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TERMS OF TRADE SHOCKS AND FISCAL CYCLES

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ABSTRACT

The latest boom in commodity prices fueled concerns about fiscal policies in commodity-exporting countries, with many claiming that it triggered loose fiscal policy and left no funds for a rainy day. This paper examines the links between fiscal policy and terms-of-trade fluctuations using a sample of 74 countries, both developed and developing. It finds evidence that booms in the terms of trade do not necessarily lead to larger government surpluses in developing countries, particularly in emerging markets and especially during capital flow bonanzas. This is not the case in OECD countries, where fiscal policy is of an acyclical nature.

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I. Introduction

After several years of relatively stable commodity prices, volatility has returned, fueling as always worries about its effects on overall economic stability around the world. This time around, the debate is also focused on fiscal policy. During the boom that started in 2003, concerns were raised that commodity price increases were encouraging excessive government spending in resource-abundant countries, leaving no funds for a rainy day. For example, the Inter-American Development Bank *2007 Annual Report* is entitled *All that Glitters May Not Be Gold*, partly in reference to the fiscal positions of Latin American countries during the latest boom in commodity prices. This report concludes that the fiscal surpluses observed during this period are far from reassuring since they are based on inflated and unsustainable fiscal revenues due to transitory increases in the price of commodities. In fact, the report concludes that when government revenues are estimated at the 'long-run' prices of commodities, the average fiscal position of these countries has deteriorated with deficits averaging 4 percent of GDP.

This concern is not limited to Latin America. Both in academic and policy circles the debate regarding what governments in commodity producer countries should do when their terms of trade improve has intensified. A new proposal based on neo-classical models of fiscal policy supports the creation of Commodity Sovereign Wealth funds. According to this proposal, fiscal policy should be acyclical, with government consumption smoothed over the business cycle and savings accumulating in boom times to provide funding for a rainy day. In fact, this policy has been at the core of the IMF recommendations for countries dependent on commodity exports.[1] This paper does not examine the role of these funds but rather pays particular attention to the effects of terms of trade cycles on fiscal positions around the world.

Relying on data for 74 countries for the period 1960-2008, this paper examines the evidence on the cycles in the terms of trade and those of fiscal policy. In particular, it studies the behavior of government expenditure, revenues, and primary balances, as well as inflation. The paper examines separately the evidence on countries grouped by income levels. It also disaggregates the sample along a variety of dimensions, by (i) differentiating episodes of capital flow bonanzas from those when international capital flows are at their historical lows, (ii) differentiating episodes of terms of trade booms from those of terms of trade crashes, (iii)

[1] See for example, Barnett and Ossowski (2003) and Davis, Ossowski, and Barnett (2002).

separating the responses of countries with persistent terms of trade shocks from those with transitory terms of trade shocks, (iv) comparing responses during periods of more rigid exchange rate regimes separately from more flexible arrangements, and (v) examining separately the fiscal responses in commodity-exporting countries.

The paper proceeds as follows. The next section briefly discusses the theoretical literature on fiscal policy used to interpret the results on terms of trade and fiscal policy cycles. Section III provides a visual representation of alternative fiscal policies and terms of trade cycles around the world by focusing on the evidence of just two countries: Argentina and Norway. Section IV extends the analysis of fiscal responses to the whole sample of 74 countries using panel data estimation techniques. Section V contains concluding remarks.

II. Models of Fiscal Policy

A number of models have been proposed to explain the cyclical behavior of fiscal policies. Keynesian models provide the rationale for countercyclical fiscal policy. In these models, the fiscal authority has an objective function that penalizes deviations of output from trend. Since an increase in government spending and/or a reduction in tax rates expands output (and *vice versa*), fiscal policy will be countercyclical. In contrast, neoclassical models rationalize acyclical fiscal policy since roughly constant tax rates over the business cycle reduce distortions (see Chari and Kehoe, 1999). Moreover, if government spending is endogeneized (by, say, providing direct utility), neo-classical models predict that it would be optimal for it to behave in a similar way to private consumption and hence would be acyclical in the presence of complete markets (Riascos and Végh, 2003).

In contrast to Keynesian and neo-classical recommendations, recent empirical literature has noted that while fiscal policy is acyclical or countercyclical in developed countries, it is procyclical in most developing countries, with fiscal policy probably exacerbating the business cycle in those countries. This begs the question of why these countries follow policies that tend to create macroeconomic instability. Theoretical models suggest two possible explanations. The first one relies on the presence of distortions in international capital markets. For example, Gavin and Perotti (1997), Caballero and Krishnamurthy (2004), and Guerson (2004) argue that developing countries face credit constraints that prevent them from borrowing in bad times.

Hence, they are 'forced' to repay in bad times, which requires a contractionary fiscal policy. In the same vein, Riascos and Végh (2003) show that incomplete markets could explain procyclical fiscal policy as the outcome of a Ramsey problem without having to impose any additional frictions.

The second strand of the literature relies on a political economy explanation. For example, Tornell and Lane (1999) develop a model in which competition for a common pool of funds among different units (ministries, provinces) leads to the so-called 'voracity effect,' whereby expenditure could actually exceed a given windfall. Taking as given such a political distortion, Talvi and Végh (2005) show how policymakers would find it optimal to run smaller primary surpluses in good times by increasing government spending and reducing tax rates.[2]

While political distortions can be present in all countries, a number of authors have concluded that these distortions can be more widespread in resource-rich economies where non-resource taxes are low and resource rents are high. For example, Lane and Tornell (1996) argue that resource-rich economies are subject to more extreme rent-seeking behavior than resource-poor economies because national politics is oriented to appropriating the rents earned by the natural resource endowments. In their model, a windfall coming from a terms-of-trade improvement can lead to sharp increases in spending, a distorted allocation of spending over time, dissipated revenues, and a collapse in growth.

There is also an important literature that links fiscal policy with exchange rate regimes. Conventional wisdom indicates that fixed exchange rates provide more fiscal discipline than flexible exchange rates (see, for example, Frenkel, Goldstein, and Masson (1991); Aghevli, Khan, and Montiel (1991); and Giavazzi and Pagano (1988)). The claim is that fixed rates induce more discipline because the sustained adoption of lax fiscal policies must eventually lead to a depletion of foreign exchange reserves and thus to a politically costly collapse of the peg. In contrast, Tornell and Velasco (2000) argue that flexible exchange rate regimes trigger more austere fiscal policies. They examine the role of exchange rate regimes using an intertemporal model with endogenous optimal fiscal policy. In this model, loose fiscal policies are costly under both fixed and flexible exchange rates. While under fixed exchange rates bad behavior today

[2] See also, Alesina and Tabellini (2005), Calderon and Schmidt-Hebbel (2003), and Ilzetzki (2009).

leads to punishment tomorrow (when reserves are depleted and a costly currency crisis starts), under flexible exchange rates unsound fiscal policy manifests itself immediately through movements in the exchange rate. The difference is in the intertemporal distribution of these costs. They show that if fiscal authorities are impatient, flexible rates – by forcing the costs to be paid up-front – provide more fiscal discipline and higher welfare for the representative agent.

Finally, the last strand of the literature on suboptimal macropolicies concludes that distortionary macroeconomic policies are likely to be symptoms of underlying institutional problems, such as lack of enforcement of property rights and repudiation of contracts. As Acemoglu *et al* (2003) conclude, in societies with institutional problems, politicians may be forced to pursue unsustainable policies in order to satisfy various groups and remain in power.

III. Fiscal Stance and Terms of Trade Cycles: A Tale of Two Countries

To grasp the distinct characteristics of cycles in the terms of trade and the fiscal stance around the world, visual evidence from two commodity-exporting countries is presented. The first country is a developing economy, Argentina, the second one is a developed economy, Norway. On average, the share of commodity exports in total exports in both countries oscillates around 70 percent. Figure 1 shows the cycles in the terms of trade as well as the cycles in government expenditure, government revenues, and the primary balance. In this figure and also in the panel estimations in Section IV, I identify cycles by using the ubiquitous Hodrick-Prescott (HP) filter. Figure 1 also reports pairwise correlations between the cyclical components of the terms of trade and the fiscal stance for the two economies. While these correlations only provide a metric of contemporaneous comovements, Section IV explores potential temporal causal patterns.[3]

It should also be noted that only government expenditure provides a measure of discretionary fiscal policy. As discussed extensively in Kaminsky, Reinhart, and Végh (2004), government revenues and the primary balance depend on the tax base (output or in this case the terms of trade), with the correlations between these two indicators and output (or terms of trade)

[3] Both fiscal and terms of trade indicators are obtained from the WEO database of the International Monetary Fund and are described in Table A1 in the appendix.

providing in most cases ambiguous information on the cyclicality of fiscal policy.[4] Still, in order to examine whether the fiscal stance tends to be loose when the terms of trade improve, the paper is also concerned with the cycles in government revenues and primary balance.

As shown in the top panel of Figure 1, while government expenditure is highly countercyclical in Norway, this is not the case in Argentina where government expenditure becomes increasingly procyclical since the early 1990s. Again, the evidence from the middle and lower panels indicates that booms in the terms of trade in Argentina did not trigger higher public savings; in fact, the primary balance is below trend when Argentina's terms of trade improve. The evidence from Norway is in stark contrast, with the fiscal stance improving with booms in the terms of trade.

IV. Panel Estimation

Kaminsky, Reinhart, and Végh (2004) examine the cyclical characteristics of fiscal and monetary policies around the world and find that developing countries (in particular, middle income countries) follow procyclical policies while industrialised countries implement acyclical or countercyclical policies. In a similar vein, this paper documents the relationship between booms and busts in the terms of trade and government expenditure and revenues, primary balances, and inflation. The purpose of this paper is not to examine the cyclical characteristics of fiscal policy but to evaluate whether fiscal positions of countries around the world deteriorate or improve with terms of trade cycles.

As discussed in Section II, political and institutional distortions are at the core of models of suboptimal fiscal policy. Since these distortions are more widespread in developing countries, I examine separately the evidence on countries grouped by income levels. The World Bank classification in 2008 is used to divide the sample into groups of low-income, lower-middle-income, upper-middle-income, and high-income (OECD) countries (see the Appendix for details).

[4] For example, tax revenues = tax rate × tax base. Suppose the government follows a procyclical fiscal policy. Since, by definition, the tax rate goes down in good times (and *vice versa*) but the tax base moves in the opposite direction, the correlation of tax revenues with the business (or terms of trade) cycle is ambiguous.

Even within the panel estimation by income groups, I also examine the possibility of non-linear relationships between the various measures of the fiscal stance and fluctuations in the terms of trade as suggested by the various models of fiscal policy.

First, as discussed in Gavin and Perotti (1997), I examine whether the relationship between the fiscal stance and the terms of trade depends on the degree of liquidity in international capital markets, that is, on the ability of countries to tap international capital markets. To identify liquidity in international capital markets, I follow Reinhart and Reinhart (2008) who identify capital flow bonanza episodes country by country[5] using a sample of 181 countries and then tally, year by year, the number of countries with capital flow bonanzas. An index of worldwide bonanzas is then constructed. This index indicates the proportion of countries with an episode of capital flow bonanza in any given year. I identify episodes of worldwide capital flow bonanzas when the Reinhart and Reinhart index indicates that at least 20 percent of the countries are found to be having a capital flow bonanza. This metric identifies 1978-1983, 1991-1993, 1998, and 2005-2008 as periods of worldwide capital flow bonanza.

Second, models with liquidity constraints and overall imperfections in capital markets also suggest that fiscal responses in bad states (when, for example, terms of trade deteriorate) may be more procyclical than those in good times, with government introducing draconian reforms in response to a collapse in the terms of trade due to lack of access to credit. Thus, I also examine whether the fiscal stance responds asymmetrically to booms and busts in the terms of trade. I identify good times (terms of trade booms) as those years when the terms of trade are above their trend and bad times (terms of trade busts) as those years when they are below their trend, with the trend estimated with the Hodrick-Prescott filter.

Third, the response of the fiscal stance to terms of trade fluctuations may depend on the exchange rate regime. To test for this, episodes of fixed and floating exchange rate regimes are identified by using the Reinhart and Rogoff (2004) *de facto* exchange rate regime classification. For this paper, it is enough to define two exchange rate regimes: fixed or predetermined exchange rates, and flexible exchange rates (which are defined as including any regime in which

[5] For each country, a capital flow bonanza year is one with a large current account deficit, defined as a current account balance in the 20th percentile.

the exchange rate is allowed some flexibility). Flexible exchange rate regimes include clean floats (which are rare) and dirty floats (which are more common).

Fourth, many have argued that fiscal authorities tend to believe that good times are more permanent than they really are, leading to too much spending or a reduction in tax rates in times of terms of trade booms. According to this hypothesis, the fiscal stance responds equally to transitory and persistent terms of trade shocks. To examine this hypothesis, I classify shocks into transitory and persistent following the analysis in Kent and Cashin (2003). These authors estimate equations of the form:

$$\Delta tot_{i,t} = c_i + \phi_i \Delta tot_{i,t-1} + \mu_{i,t} \qquad (1)$$

where Δtot is the growth rate of the terms of trade. The coefficient ϕ captures the degree of persistence of the shocks, with shocks becoming more persistent as ϕ approaches 1 in absolute value. Again, following Kent and Cashin (2003), transitory and permanent terms of trade shocks are separated by first estimating the half-life of a shock (*HLS*):

$$HLS = \text{abs}(\log(1/2)/\log(\phi)) \qquad (2)$$

For each income group, countries with persistent terms of trade shocks are identified as those countries with shocks that have a half-life larger than the median value of the half-life of shocks in the group. The rest of the countries are identified as countries with transitory terms of trade shocks.[6]

Finally, I also examine whether responses to terms of trade shocks are different in resource-abundant economies. The IMF (WEO) classification scheme is used to identify resource-abundant countries as those where commodity-related export earnings account for more than half of total export earnings. Using the United Nations COMTRADE data provided by the UN Statistical Department, for each country and for every year of the sample, the share of non fuel primary products commodity exports (Standard International Trade Classification (SITC) 0, 1 2, 4, and 68) plus fuel exports (SITC 3) in total exports is calculated. For each country, a

[6] The classification of countries into countries with persistent terms of trade shocks and those with transitory terms of trade shocks is done using all sample data. Governments do not have all of this information when deciding on spending and taxes and thus may not respond optimally to shocks with different degrees of persistence.

dummy variable is created that is equal to one when commodity export shares are above 50 per cent and zero otherwise.

As in Section III, cycles in the fiscal stance, economic activity, and the terms of trade are identified using the Hodrick-Prescott (HP) filter. The indicators are obtained from the IMF (WEO) database and are described in Table A1 of the appendix.

To examine the links between the fiscal stance and the terms of trade the following regression using fixed effects panel techniques is estimated. Each regression takes the form:

$$cY_{i,t} = \alpha_i + \beta\, ctot_{i,t} + \gamma\, ctot_{i,t} \times I_{i,t}^{j} + \delta\, X_{i,t} + \varepsilon_{i,t} \qquad (3)$$

where *cY* represents alternatively the cycle in government expenditure, government revenue, the primary balance and inflation; *ctot* is the cycle in the terms of trade; *I* is an indicator used to examine the presence of non-linearities; and *X* captures the state of the business cycle, that is, the output cycle of each country.

The simplest strategy is to estimate the model in Equation (3) using ordinary least squares (OLS) regressions. However, cycles in economic activity as captured by cycles in GDP are endogenous, so we may be capturing reverse causality. In this case, OLS regressions will give results that do not correspond to the causal effect of economic activity on the fiscal stance. Thus, Equation (3) is estimated using Two-Stage Least Squares (2SLS) with lagged values of GDP cycles as instruments for current values of GDP cycles.

In the regressions, I test sequentially each possible non-linearity between the fiscal stance and the terms of trade. More precisely, when examining for the effect of liquid international capital markets, the index *I* is equal to one during episodes of worldwide capital flow bonanzas and zero otherwise. When examining the presence of asymmetric responses to booms and busts in the terms of trade, the index *I* is equal to one when the country experiences a terms of trade boom and zero otherwise. When studying whether countries respond differently to transitory and permanent terms of trade shocks, *I* is equal to one for countries with permanent shocks and zero otherwise. When evaluating whether the exchange rate regime matters, the indicator *I* is equal to one when the country adopts a flexible exchange rate regime and zero otherwise. Finally, when studying whether resource-abundant economies respond differently to terms of trade shocks, *I* is equal to one for resource-abundant countries and zero otherwise. That is, the coefficient β will capture, respectively, the response of the fiscal indicator to terms of trade fluctuations in times of

illiquidity in world capital markets, in times when the terms of trade are not booming, in countries with transitory terms-of-trade shocks, in years of fixed exchange rate regimes, and in countries which are not resource-abundant. $\beta + \gamma$ will capture, respectively, the response of the fiscal indicators to terms of trade shocks at times of capital flow bonanzas, in times of booms in the terms of trade, in countries with permanent terms-of-trade shocks, in years with flexible exchange rates and in resource-abundant countries.

Tables 1–4 show the panel regressions for cycles in government primary balances, government revenues, government spending, and inflation, respectively. Four panel models are estimated separately according to income groups: high-income (OECD) countries, upper-middle-income countries, lower–middle-income countries, and low-income countries.

For each fiscal indicator, there are 6 regressions. The top regression provides the benchmark. The other five regressions allow for non-linearities in the responses to terms of trade shocks. Each regression includes the terms of trade cycle; the coefficient of this variable is β (from Equation 3). The next variable captures the possible non-linear effects. The coefficient on this variable is γ (from Equation 3). The final variable is the GDP cycle. The coefficient of this variable is δ (from Equation 3).

Table 1 shows the relationship between cycles in fiscal primary balances and cycles in the terms of trade and overall GDP. It is important to highlight the varied responses across the different income groups. First, fiscal balances in OECD countries increase when output is above trend, suggesting the presence of countercyclical or acyclical fiscal policies.[7] This is not the case in developing countries. In middle-income countries, fiscal balances tend to decline when output is above trend, suggesting more procyclical policies, while in low-income countries, fiscal balances are uncorrelated with GDP cycles. To examine whether the responses are economically significant, I estimate the elasticity of fiscal balances to GDP cycles (evaluated at the mean value of primary-balance and GDP cycles).[8] The elasticities of primary balances with respect to GDP cycles are: 2.00 for OECD countries, -0.60 for upper-middle-income countries, and -0.04 for

[7] Even if government expenditure and tax rates do not change (acyclical policy), primary balances improve with increases in output.

[8] I use the mean of the absolute value of the primary balance and GDP cycles since by construction, these cycles have zero mean.

lower-middle-income countries, indicating strong responses in both high-income and upper-middle-income countries. Second, fiscal balances in OECD and low-income countries are not affected by terms of trade cycles. Third, primary balances responses to terms of trade cycles in middle-income countries are affected by the extent of liquidity in international capital markets, episodes of terms of trade booms or busts, and exchange rate regimes. As shown in regression (1), in times of international capital market liquidity, the response of fiscal balances to terms of trade cycles in lower-middle-income countries is negative, with the fiscal balance deteriorating in good times (when the terms of trade are above trend) and improving in bad times (when they are below trend), suggesting procyclical responses to terms-of-trade fluctuations. In the case of upper-middle-income countries, the response of fiscal balances to terms of trade cycles while still positive in episodes of capital flow bonanza it is significantly smaller indicating a less countercyclical policy than during episodes of illiquidity in international capital markets. For upper-middle-income countries, the elasticity of fiscal balances to terms of trade cycles is equal to 2.00 in times of illiquid international capital markets and 1.00 in episodes of capital flow bonanza. The corresponding elasticity for lower-middle-income countries is respectively 0.40 and -0.10. Also, as shown in regression (2), there is evidence of asymmetric responses to terms of trade booms and busts. The fiscal balance of upper- and lower-middle-income countries responds less countercyclically in times of terms of trade booms. Again in this case, responses in upper-middle-income countries are stronger in terms of elasticity (2.00 and 1.00 for upper-middle-income countries and 0.30 and -0.10 for lower-middle-income countries, respectively for times of terms of trade busts and for times of terms of trade booms). Furthermore, as shown in regression (3), responses to terms of trade cycles in middle-income countries depend on the exchange rate regime. Flexible exchange rate regimes seem to fuel more countercyclical fiscal policies in both upper–middle and lower-middle-income countries, providing some support to the model in Tornell and Velasco (2000). Third, as shown in regression (4), for most income groups, the degree of persistence of terms of trade shocks does not seem to matter. Surprisingly, primary balances of upper-middle-income countries tend to improve more in countries with more persistent terms of trade.[9] Fourth, responses to terms of trade cycles in commodity-abundant

[9] These results should be interpreted with caution since the degree of persistence of terms of trade shocks is estimated by using information on the evolution of terms of trade for all of the sample period. Governments in contrast may underestimate or overestimate the degree of persistence of shocks by using available past information.

countries are significantly different from those in non-commodity producing economies only in the upper–middle-income group.

Table 2 shows the responses of government revenues to fluctuations in the terms of trade. As in the previous table, all the regressions control for cycles in GDP and allow for non-linear responses to terms of trade shocks. While the results in this table indicate that fiscal revenues increase with output across all groups of countries, these responses are far stronger in OECD countries. For the high-income group, the elasticity is equal to 0.80. In contrast, the elasticities of government revenues with respect to the cycles in GDP vary from 0.03 for lower-middle-income countries and 0.32 in low-income countries, with the elasticity of upper-middle-income countries equal to 0.12. Again, the responses to terms of trade cycles in middle-income countries are different from those in OECD and low-income countries. In OECD and low-income countries, government revenues are uncorrelated with terms of trade cycles. For middle-income countries, Table 2 indicates that while there is an overall positive link between government revenues and terms of trade cycles (a sign of either countercyclical or acyclical responses to terms of trade shocks), this link is weaker or even reversed in times of international capital flow bonanzas and in episodes of terms of trade booms (evidence of more procyclical responses to terms of trade cycles). Table 2 also shows that the exchange rate regime affects the responses of government revenues to terms of trade cycles. Again, for upper-middle-income countries, responses of government revenues to terms of trade cycles tend to be more countercyclical during floating exchange rates, with elasticities of 0.60 and 0.20 under flexible exchange rate and fixed exchange rate regimes, respectively. In contrast, for lower-middle-income countries, fiscal revenues seem to become more procyclical during flexible exchange rate regimes. Lastly, as shown in Regression 5, government revenues in middle income countries are only positively related to terms of trade cycles in resource abundant countries.

Table 3 shows the responses of government spending to terms of trade cycles and the overall business cycle. Supporting previous results in the literature, Table 3 shows that responses to GDP cycles in OECD countries are countercyclical, while they are procyclical in all developing countries (as captured by the positive and statistically significant coefficient of the GDP cycle). Responses to terms of trade cycles are also different across countries in different income groups. Overall, terms of trade cycles do not affect government spending in OECD and

low-income countries. Interestingly, responses of government spending to terms of trade fluctuations are countercyclical in upper–middle-income countries but procyclical in lower-middle-income countries. Importantly, when examining the role of the exchange rate regime in the responses to terms of trade shocks, the evidence suggests that government spending in middle-income countries is countercyclical only when exchange rates are floating.

Table 4 links inflation to fluctuations in the terms of trade. The experience in low- and middle-income countries with bouts of hyperinflation and overall chronic inflation during most of the years of the sample examined suggests that terms of trade fluctuations are not the main drivers of inflation. The results in Table 4 confirm this expectation. The evidence for OECD countries indicates that overall inflation increases when economic activity is strong. Interestingly, inflation declines with increases in the terms of trade, suggesting perhaps the effects of lower commodity prices since most of the OECD countries are commodity importers.[10]

Table 5 examines in more detail the responses of the fiscal stance to terms of trade cycles in resource abundant countries. This table only reports the responses in upper-middle-income countries because the results in Tables 1-3 indicate that it is in this group of countries where the fiscal stance responds significantly different in commodity-producing countries. In particular, Table 5 explores whether responses to terms of trade cycles in resource-abundant countries are affected by episodes of capital flow bonanzas, terms of trade booms and busts, and fixed and flexible exchange rate regimes. The estimated regression in Table 5 is

$$cY_{i,t} = \alpha_i + \beta\, ctot_{i,t} + \gamma\, ctot_{i,t} \times I^{com}_{i,t} + \rho\, ctot_{i,t} \times I^{com}_{i,t} \times I^{j}_{i,t} + \delta\, X_{i,t} + \varepsilon_{i,t} \qquad (4)$$

where: I^{com} captures whether the country is a commodity-abundant country; and I^{j} captures alternately the episodes of capital flow bonanzas, booms in the terms of trade, and episodes of flexible exchange rate regimes.

As in Tables 1-3, the results in Table 5 indicate that terms of trade cycles in the upper-middle-income group only affect the fiscal stance in commodity-abundant countries. While fiscal policy in upper-middle-income countries is procyclical with respect to fluctuations in GDP, it is countercyclical with respect to terms of trade fluctuations. However, the degree of countercyclicality declines sharply in episodes of capital flow bonanza and in times of booms in

[10] It may also reflect the effect of an appreciation of the exchange rate when the terms of trade are high. This is also consistent with the stronger effect for flexible exchange rate regimes.

the terms of trade, suggesting that the claim that "all that glitters might not be gold" may in fact have some support. In particular, the combination of booms in the terms of trade and the increase in liquidity in international capital markets from 2003 to 2008 may have fueled an easy fiscal policy in commodity-abundant countries with access to international capital markets. In contrast, the results in Table 5 suggest that the degree of countercyclicality increases during episodes of flexible exchange rates. The results on the links between exchange rate regimes and fiscal policy are preliminary and need to be examined in a larger sample of commodity-abundant countries, but the possibility that flexible exchange rates may contribute to less distortionary fiscal policies merits our full attention.

V. Conclusions

This paper has examined the links between the fiscal stance and terms of trade cycles. While still much more analysis needs to be undertaken to refine our understanding of the links between the terms of trade fluctuations and fiscal policies, the main findings of the paper can be summarized as follows:

i) Confirming the results in the empirical literature, the results in this paper indicate that fiscal policy is countercyclical in OECD countries (*vis à vis* GDP). In contrast, fiscal policy is procyclical (*vis à vis* GDP) in developing countries.
ii) In OECD and low-income countries, fiscal policy is acyclical with regards to the terms of trade. Moreover, the responses of the fiscal stance to terms of trade cycles are not affected by international capital liquidity, exchange rate regimes, or the degree of persistence of the shocks.
iii) For upper-middle-income countries, there is evidence of fiscal policy countercyclicality with respect to the terms of trade. But the degree of countercyclicality declines in episodes of capital flow bonanzas or during episodes of terms of trade booms, suggesting that in those episodes these countries may not be saving enough for a rainy day. Importantly, flexible exchange rate regimes seem to contribute to a more countercyclical fiscal policy.
iv) For lower-middle-income countries, there is even evidence suggesting that fiscal policy responds procyclically to terms of trade fluctuations, that is, there is evidence

that fiscal policy contributes to reinforce the terms of trade cycle. Again, as in upper-middle-income countries, episodes of capital flow bonanza and terms of trade boom fuel even more procyclicality while flexible exchange rate regimes enhance countercyclicality.[11]

These findings suggest that the boom in commodity prices during the latest episode of capital flow bonanza of 2003-2008 may have fueled a procyclical policy in middle-income countries that reinforced the terms of trade cycle. While a variety of models explain why countries follow these suboptimal fiscal policies, we need to find mechanisms that would enable macro-policies to be conducted in a neutral or stabilizing way. In this regard, the suggestive results on flexible exchange rates for upper–middle-income countries deserve our full attention.

[11] I should note that in lower-middle-income countries, flexible exchange rates seem to contribute to lower government revenues when the terms of trade increase. However, this effect is not significant from an economic point of view. The elasticity of the government revenues with respect to terms of trade cycles in these countries are quite small: 0.04 for fixed exchange rates and 0 for flexible exchange rates.

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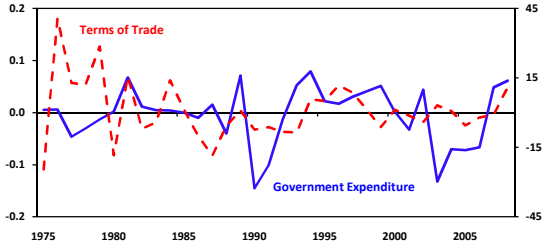
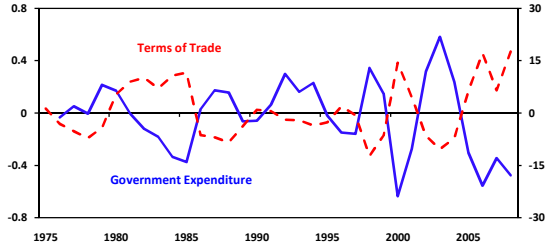
Figure 1
Fiscal Policy and Terms of Trade Cycles

Argentina | **Norway**

Government Expenditure

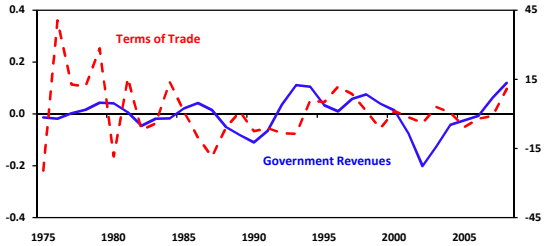


correlation until 1990 = 0.1; correlation since 1990 = 0.4

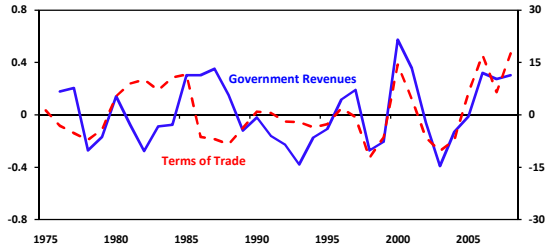


correlation before 1990 = -0.7; correlation since 1990 = -0.9

Government Revenues

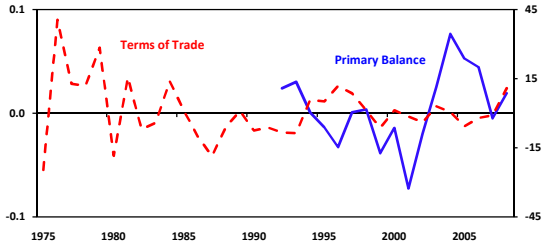


correlation until 1990 = 0.1; correlation since 1990 = 0.3

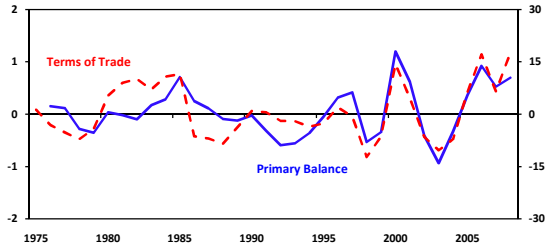


correlation before 1990 = -0.2; correlation since 1990 = 0.8

Government Primary Balance



correlation since 1990 = - 0.2



correlation before 1990 = 0.5; correlation since 1990 = 0.9

Notes: The above figures show the cycles in government expenditure, revenues, and the primary balance together with the cycles in the terms of trade for Argentina and Norway. The cycles are estimated using the Hodrick-Prescott filter. The correlation statistics in each panel show the pairwise correlation between each indicator of fiscal policy cycles and the terms of trade cycles.

Table 1
Cycles in Government Primary Balance and Terms of Trade

$$cY_{i,t} = \alpha_i + \beta\, ctot_{i,t} + \gamma\, ctot_{i,t} \times I^j_{i,t} + \delta\, X_{i,t} + \varepsilon_{i,t}$$

Regressions	Explanatory Variables	Countries							
		High Income (OECD)		Upper Middle Income		Lower Middle Income		Low Income	
		Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value
	constant	-0.03	(0.93)	0.003	(0.87)	0.07	(0.97)	0.01	(0.99)
Benchmark	Terms of Trade	0.06	(0.13)	0.31	(0.00)	0.16	(0.25)	0.001	(0.98)
	GDP	0.01	(0.00)	-0.003	(0.00)	-0.001	(0.00)	1E-4	(0.77)
	Terms of Trade	0.04	(0.53)	0.40	(0.00)	0.59	(0.01)	-0.02	(0.65)
1	Terms of Trade x Capital Flow Bonanzas	-0.15	(0.10)	-0.17	(0.01)	-0.75	(0.02)	0.06	(0.46)
	GDP	0.01	(0.00)	-0.003	(0.00)	-0.001	(0.00)	0.0002	(0.76)
	Terms of Trade	0.06	(0.29)	0.44	(0.00)	0.43	(0.06)	0.04	(0.53)
2	Terms of Trade x Terms-of-Trade Booms	-0.00	(0.98)	-0.23	(0.00)	-0.57	(0.14)	-0.08	(0.46)
	GDP	0.01	(0.00)	-0.002	(0.00)	-0.001	(0.00)	0.0002	(0.76)
	Terms of Trade	0.02	(0.61)	0.10	(0.03)	-0.12	(0.68)	0.02	(0.68)
3	Terms of Trade x Flexible Exchange Rates	0.27	(0.11)	0.20	(0.00)	0.27	(0.41)	-0.01	(0.92)
	GDP	0.01	(0.00)	-0.002	(0.00)	-0.001	(0.00)	-0.0002	(0.76)
	Terms of Trade	0.07	(0.11)	-0.01	(0.87)	0.09	(0.75)	-0.03	(0.56)
4	Terms of Trade x Persistent Terms of Trade Shocks	-0.08	(0.57)	0.48	(0.00)	0.08	(0.80)	0.06	(0.41)
	GDP	0.01	(0.00)	-0.003	(0.00)	-0.001	(0.00)	0.0001	(0.79)
	Terms of Trade	0.06	(0.12)	0.002	(0.98)	0.04	(0.86)	-0.03	(0.58)
5	Terms of Trade x Commodity-Producing Countries	-0.05	(0.70)	0.38	(0.00)	0.18	(0.53)	0.10	(0.27)
	GDP	0.01	(0.00)	-0.003	(0.00)	-0.001	(0.00)	0.0002	(0.78)

Table 2
Cycles in Government Revenues and Terms of Trade

$$cY_{i,t} = \alpha_i + \beta\, ctot_{i,t} + \gamma\, ctot_{i,t} \times I^j_{i,t} + \delta\, X_{i,t} + \varepsilon_{i,t}$$

Regressions	Explanatory Variables	Countries							
		High Income (OECD)		Upper Middle Income		Lower Middle Income		Low Income	
		Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value
	constant	0.05	(0.90)	0.003	(0.99)	-0.12	(0.95)	-0.01	(0.99)
Benchmark	Terms of Trade	-0.01	(0.71)	0.08	(0.00)	0.26	(0.02)	-0.03	(0.25)
	GDP	0.004	(0.00)	0.001	(0.24)	0.001	(0.00)	0.003	(0.00)
	Terms of Trade	-0.07	(0.24)	0.11	(0.00)	0.42	(0.02)	-0.03	(0.50)
1	Terms of Trade x Capital Flow Bonanzas	-0.10	(0.29)	0.01	(0.93)	-0.49	(0.09)	-0.03	(0.72)
	GDP	0.004	(0.00)	0.001	(0.23)	0.001	(0.01)	0.003	(0.00)
	Terms of Trade	0.01	(0.82)	0.15	(0.00)	0.69	(0.00)	-0.02	(0.71)
2	Terms of Trade x Terms-of-Trade Booms	-0.06	(0.52)	-0.12	(0.01)	-0.77	(0.02)	-0.02	(0.81)
	GDP	0.004	(0.00)	0.001	(0.21)	0.001	(0.00)	0.003	(0.00)
	Terms of Trade	-0.02	(0.68)	0.03	(0.22)	0.60	(0.00)	-0.01	(0.64)
3	Terms of Trade x Flexible Exchange Rates	-0.23	(0.17)	0.06	(0.06)	-0.63	(0.01)	0.01	(0.68)
	GDP	0.004	(0.00)	0.001	(0.11)	0.001	(0.00)	0.006	(0.00)
	Terms of Trade	0.04	(0.36)	-0.01	(0.80)	0.03	(0.90)	-0.04	(0.19)
4	Terms of Trade x Persistent Terms of Trade Shocks	-0.33	(0.00)	0.14	(0.00)	0.29	(0.29)	0.03	(0.51)
	GDP	0.004	(0.00)	0.0004	(0.41)	0.001	(0.00)	0.003	(0.00)
	Terms of Trade	-0.02	(0.69)	-0.01	(0.45)	-0.02	(0.90)	-0.04	(0.19)
5	Terms of Trade x Commodity-Producing Countries	0.02	(0.89)	0.18	(0.00)	0.56	(0.02)	0.05	(0.50)
	GDP	0.004	(0.00)	0.001	(0.14)	0.001	(0.00)	0.003	(0.00)

Table 3
Cycles in Government Expenditure and Terms of Trade

$$cY_{i,t} = \alpha_i + \beta\, ctot_{i,t} + \gamma\, ctot_{i,t} \times I^{j}_{i,t} + \delta\, X_{i,t} + \varepsilon_{i,t}$$

Regressions	Explanatory Variables	Countries							
		High Income (OECD)		Upper Middle Income		Lower Middle Income		Low Income	
		Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value
	constant	-0.07	(0.88)	0.003	(0.94)	-0.10	(0.96)	0.02	(0.97)
Benchmark	Terms of Trade	0.02	(0.62)	-0.05	(0.00)	0.14	(0.19)	-0.03	(0.19)
	GDP	-0.001	(0.00)	0.002	(0.00)	0.001	(0.00)	0.003	(0.00)
	Terms of Trade	0.03	(0.69)	-0.08	(0.00)	0.17	(0.34)	-0.01	(0.77)
1	Terms of Trade x Capital Flow Bonanzas	0.01	(0.92)	0.02	(0.56)	-0.16	(0.54)	-0.08	(0.20)
	GDP	-0.001	(0.01)	0.002	(0.00)	0.001	(0.09)	0.003	(0.00)
	Terms of Trade	0.06	(0.32)	-0.11	(0.00)	0.39	(0.06)	-0.08	(0.12)
2	Terms of Trade x Terms-of-Trade Booms	-0.10	(0.37)	-0.08	(0.05)	-0.44	(0.16)	0.07	(0.30)
	GDP	-0.001	(0.00)	0.002	(0.00)	0.001	(0.00)	0.003	(0.00)
	Terms of Trade	0.03	(0.57)	-0.01	(0.79)	0.54	(0.02)	-0.03	(0.15)
3	Terms of Trade x Flexible Exchange Rates	-0.08	(0.69)	-0.08	(0.03)	-0.72	(0.01)	0.02	(0.43)
	GDP	-0.001	(0.00)	0.002	(0.00)	0.001	(0.00)	0.006	(0.00)
	Terms of Trade	0.03	(0.50)	-0.01	(0.58)	-0.02	(0.93)	-0.03	(0.34)
4	Terms of Trade x Persistent Terms of Trade Shocks	-0.08	(0.52)	-0.06	(0.05)	0.20	(0.44)	-0.01	(0.91)
	GDP	-0.001	(0.00)	0.002	(0.00)	0.0001	(0.00)	0.003	(0.00)
	Terms of Trade	0.02	(0.60)	-0.01	(0.60)	-0.02	(0.91)	-0.03	(0.33)
5	Terms of Trade x Commodity-Producing Countries	-0.03	(0.82)	-0.08	(0.01)	0.32	(0.16)	-0.03	(0.68)
	GDP	-0.001	(0.00)	0.002	(0.00)	0.001	(0.00)	0.003	(0.00)

Table 4
Cycles in Inflation and Terms of Trade

$$cY_{i,t} = \alpha_i + \beta\, ctot_{i,t} + \gamma\, ctot_{i,t} \times I^j_{i,t} + \delta\, X_{i,t} + \varepsilon_{i,t}$$

Regressions	Explanatory Variables	Countries							
		High Income (OECD)		Upper Middle Income		Lower Middle Income		Low Income	
		Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value
	constant	0.01	(0.91)	-1.03	(0.89)	-3.03	(0.75)	-0.8	(0.94)
Benchmark	Terms of Trade	-0.04	(0.00)	0.02	(0.97)	0.13	(0.83)	-2E4	(0.99)
	GDP	1E-4	(0.10)	0.002	(0.90)	5E-5	(0.96)	-7E-4	(0.43)
	Terms of Trade	-0.04	(0.01)	-0.80	(0.42)	0.16	(0.89)	-0.03	(0.96)
1	Terms of Trade x Capital Flow Bonanzas	-0.05	(0.01)	1.43	(0.33)	0.002	(0.99)	0.02	(0.86)
	GDP	1E-4	(0.19)	0.003	(0.85)	5E-5	(0.97)	-0.001	(0.47)
	Terms of Trade	-0.06	(0.00)	1.04	(0.36)	0.55	(0.63)	-0.12	(0.13)
2	Terms of Trade x Terms-of-Trade Booms	0.04	(0.05)	-1.64	(0.30)	-0.74	(0.66)	0.20	(0.08)
	GDP	1E-4	(0.11)	0.003	(0.87)	5E-5	(0.96)	-0.0001	(0.43)
	Terms of Trade	-0.03	(0.00)	-0.08	(0.93)	-0.16	(0.87)	0.27	(0.00)
3	Terms of Trade x Flexible Exchange Rates	-0.07	(0.13)	0.39	(0.76)	0.73	(0.59)	-0.23	(0.00)
	GDP	1E-4	(0.02)	2E-4	(0.99)	1E-4	(0.93)	-0.0001	(0.27)
	Terms of Trade	-0.04	(0.00)	-0.67	(0.45)	-0.01	(0.99)	-0.01	(0.86)
4	Terms of Trade x Persistent Terms of Trade Shocks	-0.01	(0.89)	1.09	(0.33)	0.19	(0.88)	0.03	(0.75)
	GDP	1E-4	(0.10)	8E-4	(0.95)	5E-5	(0.96)	-0.001	(0.43)
	Terms of Trade	-0.04	(0.00)	-0.30	(0.72)	-0.14	(0.87)	-0.01	(0.81)
5	Terms of Trade x Commodity-Producing Countries	-0.03	(0.89)	0.52	(0.62)	0.51	(0.67)	0.03	(0.80)
	GDP	1E-4	(0.10)	0.002	(0.89)	9E-5	(0.94)	-0.0001	(0.41)

Table 5

Cycles in Fiscal Policy and Terms of Trade for Upper-Middle-Income, Commodity-Producing Countries

$$cY_{i,t} = \alpha_i + \beta\ ctot_{i,t} + \gamma\ ctot_{i,t} \times I^{com}_{i,t} + \rho\ ctot_{i,t} \times I^{com}_{i,t} \times I^{j}_{i,t} + \delta\ X_{i,t} + \varepsilon_{i,t}$$

Explanatory Variables	Government Primary Balance			Government Revenues			Government Expenditure		
	1	2	3	1	2	3	1	2	3
Terms of Trade	0.002	0.004	0.003	-0.02	-0.02	-0.02	-0.02	-0.01	-0.02
	(0.97)	(0.95)	(0.96)	(0.49)	(0.44)	(0.31)	(0.61)	(0.61)	(0.52)
Terms of Trade x Commodity-Producing Countries	0.46	0.57	0.11	0.30	0.24	0.08	-0.17	-0.13	0.01
	(0.00)	(0.00)	(0.15)	(0.00)	(0.00)	(0.03)	(0.00)	(0.00)	(0.81)
Terms of Trade x Commodity-Producing Countries x Capital Flow Bonanzas	-0.17			-0.11			0.11		
	(0.02)			(0.03)			(0.04)		
Terms of Trade x Commodity-Producing Countries x Terms-of-Trade Booms		-0.35			-0.10			0.08	
		(0.01)			(0.05)			(0.15)	
Terms of Trade x Commodity-Producing Countries x Flexible Exchange Rates			0.37			0.15			-0.13
			(0.00)			(0.00)			(0.01)
GDP	-0.002	-0.002	-0.003	0.001	0.001	0.001	0.002	0.002	0.002
	(0.00)	(0.00)	(0.00)	(0.12)	(0.10)	(0.07)	(0.00)	(0.00)	(0.00)
Adjusted R-Squared	0.22	0.24	0.17	0.23	0.18	0.14	0.09	0.09	0.11
Number of Observations	360	360	324	426	498	454	426	498	454
F-Statistic	7.87	8.47	5.51	5.71	4.72	2.90	1.60	1.70	1.37
Prob(F-Statistic)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.06)	(0.04)	(0.13)

Note: p-values are in parentheses.

Appendix
Table A1
Data Sources

Indicator	Source
1. External	
Terms of Trade	IMF, *World Economic Outlook* (WEO)
2. Fiscal	
General or Consolidated Government:	
Expenditure	IMF, WEO
Primary Balance	IMF, WEO
Revenues	IMF, WEO
4. Other	
Real GDP	IMF, WEO
GDP deflator	IMF, WEO
Consumer Price Index	IMF, IFS

Appendix
Table A2
Countries in the Sample

Low-Income Countries (14)	Lower Middle Income Countries (21)	Upper Middle Income Countries (17)	High Income OECD Countries (22)
Cambodia	Albania	Argentina	Australia
Côte D'Ivoire	Angola	Brazil	Austria
Ethiopia	Cameroon	Bulgaria	Belgium
Kenya	China	Chile	Canada
Lao	Colombia	Costa Rica	Denmark
Malawi	Congo, Republic of	Latvia	Finland
Mozambique	Egypt	Lebanon	France
Nigeria	El Salvador	Lithuania	Germany
Pakistan	Honduras	Malaysia	Greece
Senegal	India	Mexico	Hungary
Tanzania	Indonesia	Panama	Iceland
Uganda	Iran	Poland	Ireland
Vietnam	Jordan	Russia	Italy
Yemen	Morocco	South Africa	Japan
	Paraguay	Turkey	Korea
	Peru	Uruguay	Netherlands
	Philippines	Venezuela	New Zealand
	Syria		Norway
	Thailand		Spain
	Tunisia		Sweden
	Ukraine		United Kingdom
			United States

Note: The total number of countries is 74.