

$$\frac{\partial\left(\frac{BAL}{GDP}\right)}{\partial GDP} = \frac{1}{GDP}\left(\tau f' - \frac{BAL}{GDP}\right) \qquad (3)$$

estimators for dynamic panels we found similar results. We consequently continue to use the standard model, which allows us to better compare the results with the IV estimations of Section 5.

[9] Alesina and Tabellini (2005) suggest that this is mostly semantic. In particular, while most authors define as countercyclical a policy that holds constant the tax rate and discretionary spending as a fraction of GDP over the cycle, Kaminsky, Reinhart, and Végh (2004) define such a policy as acyclical.

The sign of this equation is clearly positive if the country has a budget deficit (BAL<0), but it can be either positive or negative if the country has a budget surplus (BAL>0).[10] Hence, an acyclical fiscal policy can yield any sign of $\frac{\partial\left(\frac{BAL}{GDP}\right)}{\partial GDP}$, and we cannot say anything about cyclicality by exploring this derivative. The same criticism could be applied to any attempt to measure the cyclicality of fiscal policy by using taxation or using any fiscal variable expressed as a share of GDP.

Based on this discussion, Kaminsky, Reinhart, and Végh (2004) suggest that procyclicality should be studied using expenditure growth. This is what we do in Table 3. Column 1 focuses on industrial countries and shows that the correlation between expenditure and GDP growth is essentially zero (it is negative and not statistically significant), a fact consistent with an acyclical or countercyclical fiscal policy. The second column shows that the results are unchanged if we exclude the G3 countries (US, Japan and Germany). The third column focuses on developing countries and shows that the coefficient is large, positive, and significantly different from zero (in fact, it is not significantly different from one). This finding is consistent with the presence of a procyclical fiscal policy. Furthermore, the coefficient is also significantly different from that of industrial countries (an F test rejects the null that the coefficients for industrial and developing countries are the same), indicating that the two group of countries have different correlations between GDP growth and expenditure growth. Column 4 shows that procyclicality reaches a maximum in middle-high income countries and tends to be lower in middle-low income and low income countries. This is broadly consistent with the findings of Kaminsky, Reinhart, and Végh (2004), who use different data and different statistical techniques. This confirms that the discrepancy between our results and theirs, documented above, was indeed due to the fact that we were focusing on the budget balance instead of expenditure growth.

Summing up, the results of Tables 2 and 3 show that our data and econometric techniques can be used to reproduce the standard result of countercyclical or acyclical fiscal policy in

[10] We also need to assume that the functional form is invariant with respect to GDP (i.e., that $\frac{\partial^2 f}{\partial GDP^2} = 0$). Relaxing this assumption would strengthen the results that the budget balance is a poor indicator of the degree of cyclicality.

industrial countries and procyclical fiscal policy in developing countries, with procyclicality reaching a maximum in middle-high income countries.

4. Correlation versus Policy Reaction Function

One problem with the regressions of Tables 2 and 3 is that they could provide an estimation of the policy reaction function (and hence a measure of the cyclicality of fiscal policy) only if GDP were exogenous with respect to fiscal policy. This point is well illustrated by Rigobón's (2004) comment on Kaminsky, Reinhart, and Végh (2004). Rigobon points out that the pattern illustrated in the previous section could be due to the fact that developing and industrial countries follow different fiscal policies but could also be due to the fact that the shocks that hit developing countries are different from those that hit industrial countries. Consider the following fiscal policy reaction function:

$$e_t = a + by_t + u_t \qquad (4)$$

where *e* is public expenditure, *y* is GDP, *a* and *b* are parameters to be estimated, and *u* is a shock to public expenditure. In this set up, a procyclical fiscal policy would be associated with a positive *b* and a countercyclical fiscal policy with a negative *b*. Note that Equation (4) resembles Equation (1), and the interpretation of *b* in Equation (4) is exactly the interpretation that the traditional literature has given to the point estimates of β in Equation (1), i.e., the degree of cyclicality of fiscal policy. This would not be a problem if *y* were exogenous with respect to expenditure. However, there is a large literature on Keynesian and non-Keynesian effects of fiscal policy which argues that, at least in the short run, fiscal policy does have an effect on GDP growth. This relationship can be described as:

$$y_t = m + ke_t + v_t \qquad (5)$$

where *m* and *k* are parameters to be estimated and *v* is a shock to GDP. The parameter *k* measures the effect of fiscal policy on GDP and can take either a positive value (Keynesian effect) or a negative value (non-Keynesian effect; see Alesina et al., 2002). It is easy to show that Equation (4) is identified and simple estimation of *b* from Equation (1) can be interpreted as fiscal policy parameters only if either *k* or the variance of *u* are equal to zero:

$$e_t = \frac{1}{1-bk}(a + bm + bv_t + u_t) \quad (4a)$$

$$y_t = \frac{1}{1-bk}(m + ka + ku_t + v_t) \quad (5a)$$

Assuming that the fiscal and GDP shocks are uncorrelated (E(*vu*)=0), we can use Equations (4a) and (5a) to write the correlation of *e* and *y* as:

$$\rho_{y,e} = \frac{(b\sigma_v^2 + k\sigma_u^2)}{\sqrt{\left(b^2\sigma_v^2 + \sigma_u^2\right)}\sqrt{\left(k^2\sigma_u^2 + \sigma_v^2\right)}} \quad (6)$$

and the value of $\hat{b}$ obtained by estimating Equation (4) as:

$$\hat{b} = \frac{(b\sigma_v^2 + k\sigma_u^2)}{\left(k^2\sigma_u^2 + \sigma_v^2\right)} \quad (7)$$

Sufficient conditions for $\rho_{y,e}$ to have the same sign of *b* are $\sigma_u^2 = 0$ (i.e., there are no expenditure shocks) or *k=0* (i.e., simultaneity is not an issue). The same conditions are sufficient to guarantee that $\hat{b}$ is an unbiased estimator of *b* ($E\left(\hat{b}\right) = b$).

If neither of these conditions is verified, two set of countries with identical *b*, and *k* (and hence the same degree of fiscal cyclicality) but different types of shocks can have different correlations between GDP growth and government expenditure. Just to make an example, assume, without loss of generality, that two groups of countries follow countercyclical fiscal policies (*b*<0) and that in both groups of countries fiscal policy has a Keynesian effect (*k*>0) but that in the first group of countries GDP shocks dominate fiscal shocks ($\sigma_v >> \sigma_u$) and in the second group of countries fiscal shocks dominate GDP shocks ($\sigma_u >> \sigma_v$). Then, in the first group of countries we will observe a negative correlation between *y* and *e*, and in the second group of countries a positive correlation between *y* and *e*. Clearly this is not an indication that the two countries have different degree of fiscal cyclicality (which, by assumption, is the same in both countries). Rigobón (2004) argues that it may indeed the case that in developing countries fiscal shocks dominate GDP shocks and in industrial countries GDP shocks dominate fiscal shocks.

5. Identifying the Policy Reaction Function

The discussion in the previous section does not say anything new, merely restating the well-known endogeneity problem. However, it does make clear that a fact often interpreted as being driven by differences in policy parameters may be purely due to differences in the nature of the shocks faced by different types of countries. Estimating the policy parameters of equation 4 requires an identification strategy that can solve the simultaneous equation problem. Rigobón (2004) addresses this issue by exploiting heteroskedasticity in the data and uses the method of identification though heteroskedasticity (Rigobón, 2003). One problem with this approach is that lack of heteroskedasticity does not allow providing estimations for all subgroups of countries. In this paper, we identify the policy reaction function by using the more standard instrumental variable approach.

The key problem is finding a good instrument. Such an instrument needs to be correlated with the variable that needs to be instrumented (GDP growth) and exogenous with respect to this variable, as well as have no direct effect on the dependent variable (the fiscal indicator). We argue that a real external shock consisting of the weighted average of GDP growth in country *i*'s export partners has these characteristics. We define the real external shock as:

$$SHOCK_{i,t} = \frac{EXP_i}{GDP_i} \sum_j \phi_{ij,t-1} GDPGR_{j,t} \qquad (8)$$

where $GDPGR_{j,t}$ measures real GDP growth in country j in period t, $\phi_{ij,t}$ is the fraction of export from country i going to country j, and EXP_i/GDP_i measures country i's average exports expressed as a share of GDP. Note that we use a time-invariant measure of exports over GDP because a time-variant measure would be affected by real exchange rate fluctuations, and, therefore, by domestic factors. This is not the case for the fraction of exports going to a specific country ($\phi_{ij,t}$), because the variation of the exchange rate that is due to domestic factors has an equal effect on both the numerator and denominator.

Our External Shock variable is a refinement of the instrument used by Galí and Perotti (2003) in a paper that aims at analyzing fiscal cyclicality in the Euro area. In particular, these authors instrument the GDP gap of Euro area countries using the output gap of the United States (for the United States, they use the lagged output gap of the main European countries). One problem with the instrument used by Galí and Perotti (2003) is that, unlike our external shock, it

is not heterogeneous across countries (the instrument for the Italian output gap is the same as the instrument for the French output gap) and hence cannot be easily used in a panel set-up like the one in Table 3.

It is relatively straightforward to show that our external shock variable is *not* a weak instrument and hence it *does* have the first characteristics for being a good instrument. Table 4 shows the first-stage regressions of a set of two-stage least square estimations in which GDP growth is identified with the external shock of Equation (8). All columns show that the shock variable has a positive and highly significant coefficient, with t-statistics ranging between 2 and 7.9. The sample of low income countries is the one with the lowest coefficient (1.05) and t-statistics (2.0), but also in this case the correlation between the external shock and GDP growth is significant at the 5 percent confidence level. The last row of Table 4 reports the Stock and Yogo (2002) weak instruments F test (see Stock, Wright, and Yogo, 2002, for a survey of the weak instrument literature). If we exclude the subsample of low income countries, we find that the F-test ranges between 18 (in the sub-sample of middle-high income countries) and 62 (in the sample of industrial countries). These values are well above both the Staiger and Stock (1997) rule of thumb threshold suggesting that the F test should be above 10 and the tabulated values of Stock and Yogo (2002) which suggest a threshold of approximately 14 (given our specification, the threshold for a 5 percent significance level and a 0.5 maximum desired bias is 13.91). In the subsample of low income countries, instead, we obtain an F statistics of 3.7 which is below the critical values identified by Staiger and Stock (1997) and Stock and Yogo (2002), suggesting that the instrument may not be appropriate for this specific subsample.

Showing that our external shock variable fits the second and third requirements for a good instrument (i.e., being exogenous with respect to GDP growth and having no direct effect on the dependent variable) is more complicated because this needs to be done on theoretical rather than statistical, grounds.

Let us start with exogeneity. While one may claim that the real external shock is endogenous for countries that serve as locomotives for global growth and for which domestic growth may affect GDP growth of all of their main trading partners, we do not think that this is a serious problem for countries outside the G3 (the United States, Japan and Germany).[11] This is because exports to the countries that are influenced by the domestic country shock tend to be a

[11] This is why we re-estimate all our equations by dropping the G3 countries.

small fraction of the exports of the country that originated the shock. To fix the idea, consider the case of Brazil and Uruguay. Clearly, a shock to Brazil's GDP will have a large effect on the GDP of Uruguay, and hence GDP growth in Uruguay will not be a good instrument for GDP growth in Brazil, but Uruguay consists of a minuscule share of total exports of Brazil (0.7 percent) and hence has almost no weight in Equation (8). Now consider Uruguay as a source country. In this case, exports to Brazil have a large weight (16 percent) in Uruguay's total exports, but a shock to Uruguay's GDP will have basically no effect on Brazil's GDP and this, again, should reduce concerns of reverse causality. One may argue that the case of Brazil and Uruguay is an extreme one because it focuses on one very large and one very small country. But the same conclusion applies to pairs of medium-size countries. Consider, for instance the case of Italy and France (which are each other's main trading partner), and focus on how a shock that originates in Italy affects France and then feeds back to Italy. France's exports-to-GDP ratio is about 25 percent and France;s share of exports to Italy is 9 percent. As the point estimate of Column 1 of Table 4 (which applies to industrial countries) is about 2, we obtain that a 1 percent shock to Italy's GDP growth translates into a 0.25*0.09*2=0.045 percent shock to French GDP. Now consider the feedback to Italy of this shock (which would be the source of reverse causality). Italy's export-to-GDP ratio is also around 25 percent, and Italy's share of exports to France is 12 percent. Hence, we obtain: 0.045*0.25*0.12*2=0.002, which is greater than zero but a minuscule fraction (one fifth of a percentage point) of the original shock.

Let us now discuss possible reasons why the external shock may have an effect on expenditure growth which does not go through GDP growth (i.e., a violation of the third requirement for a good instrument). First, it is hard to think that the external shock may have a *direct* effect (i.e., an effect not mediated by any other variable) on expenditure growth and, hence, this should not be a source of concern. However, one could come up with a complicated mechanism through which the external shock has an *indirect* effect on expenditure growth which does not go through GDP growth. Consider, for instance, the case of a country that taxes its exports (as some commodity producers do). Then, an increase in exports brought about by the external shock may result in an increase of tax revenues which, in turn, may relax government budget constraints and lead to higher expenditure. While this is clearly a possibility, we think that in most countries this indirect effect should be either nonexistent (because few countries tax exports) or not important quantitatively. Furthermore, most countries that tax exports only tax

commodity exports, and we are directly controlling for this effect by including terms of trade shocks in our model.

Alternatively, a shock to GDP growth in a group of large countries may affect global interest rates (for instance, a negative shock in the US and Euroland may lead to lower interest rates in these countries), and this may have a direct effect on interest expenditure throughout the world. However, this is a legitimate source of concern only when we consider total expenditure (which includes interest payment), but we will show that our results are unchanged if we use primary expenditure, which does not include interest payments. Finally, one may argue that the instrument is inappropriate because it is merely a proxy for some "global factor" that should be included in the second-stage regression. We will show that our results are robust to controlling for such global factors.

5.1 Instrumental Variable Estimates

Table 5 shows that instrumental variable estimates of the effect of GDP growth on expenditure growth yield coefficients that are dramatically different from those of the OLS estimates of Table 3. In the case of industrial countries, OLS estimates found that β was basically zero, a fact consistent with an acyclical policy. On the other hand, instrumental variables estimates suggest that the coefficient is large and negative, a finding consistent with a countercyclical policy (dropping the G3 countries from the sample, as in column 2, does not affect this result). In column 3, we focus on developing countries and find that, once we control for endogeneity, the procyclical behavior suggested by OLS estimates completely disappears. In fact, we now find that we cannot reject the null that the coefficients for industrial and developing countries are not significantly different from each other.[12]

Note that the estimates of Table 5 focus on the cyclicality of overall public expenditure and include both discretionary expenditures and automatic stabilizers. If we were able to remove the effect of automatic stabilizers (which are likely to be larger in industrial countries), we would probably find an even smaller difference between the cyclicality of discretionary fiscal policy in both groups of countries.

[12] A Wald test with one degree of freedom in the numerator and 1822 degrees of freedom in the denominator, takes a value of 1.6 and does not reject the null that the two coefficient are not significantly different form each other with a p-value of 0.20.

The remaining three columns of Table 5 show that the coefficient for middle-high income countries is basically identical to that of the full sample of developing countries and that the coefficients for middle-low income countries and for low income countries have different signs but are not even close to being statistically significant. This indicates that the acyclical fiscal behavior obtained for the full sample of developing countries is not driven by the behavior of a specific subsample.

The results are even more striking if, instead of looking at expenditure growth, we focus on the cyclicality of the budget balance (Table 6). In this case, we find that the coefficients for both developing and industrial countries are positive (a fact consistent with countercyclicality), statistically significant, and of similar magnitude.

5.2 Robustness Checks

Our instrument may not be valid if the business cycle in the large industrial countries directly affects interest expenditure in the developing countries. To check whether our results are driven by this problem, we now focus on primary expenditure instead of total expenditure. Table 7 confirms our previous finding that, while OLS regressions suggest acyclicality in industrial countries and procyclicality in developing countries, IV estimates show that fiscal policy is countercyclical in industrial countries and acyclical in developing countries. In fact, the IV coefficient for developing countries is negative, albeit not statistically significant, indicating that primary expenditure may indeed be countercyclical, even in developing countries.

Another possible problem with our instrumental variable approach is the presence of global shocks. Suppose, for instance, that a sudden increase in the price of oil causes a global recession or that a sudden stop episode (Calvo, 2005) causes a set of correlated crises in a large group of emerging markets. Then, our external shock variable would no longer be an appropriate instrument because the global shock would lead to a coordination of the business cycle across countries, a factor which is not controlled for in our regression. To address this issue, we augment our specification with a set of year fixed effects which have the objective of controlling for global shocks. Table 8 shows that including year fixed effects drastically changes the result for the subsample of industrial countries. The OLS regressions, which in Table 3 indicated acyclical behavior, now suggest that fiscal policy is procyclical, and the IV estimates, which in Table 5 indicated countercyclical behavior, now suggest that fiscal policy is either acyclical or

countercyclical (the coefficient is negative but not statistically significant). In the case of developing countries, instead, controlling for year fixed effects does not affect the basic results. The OLS regressions still suggest procyclical behavior and the IV regression still suggests acyclical behavior. Taken together, these results suggest that once one controls for global shocks and for the fact that GDP growth is endogenous there is no difference in the degree of cyclicality between industrial and developing countries.

6. Procyclicality in Good and Bad Times

Another finding of Gavin and Perotti (1997), subsequently corroborated by several other authors, is that fiscal policy is asymmetrical in industrial countries but not in developing countries. In particular, Gavin and Perotti (1997) find that in industrial countries fiscal policy is countercyclical in bad times and acyclical in good times but that the business cycle does not affect the degree of procyclicality in Latin America. Along similar lines, Manasse (2006) uses non-linear estimations methods to show that, for both industrial and developing countries, fiscal policy is acyclical in bad times and procyclical in good times, but those asymmetries tend to be larger for industrial countries.

Interestingly, while the literature that focuses on developing countries has centered on the procyclicality problem, highlighting how procyclicality may amplify the business cycle of developing countries, the literature that focuses on industrial countries has instead centered on the asymmetry problem, highlighting how this may lead to unsustainable fiscal expansions. Hercowitz and Strawczynski (2004), for instance, argue that countercyclicality during bad times and acyclicality during good times contributed to the increase in the government expenditures in OECD countries during the 1975-1998 period. Along similar lines, Balassone and Francese (2004) find that in most European industrial countries the budget deteriorates during contractions but does not improve during expansions.

Hercowitz and Strawczynski (2004) argue that the endogeneity bias should be the same in bad and good times and hence endogeneity should not be a problem when one focuses on the difference between fiscal cyclicality in good and bad times. However, the discussion in Section 3 clearly illustrates that the endogeneity bias is influenced by the relative importance of expenditure (u) and GDP shocks (v), and there are good reasons to think that the relative

importance of these shocks may vary over the business cycle. It is thus interesting to study asymmetries using our instrumental variable approach.

In Table 9, we focus on expenditure growth and split the sample into good and bad times, with bad times defined as periods in which country *i*'s GDP growth is below the country's median GDP growth. The first panel focuses on OLS estimates and shows that in industrial countries fiscal policy is asymmetric over the business cycle. In particular, we find that fiscal policy is procyclical in good times (the coefficient is positive and statistically significant) and either acyclical or countercyclical (the coefficient is negative but not statistically significant) in bad times. In contrast, we find no asymmetries in the subsample of developing countries. The coefficients are almost identical across sub-periods and consistent with a procyclical fiscal policy in both good and bad times (the coefficients are not statistically significant in the subsample of middle-low income countries). Again, instrumental variable estimates yield very different results. In this case, we find that in industrial countries fiscal policy is either countercyclical or acyclical in good times (the coefficient is negative and large but not statistically significant) and clearly countercyclical in bad times. In developing countries, we find that the coefficients are always large and negative (with small differences between good and bad times) and hence consistent with a countercyclical fiscal policy, but never statistically significant.[13]

[13] These results should be taken with caution because they may suffer from the weak instrument problem. This is especially the case in developing countries during good times (the F test ranges between 0.08 and 4.6).

7. Conclusions

There is a large literature dating back to Gavin and Perotti (1997) that argues that fiscal policies tend to be countercyclical in industrial countries and procyclical in developing countries and that this difference in procyclicality is due to the fact that industrial countries can adopt expansionary fiscal policies during recessions.

The objective of our paper was to test whether these results are due to different degrees of cyclicality in fiscal policy or are due to the fact that developing countries receive different types of shocks. We find that while OLS estimates reproduce the standard result first highlighted by Gavin and Perotti, this result disappears once GDP growth is properly instrumented for. In fact, our instrumental variable estimations suggest that there is no statistically significant difference between the cyclicality of fiscal policy in developing and industrial countries.

A greater understanding of the causes of these different correlations is important for policy purposes. If these correlations result from difference in policies, then any solution to this problem should focus on removing the constraints (either due to political or market imperfections) that lead policymakers to adopt procyclical policies. However, these policies may be misguided (or at best useless) if the observed correlation between GDP growth and fiscal variables is due to the different nature of the shocks rather than to different policy reaction functions.

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Table 1. Descriptive Statistics

		(1) INDUSTRIAL COUNTRIES	(2) DEVELOPING COUNTRIES	(3) MIDDLE-HIGH INCOME COUNTRIES	(4) MIDDLE-LOW INCOME COUNTRIES	(5) LOW INCOME COUNTRIES	(6) LAC (GP SAMPLE)
BUDGET BALANCE	Mean	-3.50	-3.15	-2.02	-2.78	-4.56	-2.24
	Median	-2.72	-2.65	-1.75	-2.32	-4.09	-1.72
	St. Dev.	4.05	4.80	5.29	3.68	4.99	3.81
EXPENDITURE GROWTH	Mean	2.85	3.36	3.43	3.53	3.15	3.56
	Median	2.62	3.80	4.11	3.50	3.58	3.74
	St. Dev.	4.75	16.19	12.48	14.92	19.99	13.74
GDP GROWTH	Mean	2.59	3.35	3.66	3.30	3.12	2.75
	Median	2.68	3.79	4.21	3.64	3.49	3.49
	St. Dev.	2.21	4.54	5.05	4.45	4.17	4.94
EXTERNAL SHOCKS	Mean	0.77	0.86	1.13	0.83	0.62	0.59
	Median	0.70	0.69	0.96	0.70	0.50	0.56
	St. Dev.	0.55	0.74	0.95	0.63	0.51	0.42
Observations		456	1514	472	505	527	200
Countries		23	95	34	27	33	13

Table 2. Cyclical Properties of the Budget Balance

	(1) INDUSTRIAL COUNTRIES	(2) LAC (GP SAMPLE)	(3) DEVELOPING COUNTRIES	(4) MIDDLE-HIGH INCOME COUNTRIES	(5) MIDDLE-LOW INCOME COUNTRIES	(6) LOW INCOME COUNTRIES
GDP GROWTH	0.312	0.052	0.094	0.063	0.159	0.073
	(0.051)***	(0.042)	(0.027)***	(0.049)	(0.036)***	(0.044)*
ΔTOT	7.817	0.546	4.529	11.083	3.093	3.064
	(3.557)**	(1.785)	(1.092)***	(3.031)***	(1.495)**	(0.932)***
LDEF	-0.207	-0.350	-0.551	-0.495	-0.515	-0.669
	(0.031)***	(0.067)***	(0.064)***	(0.076)***	(0.064)***	(0.043)***
Observations	456	200	1514	472	505	527
Countries	23	13	95	34	27	33
R^2	0.2252	0.1819	0.3185	0.3287	0.301	0.3549

Robust standard errors in parentheses, * significant at 10%; ** significant at 5%; *** significant at 1%. Outlier observations for Bolivia (1982-1986) and Sri Lanka (1980-1982) were dropped. For Low Income Countries, the observations that have residuals with absolute value greater than 2.5 standard deviations in the first stage of the IV estimates first stage (Table 4) were dropped. All regressions include country fixed effects.

Table 3. Cyclical Properties of Expenditures

	(1) INDUSTRIAL COUNTRIES	(2) INDUSTRIAL COUNTRIES WITHOUT G3	(3) DEVELOPING COUNTRIES	(4) MIDDLE-HIGH INCOME COUNTRIES	(5) MIDDLE-LOW INCOME COUNTRIES	(6) LOW INCOME COUNTRIES	(7) LAC (GP SAMPLE)
GDP GROWTH	-0.007	-0.016	0.907	1.162	0.629	0.760	1.084
	(0.136)	(0.146)	(0.098)***	(0.140)***	(0.138)***	(0.215)***	(0.223)***
ΔTOT	-18.355	0.169	-12.283	-22.646	1.049	-12.201	-0.253
	(5.722)***	(0.107)	(5.368)**	(6.710)***	(5.011)	(4.565)***	(8.920)
LDEF	0.168	-20.696	0.912	0.553	1.306	1.245	0.984
	(0.103)	(7.071)***	(0.142)***	(0.111)***	(0.196)***	(0.209)***	(0.259)***
Observations	450	398	1495	473	483	529	184
Countries	23	20	94	34	26	33	12
R^2	0.0394	0.0415	0.1190	0.1950	0.1142	0.1192	0.2256

Robust standard errors in parentheses, * significant at 10%; ** significant at 5%; *** significant at 1%. Outliers observations for Bolivia (1982-1986) and Sri Lanka (1980-1982) were dropped. For Low Income Countries, the observations that have residuals with absolute value greater than 2.5 standard deviations in the IV estimates first stage (Table 4) were dropped. All regressions include country fixed effects.

Table 4. First Stage for IV Estimates

	(1) INDUSTRIAL COUNTRIES	(2) DEVELOPING COUNTRIES	(3) MIDDLE-HIGH INCOME COUNTRIES	(4) MIDDLE-LOW INCOME COUNTRIES	(5) LOW INCOME COUNTRIES
SHOCK	1.969	1.742	1.592	2.132	1.054
	(0.249)***	(0.260)***	(0.373)***	(0.466)***	(0.519)**
Observations	450	1495	473	483	529
Countries	23	94	34	26	33
R^2	0.1820	0.0444	0.0567	0.0897	0.0283
F-test for the instrument	62.62	44.88	18.20	20.95	3.68

Robust standard errors in parentheses, * significant at 10%; ** significant at 5%; *** significant at 1%. Outlier observations for Bolivia (1982-1986) and Sri Lanka (1980-1982) were dropped. For Low Income Countries, the observations that have residuals with absolute value greater than 2.5 standard deviations were dropped. The first stage includes all the controls of Table 3, not reported here to save space. All regressions include country fixed effects.

Table 5. Cyclical Properties of Expenditures, IV Estimates

	(1) INDUSTRIAL COUNTRIES	(2) INDUSTRIAL COUNTRIES WITHOUT G3	(3) DEVELOPING COUNTRIES	(4) MIDDLE-HIGH INCOME COUNTRIES	(5) MIDDLE-LOW INCOME COUNTRIES	(6) LOW INCOME COUNTRIES
GDP GROWTH	-0.840	-0.818	0.009	0.013	0.156	-2.294
	(0.272)***	(0.290)***	(0.501)	(0.623)	(0.647)	(2.963)
ΔTOT	-15.790	0.187	-12.562	-22.688	2.871	-15.594
	(6.044)***	(0.082)**	(3.123)***	(6.728)***	(7.011)	(6.335)**
LDEF	0.186	-17.511	0.959	0.472	1.396	1.631
	(0.079)**	(7.115)**	(0.109)***	(0.137)***	(0.252)***	(0.448)***
Observations	450	398	1495	473	483	529
Countries	23	20	94	34	26	33

Robust standard errors in parentheses, * significant at 10%; ** significant at 5%; *** significant at 1%. Outlier observations for Bolivia (1982-1986) and Sri Lanka (1980-1982) were dropped. For Low Income Countries, the observations that have residuals with absolute value greater than 2.5 standard deviations in the IV estimates first stage (Table 4) were dropped. All regressions include country fixed effects.

Table 6. Cyclical Properties of Budget Balance, IV Estimates

	(1) INDUSTRIAL COUNTRIES	(2) INDUSTRIAL COUNTRIES WITHOUT G3	(3) DEVELOPING COUNTRIES	(4) MIDDLE-HIGH INCOME COUNTRIES	(5) MIDDLE-LOW INCOME COUNTRIES	(6) LOW INCOME COUNTRIES
GDP GROWTH	0.585	0.583	0.453	0.310	0.389	1.491
	(0.106)***	(0.114)***	(0.116)***	(0.181)*	(0.122)***	(0.830)*
ΔTOT	6.997	9.046	4.619	11.094	2.179	4.642
	(2.351)***	(2.813)***	(0.726)***	(1.941)***	(1.305)*	(1.885)**
LDEF	-0.210	-0.2149	-0.572	-0.478	-0.564	-0.851
	(0.030)***	(0.032)***	(0.025)***	(0.040)***	(0.048)***	(0.130)***
Observations	456	399	1514	472	505	527
Countries	23	20	95	34	27	33

Robust standard errors in parentheses, * significant at 10%; ** significant at 5%; *** significant at 1%. Outlier observations for Bolivia (1982-1986) and Sri Lanka (1980-1982) were dropped. For Low Income Countries, the observations that have residuals with absolute value greater than 2.5 standard deviations in the IV estimates first stage (Table 4) were dropped. All regressions include country fixed effects.

Table 7. Robustness Analysis: Primary Expenditure Growth

	(1) INDUSTRIAL COUNTRIES	(2) DEVELOPING COUNTRIES	(3) MIDDLE-HIGH INCOME COUNTRIES	(4) MIDDLE-LOW INCOME COUNTRIES	(5) LOW INCOME COUNTRIES
OLS	-0.032	1.006	1.241	0.789	0.900
	(0.121)	(0.113)***	(0.158)***	(0.163)***	(0.256)***
IVREG	-0.888	-0.283	-0.541	0.277	-2.209
	(0.288)***	(0.661)	(0.964)	(0.804)	(3.418)
Obs.	417	1066	397	358	303

Robust standard errors in parentheses, * significant at 10%; ** significant at 5%; *** significant at 1%.
The OLS and IV regressions, include the same set of controls used in Table 5.

Table 8. Robustness Analysis: Controlling for Global Factors

	(1) INDUSTRIAL COUNTRIES	(2) DEVELOPING COUNTRIES	(3) MIDDLE-HIGH INCOME COUNTRIES	(4) MIDDLE-LOW INCOME COUNTRIES	(5) LOW INCOME COUNTRIES
OLS	0.321	0.961	1.192	0.665	0.900
	(0.151)**	(0.099)***	(0.148)***	(0.139)***	(0.223)***
IVREG	-0.231	0.708	0.012	0.740	-3.022
	(1.000)	(0.629)	(1.005)	(0.632)	(16.919)
Obs.	450	1495	473	483	529

Robust standard errors in parentheses, * significant at 10%; ** significant at 5%; *** significant at 1%.
The OLS and IV regressions, include the same set of controls used in Table 5. Global factors are controlled for by including year fixed effects

Table 9.Cyclicality of Expenditures in Good and Bad Times, IV Estimates

	(1) INDUSTRIAL COUNTRIES	(2) DEVELOPING COUNTRIES	(3) MIDDLE-HIGH INCOME COUNTRIES	(4) MIDDLE-LOW INCOME COUNTRIES	(5) LOW INCOME COUNTRIES
			OLS		
Good Times	1.145	0.909	0.998	0.304	1.135
	(0.411)***	(0.211)***	(0.264)***	(0.326)	(0.479)**
Bad Times	-0.120	0.973	1.299	0.481	1.053
	(0.233)	(0.227)***	(0.255)***	(0.407)	(0.446)**
			IV		
Good Times	-1.687	-1.955	-0.987	-3.172	-4.017
	(1.543)	(3.954)	(2.277)	(3.821)	(12.980)
Bad Times	-2.971	-1.565	-0.429	-0.175	-12.061
	(1.496)**	(1.052)	(1.146)	(1.623)	(7.595)
			Observations		
Good Times	226	744	235	240	264
F test GT	10.67	4.61	3.79	2.25	0.08
Bad Times	222	735	233	243	254
F test BT	7.87	31.14	14.09	10.77	2.08
Countries	23	94	34	26	33

Robust standard errors in parentheses, * significant at 10%; ** significant at 5%;
*** significant at 1%.
The OLS and IV regressions, include the same set of controls used in Table 5.

Appendix

Table A1. Variable Definitions and Sources

Variable Name	Definition	Source
BUDGET BALANCE	Central Government revenues and grants minus expenditures and lending.	GFS + IFS
EXPENDITURE GROWTH	Real Central Government total expenditures growth in local currency units.	GFS + IFS
GDP GROWTH	Real GDP growth in local currency units.	WDI
EXTERNAL SHOCKS	Weighted average of GDP growth in country's export partners, weighted by share of partner in total exports.	DOTS
TERMS OF TRADE	(Real Imports/Nominal Imports)/ (Real Exports/Nominal Exports)	WDI
PRIMARY EXPENDITURE GROWTH	Total Central Government expenditure minus interest expenditures.	GFS + IFS

Acronyms: GFS, Government Finance Statistics (IMF). IFS, International Finance Statistics (IMF). DOTS, Direction of Trade Statistics (IMF). WDI, World Development Indicators (World Bank).

Table A2. Countries in the Sample

INDUSTRIAL COUNTRIES (23)	MIDDLE-HIGH INCOME COUNTRIES (34)	MIDDLE-LOW INCOME COUNTRIES (27)	LOW INCOME COUNTRIES (33)
Australia	Argentina	Algeria	Bangladesh
Austria	Bahrain, kingdom of	Bolivia	Burkina Faso
Belgium	Barbados	Bulgaria	Burundi
Canada	Belize	Colombia	Cameroon
Denmark	Botswana	Dominican Republic	Chad
Finland	Brazil	Ecuador	Congo, Republic of
France	Chile	Egypt	Cote d ivoire
Germany	Costa Rica	El salvador	Ethiopia
Greece	Croatia	Fiji	Gambia, the
Iceland	Cyprus	Guatemala	Ghana
Ireland	Czech Republic	Honduras	Guinea-Bissau
Italy	Estonia	Indonesia	Haiti
Japan	Gabon	Iran	India
Malta	Grenada	Jamaica	Kenya
Netherlands	Hungary	Kazakhstan	Lesotho
New Zealand	Israel	Morocco	Madagascar
Norway	Korea	Paraguay	Malawi
Portugal	Kuwait	Peru	Mali
Spain	Latvia	Philippines	Mongolia
Sweden	Lithuania	Sri lanka	Namibia
Switzerland	Malaysia	St. Vincent & Grens.	Nicaragua
United Kingdom	Mauritius	Swaziland	Nigeria
United States	Mexico	Syria	Pakistan
	Oman	Thailand	Papua New Guinea
	Panama	Tunisia	Rwanda
	Poland	Turkey	Senegal
	Saudi Arabia	Vanuatu	Sierra Leone
	Seychelles		Solomon Islands
	Slovak Republic		Tanzania
	South Africa		Togo
	St. Kitts and Nevis		Uganda
	Trinidad and Tobago		Zambia
	Uruguay		Zimbabwe
	Venezuela, Rep. Bol.		