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THE STRUCTURAL DETERMINANTS OF EXTERNAL VULNERABILITY*

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Abstract

This paper examines empirically how domestic structural characteristics related to openness and product- and factor-market flexibility influence the impact that terms-of-trade shocks can have on aggregate output. For this purpose, it applies an econometric methodology based on semi-structural vector auto-regressions to a panel of 90 countries with annual observations for the period 1974-2000. Using this methodology, the paper isolates and standardizes the shocks, estimates their impact on GDP, and examines how this impact depends on the domestic conditions outlined above. We find that larger trade openness magnifies the output impact of external shocks, particularly the negative ones, while improvements in labor market flexibility and financial openness reduce their impact. Domestic financial depth has a more nuanced role in stabilizing the economy. It helps reduce the impact of external shocks particularly in environments of high exposure --that is, when trade and financial openness are high, firm entry is unrestricted, and labor markets are rigid.

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1. Introduction

Macroeconomic volatility is not only a source of business cycle uncertainty but also a major cause of low economic growth. Ramey and Ramey (1995) were the first to document this finding for a cross-section of countries. Fatás (2000) and Hnatkovska and Loayza (2005) complemented it, showing that macroeconomic volatility is particularly harmful for developing countries, where volatility is higher and its impact more pronounced.

Among the causes of macroeconomic volatility, the incidence of external shocks and in particular fluctuations in the terms of trade play an important role. Across countries, about 10 percent of the variation in GDP growth and a quarter of the variation in growth volatility can be explained by the observed differences in the volatility of terms-of-trade changes (see Easterly et al. 1993 and Hnatkovska and Loayza 2005). Terms-of-trade shocks have also been documented to have a significant impact on GDP within countries (see Ahmed 2003, and Raddatz, 2005, among others), although on this front the evidence of their relative importance vis-à-vis domestic shocks is more controversial.[1]

Going beyond the average impact of external shocks, there is a rich literature that suggests the possibility that the impact of an external shock on the real side of the economy may be determined by domestic conditions that interact with the shocks to produce macroeconomic stability or volatility as outcomes. The traditional approach to analyze the domestic sources of vulnerability has stressed macroeconomic policy responses in monetary, foreign exchange, and fiscal areas. A recent example of this macroeconomic emphasis is Broda (2001), who compares the stabilization properties of different exchange rate regimes in the face of terms-of-trade shocks. New developments in the vulnerability literature have concentrated, instead, on the role of structural characteristics related to the functioning of markets and institutions. Some studies stress the role of factor and product market rigidities for the amplification of shocks at the

[1] On the one hand, Mendoza (1995), and Kose and Riezman (2001), using calibrated small-open economy models find terms-of-trade shocks to account for almost half of economic fluctuations. On the other hand, Hoffmaister, Roldós, and Wickham (1998), Ahmed (2003), and Raddatz (2005), among others, using time-series analysis find that external shocks explain a much smaller fraction of output volatility (around 20 percent).

macroeconomic level. See, for example, Kiyotaki and Moore (1997), Bernanke and Gertler (1989), Caballero and Hamour (1994, 1996, 1998), and Caballero and Krishnamurty (2001). Others, such as Acemoglu et al. (2003), point to the relevance of institutional development in the control of crises and management of shocks.

Notwithstanding these contributions, the extent to which domestic structural characteristics can account for the relative instability of aggregate output remains an open question. This paper contributes to this literature by examining how certain domestic structural characteristics influence the impact that external shocks may have on aggregate output. The broad issue under study here is whether a country's vulnerability to shocks is not purely random but linked to structural characteristics driven at least partially by policy and related specifically to trade and financial openness, financial depth, and labor and firm flexibility.

For analytical purposes we can distinguish two aspects of output vulnerability to external shocks. The first is the frequency and strength of the shocks affecting the country. The second one is the effect that a shock of a given size and frequency can have on the country's output. This paper is dedicated to the second aspect of vulnerability. For this purpose and working with a panel sample of 90 countries and annual observations for the period 1974-2000, the paper applies an econometric methodology that isolates and standardizes the shocks, estimates their impact on GDP, and examines how this impact depends on the domestic conditions outlined above.[2]

From an empirical perspective, the relevant question for the paper is whether the differential impact of a *given* external shock is related to country characteristics. Controlling for the size of the shocks is not an easy task. Most of the recent literature on this issue has relied on either indirect evidence from difference-in-difference estimation (see, for example, Braun and Larrain 2005, Caballero, Cowan, Engel, and Micco 2005, and Raddatz 2005) or calibrated macroeconomic models developed to match certain moments of developing countries' economic performance (for a survey, see Arellano and Mendoza 2004). This paper takes a different approach and directly estimates the output

[2] An analogy can illustrate these ideas: how vulnerable people are to disease depends on the seriousness of the disease itself (first aspect) and how well prepared they are to bear a given disease (second aspect). In order to analyze the second aspect, it would be necessary to examine how people facing the same disease (in type and strength) react. This would shed light on why some people suffer so much from an attack of, say, the flu, while others remain unscathed.

impact of external shocks using semi-structural vector auto-regression analysis (VAR), as applied to a (cross-country, time-series) panel data of aggregate variables. This methodology requires the identification assumption that the relevant external variable, that is, the change in the terms of trade, does not respond to either domestic output changes or the variables that account for the country's structural characteristics. In practice, this rather uncontroversial assumption amounts to a small-open-economy condition for the countries included in the analysis. Similar applications of this methodology can be found in Broda (2004), Ahmed (2002), Uribe and Yue (2003), and Raddatz (2005). Controlling for the size of the shock, the analysis proceeds to account for its interaction with the set of country characteristics under analysis and estimate its conditional output impact.

The rest of the paper carries on as follows. Section 2 presents the econometric methodology in detail and conducts the corresponding specification tests. Section 3 introduces the data, providing information on variable definitions and sources, as well as the sample of countries and years under analysis. Section 4 presents the empirical results, including the discussion of symmetric and asymmetric (positive/negative) effects, the potential complementarity between structural characteristics, and a set of robustness checks. Section 5 concludes.

2. Methodology

We estimate the impact of exogenous shocks on a country's economic performance and its relation to a country's structural characteristics using a panel vector auto-regression (panel VAR). In order to impose the minimum identification assumptions possible (see below), we focus exclusively on terms-of-trade shocks. Therefore, for a given country *i*, our semi-structural model corresponds to:

$$A_{i,0}x_{i,t} = \sum_{j=1}^{q} A_{i,j}x_{i,t-j} + \varepsilon_{it} \quad (1)$$

where $x_{i,t} = (\Delta tt_{i,t}, \Delta y_{i,t})'$, is a vector that contains the first difference of the (log) terms-of-trade index ($\Delta tt_{i,t}$) and the log of real GDP per capita ($\Delta y_{i,t}$), both as deviations from

their country-specific means.[3] The matrices $A_{i,j}$ contain the structural coefficients for the different lags included in the model (including the contemporaneous). The structural errors $\varepsilon_{i,t}$ are i.i.d. with zero mean and a diagonal variance-covariance matrix Σ.

The identification assumption used in the paper is that, for a given country, terms-of-trade changes are strictly exogenous. That is, we assume that $\Delta tt_{i,t}$ do not respond to $\Delta y_{i,t}$ at any lags. This assumption is equivalent to imposing the following triangular structure in all the A matrices:

$$A_{i,j} = \begin{bmatrix} a^{i,j}{}_{11} & 0 \\ a^{i,j}{}_{21} & a^{i,j}{}_{22} \end{bmatrix}.$$

For the developing and small developed countries included in this study, this assumption should be uncontroversial. In fact, for the sample of countries included in this study, a standard Granger causality cannot reject the hypothesis that output fluctuations do not Granger-cause terms of trade fluctuations.[4] The relatively weak assumption required to identify the impact of a terms-of-trade shock is the reason why we focus exclusively on these shocks. We believe that it is preferable to focus on a reduced set of shocks that we can clearly identify that in a broader set of shocks that would require strong and controversial identification assumptions. This means, however, that we have to interpret our results with caution. Our statements on the role of different structural characteristics on the amplification or dampening of shocks apply directly to terms-of-trade shocks, and only indirectly to other exogenous contingencies that are correlated with these shocks.[5] It may well be the case, however, that some of the structural characteristics will be especially important for other types of shocks that are not or loosely correlated to those to the terms-of-trade.

Our baseline model corresponds to a panel VAR in which we assume that part of the coefficients in the *A* matrices are common across cross-sectional units. As we are

[3] Of course, this is equivalent to including a country fixed effect in the VAR.
[4] When performed on a country-by-country basis, the test cannot reject the null in 77 of the 90 cases. In the robustness section we will show that the results are not materially affected by excluding the 13 countries in which the hypothesis that terms of trade are no Granger-caused by output is rejected.
[5] As we do not have a full structural model that accounts for all exogenous sources of fluctuations, ours is a semi-structural model, and our terms of trade variable captures all strictly exogenous variables that are correlated with the fluctuations in terms of trade.

interested in testing how different structural characteristics of a country affect the impact of terms-of-trade shocks on output, which is captured on the $a^{i,j}{}_{21}$ coefficients, we permit these coefficients to vary across countries according to the specific characteristics whose role we want to determine. In particular, we assume that

$$a^{i,j}{}_{21} = \beta_0{}^j + \beta_1{}^j \times OPEN_i + \beta_2{}^j \times FDEV_i + \beta_3{}^j \times CAOPEN_i + \beta_4 \times LABOR_i + \beta_5 \times ENTRY_i$$

where $OPEN_i$, $FDEV_i$, $CAOPEN_i$, $LABOR_i$, and $ENTRY_i$ are measures of trade openness, financial development, capital account openness, labor flexibility, and firm entry flexibility for country *i* that we describe below in section 3. In part of our analysis we will also allow for the possibility that the role of these characteristics on the transmission of terms-of-trade shocks may be different when there is a decrease in (log) terms of trade (with respect to the mean change). In terms of the notation above, this corresponds to allowing the β^j coefficients to vary with the state of the terms-of-trade in the following way:

$$\beta = \begin{cases} \beta^+ & \text{if } \Delta tt_{i,t} > 0 \\ \beta^- & \text{otherwise} \end{cases}$$

where $\beta = (\beta^0, \ldots, \beta^j, \ldots, \beta^q)$, $\beta^j = (\beta_0{}^j, \ldots, \beta_5{}^j)$, and β^+ and β^- are similarly defined. The rest of the coefficients that capture the dynamics of the terms of trade and the lagged effect of output on itself (the $a^{i,j}{}_{11}$ and $a^{i,j}{}_{22}$ coefficients respectively) are restricted to be the same for all countries.

The use of panel VARs, with the consequent restrictions on the parameters, is common in the recent literature that estimates the impact of exogenous shocks on different macroeconomic variables (see Broda, 2004; Ahmed, 2003; Uribe and Yue, 2003) because the length of the time series dimension of the data (around 25 annual observations) makes it difficult to estimate country specific dynamics. Using a panel VAR approach instead increases the degrees of freedom of the estimation, and, if the restrictions are correct, provides more efficient estimators. Of course, the obvious disadvantage is that if the restrictions are incorrect the model may be incorrectly specified.

A particular concern with this approach is that, as noticed by Pesaran and Smith (1995), the assumption of common coefficients may lead to obtaining parameters that underestimate (overestimate) the short (long) run impact of exogenous variables if the dynamics differ importantly across countries. However, as demonstrated by Pakes and Griliches (1984), if differences in slope coefficients are uncorrelated with the exogenous variables the estimated parameters would be consistent estimators of the average coefficients. This is an important result for our case, as we do not see a good reason to believe that the effect of terms of trade in a country should be determined by the level of terms of trade. Nevertheless, with the caveat of the lack of precision of the estimates, we will also estimate the VAR on a country-by-country basis, without imposing any restriction on the dynamics, and then relate the estimated country specific effects of shocks to the structural characteristics we are studying. The results will prove to be very similar to those obtained with our panel methodology.

As mentioned above, the variables in the VAR are the first differences of the (log) terms of trade and output per capita. That is, we model the relevant series as difference-stationary. There are two reasons for this modeling choice. First, standard tests tend to suggest the presence of a unit root in the series. The results of those tests are summarized in Table 1. Columns 1 and 2 show the results of the ADF tests performed on a country-by-country basis for the cases where the underlying Dickey-Fuller tests have been augmented with a number of lags that varies or is kept constant across countries respectively.[6] It is clear that in most cases the test cannot reject the null of a unit-root for both series (about 85 percent of the time for both series when the median number of lags is used for all countries). The panel based unit-root test suggested by Levin, Lin, and Chu (2002), augmented by the median number of lags across countries (2 lags), reported in column (3) provides a similar conclusion. The null of a unit root cannot be rejected. Second, previous empirical papers in this literature (e.g. Ahmed, 2003, Broda, 2004) have estimated difference stationary models, so this specification has the advantage of being more directly comparable with the existing results.[7]

[6] The number of lags for each country was determined using Hall's (1990) methodology. The common number of lags used in column (2) corresponds to the median across countries (2 lags).

[7] Pedroni (1999) panel cointegration test, not reported, does not reject the null of no cointegration between (log) terms of trade and output. The different statistics derived by Pedroni (1999) tend to give different

Regarding the number of lags, we use two annual lags in the benchmark specification. This number of lags was obtained from standard lag selection tests (Akaike information criterion, Schwartz information criterion, and Hannan-Quinn criterion).

Under the identification assumptions described above, we estimate the parameters of the model using a two-step procedure in which we first estimate the reduced form coefficients by OLS equation-by-equation and recover the impulse-response functions (IRF) to each of the structural shocks using the reduced form coefficients and the variance-covariance matrices of reduced form errors derived from these coefficients. The confidence bands for the IRF were estimated by parametric bootstrapping assuming normally distributed reduced form errors.[8]

3. Data

The main variables used in the paper are the following. Real GDP per-capita corresponds to the GDP per capita in constant 2000 U.S. dollars and was obtained from the WDI. The reason to use this series instead of the PPP adjusted ones, despite the reduced international comparability, is that it has more recent coverage than the measures from the Penn World Tables and longer coverage than the PPP series produced by the World Bank. The terms-of-trade index is the ratio of export prices to import prices computed using the current and constant price values of exports and imports from the national accounts component of the Penn World Tables (version 6.1) and updated using the terms-of-trade data from WDI. To reduce concerns about structural breaks we focus on the post Bretton-Woods period, 1974-2000.

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results but most of them cannot reject the null of no cointegration. As the power and size trade-off of the different tests varies with the cross-sectional and time-series dimension of the panel (see Pedroni, 2004), we focused on the statistics with that have the largest size (so tend to over-reject) and highest power at short time dimensions. Those tests, corresponding to the panel and group t-statistics derive by Pedroni (1999) clearly do not reject the null of no cointegration.

[8] The procedure can be briefly described as follows: (i) we use the estimated variance-covariance matrix of the reduced form errors to simulate a random realization of the perturbations; (ii) we use the initial values of the different variables, the baseline coefficients, and the simulated perturbations to simulate a new set of observations for the variables in the VAR; (iii) we use these simulated observations to estimate a new set of coefficients; (iv) we repeat this exercise 500 times; (v) we compute the IRF for each set of coefficients obtained from the bootstrapping; (vi) we build a 90% confidence interval for the IRF by taking the 5^{th} and 95^{th} percentile of the empirical distribution of the IRF on a point-by-point basis.

The structural characteristics of the countries are captured in the following variables. Trade openness is measured as the (log) of the ratio of total trade to GDP. Financial development corresponds to the (log) of the ratio of the private credit provided by banks and other financial institutions to GDP, obtained from Beck, Demirguc-Kunt, and Levine (2000). When not available we used data on the domestic credit to private sector (as a fraction of GDP) from WDI. Openness in capital account transactions is captured by the Ito and Chinn (2002) index.[9] The index is such that a higher value indicates a higher degree of openness. The index of labor market flexibility is calculated from data in World Bank (2003) and is a weighted average of three indicators --flexibility of hiring, conditions of employment, and flexibility of firing-- as in Botero et al. (2004). For this paper, the original index was rescaled to range between 0 and 1, with higher values indicating more flexible labor markets. Finally, the index measuring the ease of firm entry was calculated from data in World Bank (2003) and O'Driscoll, Feulner, and O'Grady (2003) and is a weighted average of four indicators –registration procedures, cost of registration, days to registration, and burden entry regulations—as in Chang, Kaltani, and Loayza (2005). This index also ranges from 0 to 1, with higher values indicating less restricted firm entry.

The sample of countries used in the empirical analysis is shown in Table 2. The sample includes 90 countries from different regions and income levels. The largest region in the sample is Sub-Saharan Africa with 31 countries, followed by Latin America with 20, East Asia and Pacific and with 11, Middle East and North Africa and Western Europe with 10 each, and South Asia, East and Central Europe, and North America with 4, 3, and 1 countries respectively. With respect to income, there are 36 low-income countries, 36 middle-income countries, and 18 high-income countries. The sample includes all countries where at least 15 continuous observations of both terms-of-trade and output per capita were available during the period 1974-2000 and with available measures of the structural characteristics described above. We excluded from the sample large industrial

[9] The Ito-Chin index corresponds to the first principal components of the following 4 binary variables reported in the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER): existence of multiple exchange rates, restrictions on current account, capital account transactions, and the existence of requirements to surrender exports proceedings.

countries because of the possible endogeneity of their terms of trade,[10] and five developing countries where the terms of trade data exhibited long flat periods.[11]

The different columns of Table 2 show some summary statistics for each of these variables for all countries in the sample. The cross-sectional correlations among these variables are reported in Table 3. There we observe the well documented positive correlations between the different structural characteristics and output growth, and between the measures of volatility and growth. We also observe that all the structural characteristics are positively correlated, although the magnitudes of the correlations are not particularly large with the exception of the correlation between financial development and firm flexibility, which reaches 66 percent. These relatively low correlations give us ground to expect to be able to sort out the role of the different characteristics for the transmission of shocks.

4. Results

Our basic results are derived from estimating the cumulative output effect of a one-standard-deviation shock to the terms of trade at different levels of a particular structural characteristic. As explained in the methodological section, we conduct this estimation in the context of a panel (cross-country, time-series) vector autoregression with (detrended log) GDP changes as the dependent variable and (detrended log) terms-of-trade changes as the exogenous variable. We allow the output effect of terms-of-trade shocks to vary with five country structural characteristics: trade openness, financial depth, financial (or capital-account) openness, labor market flexibility, and ease of firm entry. To analyze the effect of these structural factors, we compare the shock's cumulative output impact measured at the 25^{th} and the 75^{th} percentiles of the world distribution of each structural characteristic. Comparing the impact statistics at these (relatively) low and high levels for a given structural factor provides a sense for how much it contributes to amplifying or dampening the external shock.

[10] The excluded countries are United States, United Kingdom, France, Italy, Germany, and Japan.
[11] These countries are Cape Verde, Grenada, St. Lucia, St. Kitts and Nevis, and Nepal.

Figure 1 and Table 4 present the cumulative effect of a one-standard-deviation shock in the terms of trade on the level of GDP per capita for low and high levels of each country characteristic. In order to indicate the accuracy of the estimated impacts, Figure 1 also presents their 90% confidence bands, and Table 4 the corresponding (empirical) standard errors.[12] In order to have a benchmark for quantitative comparison, we estimated the *average* cumulative output impact of a one-standard-deviation terms-of-trade shock (that is, the impact calculated at the means of all structural characteristics) and its value is approximately 1 percentage point of GDP.

The most noticeable result is that larger trade openness appears to increase the cumulative output impact of terms-of-trade shocks. This is likely to be a size effect, as a higher volume of trade implies a larger share of economic activities that trade prices can influence. This effect is large: the output impact of the shock at the third quartile of trade openness is 1.4 percentage points higher than at the first quartile. Conversely, higher financial depth seems to have no effect on the impact of terms-of-trade shocks. This is rather surprising given that financial depth is usually considered as an antidote to external vulnerability. This is an important issue, and we'll revisit it at several points in this paper.

An increase in financial openness does appear to reduce the effect of a terms-of-trade shock, although by only a moderate margin: the difference in the cumulative output impact between the 25^{th} and 75^{th} percentiles of financial openness is 0.34 percentage points. The fact that access to international financial markets has a stabilizing effect while domestic financial depth does not is puzzling. Below we examine a possible interaction between these two structural characteristics. Easing firm entry has a small amplifying effect of terms-of-trade shocks, but it fails to be statistically significant. The entry of new firms may be compensated by exit in relatively equal amounts, and, moreover, this process of firm dynamics may have different characteristics under negative or positive shocks. For this and the other structural characteristics, we analyze the possibility of asymmetric effects below.

[12] Critical values and corresponding confidence intervals are obtained from the empirical distribution derived through the parametric bootstrapping procedure described above.

Finally, of all structural characteristics considered here, improvement in labor market flexibility has the strongest effect of reducing the impact of terms-of-trade shocks on per capita GDP. The difference in the shock's cumulative output impact between the first and third quartiles of labor market flexibility is 0.74 percentage points. The ability of firms to adjust their activities on the labor margin seems crucial for the economy to accommodate the shock.

Robustness

We examine the robustness of the basic results to the application of a longer lag structure in the estimated VARs, changes in the sample of countries, the use of alternative measures of financial depth, the inclusion of the exchange-rate regime as an additional country characteristic, and the implementation of an alternative method to estimate the effects of structural characteristics. The results are presented in Tables 5 and 6.

The benchmark results are obtained from panel VARs that include both developing and developed countries and set a common lag structure of 2 lags. The first two robustness checks refer to these features of estimation. First, to dispel concerns on whether pre-estimation diagnostics could have indicated a longer lag structure, we re-estimate the shock impacts from VARs with 3 lags for all countries. The results change little if anything: there seems to be some reshuffling in the relative importance of the structural characteristics, but the differences are quantitatively small and unlikely to be statistically significant. A richer lag structure comes at the price of using fewer observations for estimation, particularly in countries where the time series is rather limited, and we prefer to continue working with VARs of 2 lags.

Second, in order to discard the possibility that our results are derived only from the contrast between developing and developed countries, we exclude all OECD countries from our sample, re-estimate the model, and compute again the impact statistics. These results are qualitatively the same and quantitatively quite similar as those obtained using the full sample. This similarity is noteworthy and indicates that our results can be compared to those of studies that focus only on developing countries.[13]

[13] The results are also unaffected by the exclusion of the 13 countries where were we rejected the hypothesis that output fluctuations Granger caused terms of trade fluctuations.

The absence of any clear effect of increasing financial depth on the impact of external shocks is arguably the most surprising result of our basic exercises. Here we examine whether this result is robust to changes in the measurement of financial depth. In particular, it can be argued that larger financial depth appears not to reduce the impact of shocks because it expands as these shocks occur (this is a variation of the reverse causality argument). As in the empirical growth literature, we address this possibility by using the initial measure of private credit/GDP instead of its period average as the proxy for financial depth. However, the result on the effect of financial depth is basically unchanged and, therefore, the puzzling irrelevance of financial depth continues.

The exchange-rate regime is usually considered a macroeconomic policy and not a structural characteristic. That's why it was not included in the basic set of interactions. However, since it has received so much attention in the stabilization literature and could in principle be related to the structural characteristics considered here, we conduct an additional exercise that includes the exchange rate regime as an additional interaction variable. We follow the Gosh et al. (2000) classification to separate country-year observations with a pegged regime from those with intermediate and floating regimes. This exercise renders very similar results to those of the benchmark: Trade openness is found to amplify the shocks, financial openness and labor market flexibility to mitigate them, and financial depth and ease of firm entry to be negligible in this respect. The effect of the exchange rate regime itself is quite small and statistically insignificant. This result is, however, only tentative. The analysis of the exchange rate regime requires a treatment of measurement issues that is out of the scope of this paper.

As explained in the methodological section, an alternative to estimating the interactions model using panel data consists of estimating the simple model (with no interactions) country-by-country, and then running a cross-country regression of the resulting cumulative impacts on the five structural variables. The advantage of this method is that it allows for full country heterogeneity in parameter estimation; this, however, comes at the price of lower estimation efficiency and increased noise in the individual country impulse responses.

Table 6 presents the results of this regression, estimated with a procedure that is robust to the undue influence of outlying observations. The results are qualitatively

similar to those obtained from panel VARs. That is, the two most important country characteristics that affect the shocks' impact are trade openness and labor market flexibility, the former magnifying the impact and the latter reducing it. Financial depth and ease of firm entry carry positive coefficients, but not large enough to be statistically insignificant. Financial openness carries a negative coefficient, implying a stabilizing effect, and this effect is close to achieving statistical significance.

Asymmetric effects

The analysis above allows us to determine if structural characteristics have a stabilizing (or destabilizing) effect for all shocks, whether positive or negative. In principle, however, this symmetric treatment could mask important differences on the effects of structural characteristics for positive and negative shocks. For instance, an ideal structural characteristic --one that in reality magnifies positive shocks and reduces negative ones-- could be found to be ineffectual under a symmetric analysis. We now consider separately the output response to negative and positive terms-of-trade shocks.

The results of the asymmetric analysis are presented in Table 7 and the corresponding panels of Figures 2 and 3. The first thing to notice is that only increases in trade openness and in labor market flexibility and only in the case of *negative* shocks produce statistically significant results. The estimation of asymmetric shocks presents larger standard errors as it uses fewer observations and suffers from wide data variations associated to sign transitions. While the following discussion takes the point estimates at face value, we acknowledge that small effects (those below 0.3 percentage points, as a simple rule of thumb) are likely to be statistically irrelevant.

There is some evidence of asymmetric effects. The asymmetry in the effect of trade openness is not present in the direction of the impact but in its magnitude. Larger trade openness increases the (absolute) impact of both negative and positive shocks on per capita GDP. However, its effect on the impact of negative shocks is larger than that on positive ones. In fact, comparing the effects at the first and third quartiles of trade openness, its negative effect is about four times as large as the positive one.

Higher financial depth has no significant effect on the impact of either positive or negative terms-of-trade shocks. Therefore, its lack of relevance as shock stabilizer

cannot be explained by asymmetric effects. An increase in financial openness reduces the (absolute) impact of both negative and positive shocks and by similar magnitudes than under the case of symmetric effects (0.3-0.4 percentage points). It is not surprising, then, that assuming symmetry in the case of financial openness produces more efficient estimates and, thus, significant effects.

An improvement in labor market flexibility dampens the effect of both negative and positive shocks, with a bit stronger effect on negative ones. Raising labor market flexibility from the 25^{th} to the 75^{th} percentile of its world distribution helps reduce the impact of negative shocks by 0.82 percentage points while reducing that of positive shocks by 0.51 percentage points. Labor market flexibility is, thus, particularly important in the face of adverse shocks. Finally, ease of firm entry also shows some evidence of an asymmetric effect: whereas easing firm entry does not alter the impact of negative shocks, it increases somewhat the consequences of positive ones. Improving the ease of firm entry from the first to the third quartile of its world distribution increases the cumulative output impact of *positive* shocks by 0.55 percentage points.

In summary, the following taxonomy arises from the analysis on asymmetric effects. Trade openness amplifies both negative and positive shocks, ease of firm entry magnifies only positive shocks, financial openness and labor market flexibility (most clearly) help stabilize the economy after positive and negative shocks, and financial depth appears to be inconsequential for the effect of either type of shock. However, as mentioned above, estimation under asymmetric effects is rather imprecise and produces statistically significant results only for larger trade openness (as shock magnifier) and further flexibility in labor markets (as stabilizer).

The Role of Financial Depth: Complementarities

According to the evidence presented above, financial depth appears to have no effect on the output impact of terms-of-trade shocks. This result is based on a model that controls for other structural factors but does not condition the effect of financial depth itself on these variables. The latter calls for a model that interacts financial depth with other structural characteristics, thus allowing for complementarities between them. This is necessary to assess whether financial depth becomes relevant under special

circumstances; for instance, in countries with a large degree of financial openness or low labor market flexibility. Allowing for multiplicative interactions is complex enough, so that we restrict this analysis to the case of symmetric effects (of positive and negative shocks).

The summary results of the interactions model are presented in Table 8. In particular, it shows the effect of improving financial depth from the 25^{th} percentile ("Low") to the 75^{th} percentile ("High") when each of the other characteristics are at their respective 25^{th} and 75^{th} percentiles. In contrast to the basic one, the interactions model indicates a relevant though nuanced role for financial depth in affecting the impact of external shocks. At low trade openness, increasing financial depth raises the shock impact; while at high trade openness, it reduces the impact. In both cases the effect of larger financial depth is statistically significant and by around 0.55 percentage points in magnitude.

Likewise, at low financial openness, increasing financial depth increases the impact of the shock; while at high financial openness, the opposite occurs. The former effect is small and not quite significant. However, at high levels of capital account openness, the effect of improving financial depth is not only statistically significant but also remarkably large (1.6 percentage points). This result is consistent with the literature that emphasizes the complementarity between reforms in domestic and international financial markets (see Caballero and Krishnamurthy, 2001, or Edwards, 2001, among others).

An alternative reading of the previous results may help clarify the positive role of financial development. First, although trade openness always increases the impact of a shock, this is considerably smaller when the expansion in openness occurs in a country with well developed local financial markets. Similarly, our findings indicate that higher financial openness in an environment of underdeveloped local financial markets may result in an increase in the impact of external shocks. In contrast, when financial openness occurs in a country with well developed financial markets the impact of the shocks is reduced.

The interaction between financial depth and the ease of firm entry is equally noteworthy: improving financial depth when firm entry is unrestricted renders a large

payoff in terms of reducing the shock impact (by 1.5 percentage points). At low levels of firm entry flexibility, improving financial depth also contributes significantly to reduce the impact of shock but by less than half of the effect under flexible firm entry.

Whereas for trade openness, financial integration, and firm entry, there emerges a pattern of complementarity with financial depth; the case of labor market flexibility appears to be one of substitution. Improving financial depth has an attenuating effect on the shock's impact when labor markets are rather rigid (by a significant 0.62 percentage points). Improving financial depth has no effect when labor markets are flexible.

5. Concluding Remarks

What underlies a country's vulnerability to external shocks? Why do some countries suffer so much in the face of terms-of-trade shocks while others remain unscathed? With these questions in mind, in this paper we examine how certain domestic characteristics influence the impact that terms-of-trade shocks can have on aggregate output. The paper has an empirical objective but is motivated by the recent literature that emphasizes the role of product- and factor-market rigidities as the source of macroeconomic vulnerability.

The paper applies an econometric methodology based on semi-structural vector auto-regressions to a panel of 90 countries with annual observations for the period 1974-2000. Using this methodology, the paper identifies and standardizes the terms-of-trade shocks affecting these countries, estimates their impact on (detrended) GDP per capita, and examines how this impact depends on the countries' trade and financial openness, domestic financial depth, and labor and firm-entry flexibility.

Our basic results indicate that the two most important country characteristics affecting the shocks' output impact are trade openness and labor market flexibility, the former magnifying the impact and the latter reducing it. Financial openness also shows a significant stabilizing effect, but weaker in magnitude. Financial depth and ease of firm entry do not seem to affect the shocks' impact significantly in the basic specification. These results are robust to using a longer lag structure for the VARs, concentrating exclusively on developing countries, substituting initial for average financial depth,

controlling in addition for the exchange rate regime, and allowing full heterogeneity in the estimation of country impulse responses.

When we allow for the possibility of asymmetric effects (from negative and positive shocks), we find that higher trade openness amplifies *negative* shocks while improvements in labor market flexibility reduces their impact. We find no significant effects of the structural determinants on the impact of positive shocks. However, this may be due to difficulties in the precise estimation of asymmetric affects associated with wide data variations during transitions between positive and negative shocks.

The role of domestic financial depth deserves special examination. In our basic exercises, we fail to find a significant effect of financial depth on the output impact of terms-of-trade shocks. However, this does not mean that financial development is inconsequential for the issue of vulnerability. On the contrary, further exploration reveals a significant though more nuanced role for this structural characteristic. In particular, when we allow for interactions between financial depth and the other characteristics, we find that higher financial depth helps output stabilization when trade and financial openness are high and firm entry is unrestricted. This pattern of complementarity is not, however, present in the relationship between financial depth and labor market flexibility. In this case, financial depth has a stabilizing effect that compensates for the rigidity of labor markets.

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Table 1. Unit Root Tests

Variable	ADF by country (% cannot reject UR) (1)	ADF by country (% cannot reject UR) (2)	Levin-Lin-Chu P-value (3)
logy	71	84	1.00
logtt	60	83	0.98

Notes:

a) Column (1) reports the percentage of the 90 countries in the sample where the Augmented Dickey-Fuller test cannot reject the null hypothesis of a unit root when the number of lags augmenting the test is country specific, as determined by performing the Hall (1990) procedure on a country-by-country basis.

b) Column (2) reports the same percentage for the case where for all countries the model is augmented using the median number of lags across countries (2 lags).

c) Column (3) shows the p-value of the Levin-Lin-Chu (2002) test for panel unit roots for the case where the panel is augmented by 2 lags.

Table 2. Sample of Countries and Summary Statistics

Country Name	Average output growth (%)	Average terms of trade growth (%)	Standard deviation output growth	Standard deviation terms-of-trade growth	Trade Openness	Financial Depth	Financial Openness	Labor Market Flexibility	Ease of Firm Entry
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Algeria	0.46	-0.43	2.87	23.14	3.81	-1.12	-1.41	0.54	0.66
Angola	-2.26	-3.66	9.28	18.08	4.16	-4.31	-1.55	0.22	0.22
Argentina	0.27	-0.01	5.78	8.17	2.70	-1.78	-0.13	0.34	0.69
Australia	1.86	-0.66	1.92	5.06	3.28	-0.77	1.32	0.64	0.89
Austria	2.20	-0.31	1.56	1.34	3.97	-0.25	1.68	0.70	0.74
Bangladesh	1.62	0.85	2.27	12.44	2.91	-1.60	-1.40	0.50	0.62
Belgium	1.95	-0.12	1.66	1.59	4.83	-0.96	1.56	0.52	0.80
Benin	0.55	-1.69	3.63	14.17	3.71	-2.37	-0.24	0.48	0.69
Bolivia	-0.11	-2.19	3.00	11.32	3.73	-1.40	0.68	0.34	0.52
Botswana	5.26	-1.52	3.57	11.19	4.63	-2.06	-0.21	0.65	0.62
Brazil	1.21	-1.73	3.68	9.83	2.75	-1.30	-1.64	0.22	0.45
Burkina Faso	1.19	0.77	3.43	12.52	3.17	-2.01	-0.36	0.47	0.45
Burundi	-0.61	-2.78	5.11	33.79	3.28	-2.48	-1.09	0.38	0.25
Cameroon	0.61	0.00	7.03	22.39	3.45	-1.63	-0.47	0.56	0.59
Canada	1.76	0.18	2.28	3.05	3.90	-0.37	2.68	0.66	0.94
Central African Republic	-1.42	-1.27	4.61	16.26	3.22	-2.60	-0.66	0.38	0.25
Chad	-0.56	-2.94	9.06	13.46	3.26	-2.57	-0.76	0.34	0.41
Chile	3.18	-2.54	5.75	14.51	3.73	-0.85	-1.25	0.50	0.78
China	7.35	-0.93	3.44	5.74	3.16	-0.13	-1.24	0.53	0.61
Colombia	1.34	0.54	2.30	10.19	3.21	-1.33	-1.53	0.41	0.65
Congo, Dem. Rep.	-5.17	-0.57	5.19	18.07	3.54	-5.74	-1.09	0.40	0.31
Congo, Rep.	0.37	-0.79	7.02	22.26	4.27	-2.28	-0.91	0.40	0.58
Costa Rica	1.29	0.14	3.73	9.45	4.12	-1.69	-0.56	0.37	0.64
Cote d'Ivoire	-1.14	-1.95	4.94	16.36	4.05	-1.16	-0.53	0.47	0.59
Denmark	1.65	0.40	1.93	2.43	3.97	-0.89	1.13	0.75	0.91
Dominican Republic	2.27	-2.49	3.31	11.72	4.02	-1.37	-1.46	0.51	0.60
Ecuador	0.40	-1.73	3.18	13.45	3.71	-1.53	0.04	0.45	0.51
Egypt, Arab Rep.	3.55	-2.80	2.86	11.33	3.57	-1.24	-1.05	0.41	0.59
El Salvador	0.01	0.07	4.83	17.84	3.90	-2.71	-0.64	0.31	0.59
Ethiopia	-0.09	0.29	7.67	19.72	3.02	-1.82	-1.14	0.49	0.69
Finland	2.13	-0.08	3.05	3.09	3.89	-0.55	1.54	0.45	0.85
Ghana	-0.60	-2.01	5.06	15.93	3.89	-3.26	-1.39	0.65	0.55
Greece	1.42	0.08	2.46	3.41	3.47	-0.99	-0.54	0.33	0.63
Guatemala	0.48	0.01	2.59	8.65	3.52	-1.90	0.63	0.35	0.56
Guinea	1.38	-3.96	1.42	8.91	3.71	-3.18	-1.07	0.40	0.56
Haiti	-1.59	1.12	4.82	17.40	3.34	-2.20	0.44	0.40	0.32
Honduras	0.53	0.57	3.25	9.66	4.07	-1.23	0.17	0.44	0.56
Hong Kong, China	4.56	0.38	4.50	1.75	5.22	0.39	2.68	0.73	0.94
Hungary	1.69	-0.88	3.91	3.18	4.36	-1.25	-0.68	0.46	0.76
India	3.12	-0.27	2.92	9.86	2.57	-1.45	-1.03	0.49	0.56
Indonesia	3.87	1.46	4.46	10.94	3.72	-1.20	2.05	0.43	0.45
Iran, Islamic Rep.	-0.64	-1.18	7.73	24.31	3.31	-1.25	-0.90	0.48	0.63
Ireland	4.35	-0.46	3.15	2.55	4.57	-0.56	0.58	0.51	0.88
Israel	1.86	0.29	1.96	3.17	4.09	-0.65	-0.39	0.62	0.83
Jamaica	-0.21	0.45	4.19	11.39	4.17	-1.33	-0.36	0.66	0.76
Jordan	1.73	1.45	7.52	4.82	4.31	-0.49	-0.18	0.40	0.69
Kenya	0.23	-0.44	2.33	10.48	3.80	-1.24	-0.74	0.66	0.60
Korea, Rep.	5.82	-0.73	3.79	5.29	4.03	-0.30	-0.63	0.49	0.70
Lesotho	2.85	-0.98	6.64	15.82	4.79	-2.01	-0.54	0.55	0.59
Madagascar	-1.57	-1.90	3.67	7.81	3.32	-1.86	-0.92	0.39	0.65
Malawi	0.56	-2.13	5.34	10.94	3.97	-2.25	-1.03	0.48	0.63
Malaysia	3.92	-0.14	4.08	6.99	4.71	-0.29	1.63	0.75	0.77
Mali	0.65	0.01	5.93	8.07	3.64	-2.03	-0.24	0.46	0.62
Mauritania	0.10	0.46	3.36	9.42	4.29	-1.16	-1.08	0.41	0.55

Table 2. Sample of Countries and Summary Statistics (*continued*)

Country Name	Average output growth (%)	Average terms of trade growth (%)	Standard deviation output growth	Standard deviation terms-of-trade growth	Trade Openness	Financial Depth	Financial Openness	Labor Market Flexibility	Ease of Firm Entry
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Mexico	1.50	-0.38	3.74	9.90	3.28	-1.67	0.92	0.23	0.66
Morocco	1.57	1.12	4.98	9.09	3.74	-1.25	-1.26	0.49	0.82
Mozambique	0.88	-4.45	7.90	11.96	3.45	-2.19	-1.32	0.26	0.40
Namibia	-0.47	-1.94	2.72	11.23	4.58	-0.97	-1.18	0.57	0.64
Netherlands	1.83	-0.14	1.50	1.00	4.52	0.08	2.53	0.46	0.80
New Zealand	0.68	0.37	2.39	5.05	3.79	-0.64	1.70	0.68	0.93
Nicaragua	-2.91	-0.76	7.85	25.54	4.01	-1.28	0.11	0.39	0.62
Niger	-1.71	0.10	6.05	17.16	3.47	-2.13	-0.53	0.41	0.57
Nigeria	-0.96	-0.03	5.59	27.87	4.11	-2.11	-1.19	0.57	0.62
Norway	3.04	-0.48	1.76	7.94	3.95	-0.22	0.54	0.59	0.82
Pakistan	2.47	-2.96	1.93	15.40	3.39	-1.48	-1.09	0.42	0.65
Panama	1.12	-0.21	4.92	3.06	3.67	-0.59	2.68	0.21	0.78
Papua New Guinea	0.07	-1.47	5.43	12.24	4.36	-1.67	-0.23	0.74	0.67
Paraguay	1.32	0.83	4.12	24.12	3.36	-1.73	-0.70	0.27	0.50
Peru	-0.42	-1.56	6.10	12.96	3.23	-1.97	0.12	0.27	0.59
Philippines	0.72	0.18	3.76	7.46	3.86	-1.13	-0.57	0.40	0.63
Portugal	2.47	0.02	3.23	4.65	3.87	-0.32	0.09	0.21	0.65
Romania	-0.63	-3.03	5.32	29.82	3.85	-2.53	-1.32	0.46	0.73
Rwanda	0.32	1.98	10.06	30.39	3.08	-2.67	-1.00	0.40	0.55
Senegal	0.19	-0.85	4.34	6.69	3.90	-1.29	-0.24	0.46	0.62
Sierra Leone	-3.35	1.26	7.15	13.25	3.52	-3.12	-0.85	0.33	0.46
Singapore	5.32	0.06	2.56	1.46	5.67	-0.17	2.00	0.80	0.92
South Africa	-0.38	-0.79	2.30	5.61	3.75	-0.69	-1.12	0.64	0.77
Spain	1.98	0.52	1.76	5.11	3.36	-0.24	0.36	0.30	0.68
Sri Lanka	3.48	1.15	1.21	14.27	4.02	-1.73	-0.52	0.58	0.74
Sweden	1.62	-0.47	2.00	2.82	3.94	0.01	1.58	0.58	0.84
Switzerland	0.80	1.25	2.38	3.86	3.99	0.31	2.68	0.64	0.79
Syrian Arab Republic	1.57	-3.00	6.00	13.70	3.80	-2.68	-1.64	0.55	0.65
Thailand	4.66	-1.99	4.37	5.57	3.99	-0.51	-0.04	0.39	0.75
Togo	-0.49	-2.48	7.08	23.49	4.05	-1.51	-0.87	0.43	0.44
Tunisia	2.44	-1.18	2.65	4.71	4.14	-0.53	-0.92	0.43	0.78
Turkey	1.93	0.32	4.11	9.72	3.11	-1.86	-0.95	0.45	0.77
Uganda	2.05	-0.91	3.44	20.64	3.11	-3.69	-0.47	0.58	0.60
Uruguay	1.59	-0.26	4.89	6.40	3.35	-1.29	0.87	0.61	0.68
Venezuela	-0.94	2.30	4.53	22.09	3.71	-1.07	0.64	0.25	0.55
Zambia	-2.23	-5.99	3.98	26.15	4.08	-2.78	-0.71	0.54	0.71

Notes:

a) The different columns of the table show various summary statistics for each of the countries included in the sample, which are displayed in the corresponding rows. The first column reports the average growth of real GDP per capita during the period 1974-2000 (or the sub-period for which there was available data).

b) Average terms of trade growth (%): the average growth of the terms of trade index over the same period
Standard deviation output growth: the standard deviation of the growth rates of real GDP per capita over the period 1974-2000
Standard deviation terms-of-trade growth: the standard deviation of terms of trade growth over the period 1974-2000
Trade Openness: Log (Exports + Imports) / GDP
Financial Depth: Log (Private credit) / GDP
Financial Openness: Ito and Chinn measure of capital account openness
Labor market flexibility: 0-1 index obtained from de jure labor regulation
Ease of Firm Entry: 0-1 index obtained combining information on number of procedures, monetary cost, and time to open a new firm.

Table 3. Correlations

Cross-sectional correlations between the different variables reported in Table 2.

	Output growth	Terms of trade growth	Std. dev. output growth	Std. dev. terms-of-trade gth	Trade Openness	Financial Depth	Financial Openness	Labor Market Flexibility	Ease of Firm Entry
Output growth	1.00								
Terms of trade growth	0.11	1.00							
Std. dev. output growth	-0.40	-0.13	1.00						
Std. dev. terms-of-trade gth	-0.51	-0.23	0.56	1.00					
Trade Openness	0.25	-0.02	-0.13	-0.26	1.00				
Financial Depth	0.59	0.30	-0.47	-0.61	0.31	1.00			
Financial Openness	0.25	0.36	-0.33	-0.52	0.35	0.54	1.00		
Labor Market Flexibility	0.30	0.06	-0.31	-0.23	0.46	0.29	0.27	1.00	
Ease of Firm Entry	0.47	0.21	-0.45	-0.57	0.41	0.66	0.49	0.55	1.00

Table 4. Basic Results under Symmetric Analysis

Cumulative output impact of a 1-std.deviation terms-of-trade shock for low and high values of 5 structural characteristics

	Trade Openness	Financial Depth	Financial Openness	Labor Market Flexibility	Ease of Firm Entry
Low	0.012	0.903	1.031	1.193	0.885
	(0.224)	(0.209)	(0.249)	(0.243)	(0.257)
High	1.439	0.905	0.688	0.450	0.940
	(0.263)	(0.261)	(0.208)	(0.262)	(0.275)
Difference	1.427	0.002	-0.343	-0.742	0.055
	(0.300)	(0.267)	(0.243)	(0.302)	(0.351)
Test Ho:Diff.=0 (one-tail)	**	-	*	**	-

Notes:

a) The reported impacts are given in percentage points of GDP.

b) Trade Openness: Log (Exports + Imports) / GDP
Financial Depth: Log (Private credit) / GDP
Financial Openness: Ito and Chinn measure of capital account openness
Labor market flexibility: 0-1 index obtained from de jure labor regulation
Ease of Firm Entry: 0-1 index obtained combining information on number of procedures, monetary cost, and time to open a new firm.

c) "Low" and "High" correspond to the 25th and 75th percentiles of the world distribution of the respective structural characteristic.

d) Numbers in parentheses are standard errors of corresponding cumulative output impact.

e) (*) and (**) indicate 10% and 5% significance, respectively. Critical values are obtained from empirical distribution (which may have non-Gaussian properties).

Table 5. Robustness

Cumulative output impact of a 1-std.deviation terms-of-trade shock for low and high values of 5 structural characteristics

		Trade Openness	Financial Depth	Financial Openness	Labor Market Flexibility	Ease of Firm Entry	Exchange Rate Regime
Benchmark	Low	0.012	0.903	1.031	1.193	0.885	
	High	1.439	0.905	0.688	0.450	0.940	
	Diff.	1.427	0.002	-0.343	-0.742	0.055	
3 lags in common lag structure	Low	-0.169	0.686	0.647	0.999	0.407	
	High	1.021	0.501	0.452	-0.092	0.887	
	Diff.	1.190	-0.185	-0.195	-1.091	0.481	
Only developing countries	Low	0.020	0.931	1.063	1.226	0.915	
	High	1.485	0.938	0.718	0.479	0.974	
	Diff.	1.464	0.007	-0.345	-0.747	0.059	
Initial financial depth (instead of average)	Low	0.189	1.128	1.262	1.427	0.961	
	High	1.649	1.084	0.828	0.590	1.363	
	Diff.	1.460	-0.044	-0.434	-0.837	0.402	
Including exchange rate regime	Low	-0.002	0.791	0.964	1.111	0.808	0.843
	High	1.350	0.878	0.637	0.422	0.909	0.970
	Diff.	1.352	0.087	-0.327	-0.689	0.101	0.127

Notes:

a) The reported impacts are given in percentage points of GDP.

b) Trade Openness: Log (Exports + Imports) / GDP

Financial Depth: Log (Private credit) / GDP

Financial Openness: Ito and Chinn measure of capital account openness

Labor market flexibility: 0-1 index obtained from de jure labor regulation

Ease of Firm Entry: 0-1 index obtained combining information on number of procedures, monetary cost, and time to open a new firm.

c) "Low" and "High" correspond to the 25th and 75th percentiles of the world distribution of the respective structural characteristic.

d) The benchmark includes all countries and sets the common lag structure to 2 lags.

e) For exchange regime, low and high mean flexible and pegged regime, respectively.

Table 6. Shock Impact and Structural Characteristics
Dependent variable: Cumulative GDP impact of a 1-std.deviation terms-of-trade shock

	OLS	
Constant	-0.2548	
	(0.2637)	
Trade Openness	0.1443	**
	(0.0590)	
Financial Depth	0.0311	
	(0.0380)	
Financial Openness	-0.0412	
	(0.0292)	
Labor Market Flexibility	-0.5369	**
	(0.2512)	
Ease of Firm Entry	0.1635	
	(0.2770)	
R-square	0.09	
Number of countries	100	

Notes:
a) Trade Openness: Log (Exports + Imports) / GDP
Financial Depth: Log (Private credit) / GDP
Financial Openness: Ito and Chinn measure of capital account openness
Labor market flexibility: 0-1 index obtained from de jure labor regulation
Ease of Firm Entry: 0-1 index obtained combining information on number of procedures, monetary cost, and time to open a new firm.
b) Robust standard erroes in parentheses below corresponding coefficient.
c) Regression is estimated using a robust procedure that reduces the influence of outliers.
d) * : Significant at 10%
** : Significant at 5 %

Table 7. Asymmetric Effects

Cumulative output impact of 1-std.deviation terms-of-trade negative and positive shocks for low and high values of 5 structural characteristics

	Trade Openness		Financial Depth		Financial Openness		Labor Market Flexibility		Ease of Firm Entry	
	Negative	Positive	Negative	Positive	Negative	Positive	Negative	Positive	Negative	Positive
Low	0.115	0.400	-1.193	0.666	-1.294	0.855	-1.513	0.903	-1.216	0.511
	(0.445)	(0.456)	(0.410)	(0.382)	(0.471)	(0.478)	(0.457)	(0.452)	(0.487)	(0.511)
High	-1.977	0.886	-1.192	0.729	-1.020	0.446	-0.688	0.392	-1.149	1.062
	(0.495)	(0.492)	0.484)	(0.515)	(0.402)	(0.393)	(0.492)	(0.512)	(0.506)	(0.497)
Difference	-2.092	0.4858	0.000	0.0633	0.273	-0.4088	0.825	-0.5108	0.067	0.5514
	(0.518)	(0.512)	(0.422)	(0.453)	(0.387)	(0.379)	(0.492)	(0.498)	(0.589)	(0.623)
Test Ho:Diff.=0 (one-tail)	**	-	-	-	-	-	**	-	-	-

Notes:

a) The reported impacts are given in percentage points of GDP.

b) Trade Openness: Log (Exports + Imports) / GDP
Financial Depth: Log (Private credit) / GDP
Financial Openness: Ito and Chinn measure of capital account openness
Labor market flexibility: 0-1 index obtained from de jure labor regulation
Ease of Firm Entry: 0-1 index obtained combining information on number of procedures, monetary cost, and time to open a new firm.

c) "Low" and "High" correspond to the 25th and 75th percentiles of the world distribution of the respective structural characteristic.

d) Numbers in parentheses are standard errors of corresponding cummulative output impact.

e) (*) and (**) indicate 10% and 5% significance, respectively. Critical values are obtained from empirical distribution (which may have non-Gaussian properties).

Table 8. Interactions between Financial Depth and Other Structural Characteristics

Cumulative output impact of a 1-std.deviation terms-of-trade shock for low and high values of 5 structural characteristics

	Trade Openness		Financial Openness		Labor Market Flexibility		Ease of Firm Entry	
	Negative	Positive	Negative	Positive	Negative	Positive	Negative	Positive
Low	0.316	1.779	0.914	1.770	1.566	0.703	1.089	1.494
	(0.263)	(0.270)	(0.279)	(0.321)	(0.314)	(0.293)	(0.255)	(0.341)
High	0.876	1.240	1.291	0.168	0.948	0.762	0.499	0.000
	(0.338)	(0.336)	(0.377)	(0.253)	(0.307)	(0.336)	(0.390)	(0.000)
Difference	0.559	-0.539	0.378	-1.602	-0.618	0.059	-0.590	-1.494
	(0.342)	(0.353)	(0.342)	(0.362)	(0.345)	(0.332)	(0.289)	(0.390)
Test Ho:Diff.=0 (one-tail)	**	*	-	**	**	-	**	**

Notes:

a) The reported impacts are given in percentage points of GDP.

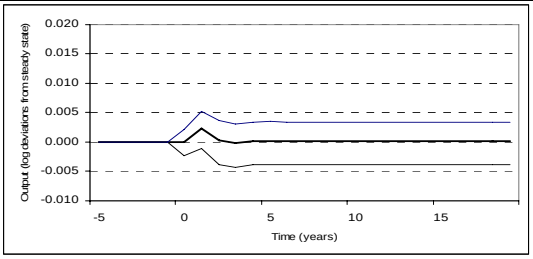
b) Trade Openness: Log (Exports + Imports) / GDP
Financial Depth: Log (Private credit) / GDP
Financial Openness: Ito and Chinn measure of capital account openness
Labor market flexibility: 0-1 index obtained from de jure labor regulation
Ease of Firm Entry: 0-1 index obtained combining information on number of procedures, monetary cost, and time to open a new firm.

c) "Low" and "High" correspond to the 25th and 75th percentiles of the world distribution of the respective structural characteristics.

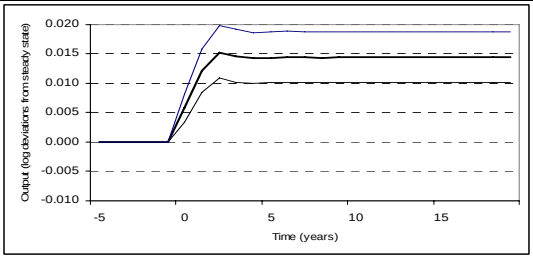
d) (*) and (**) indicate 10% and 5% significance, respectively. Critical values are obtained from empirical distribution (which may have non-Gaussian properties).

Figure 1. Cumulative Output Impact of Terms-of-Trade Shock – Symmetric Case

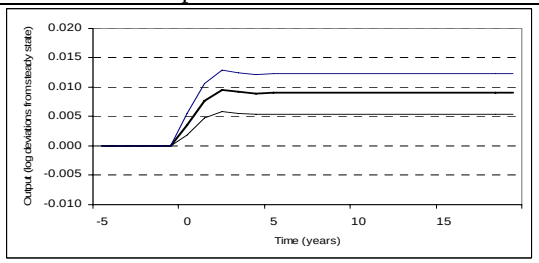
Low Trade Openness



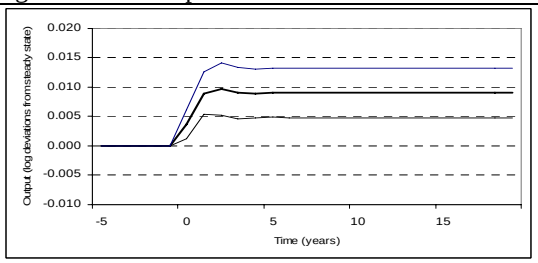
High Trade Openness



Low Financial Depth



High Financial Depth



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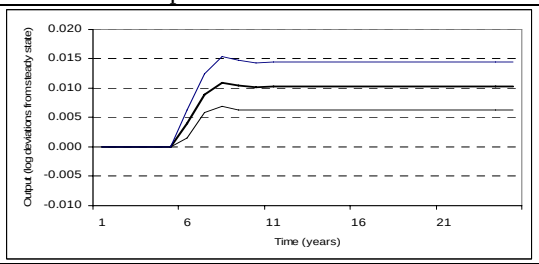
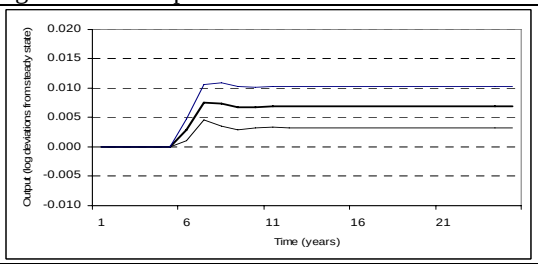
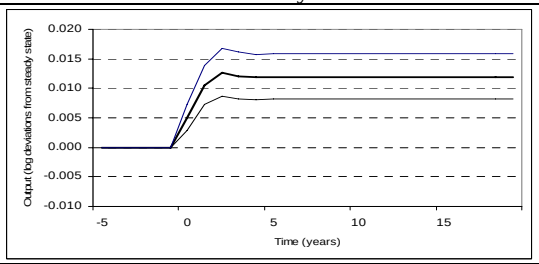


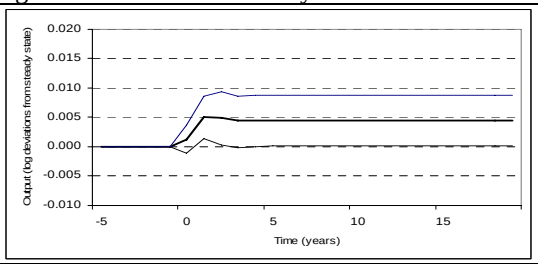
High Financial Openness



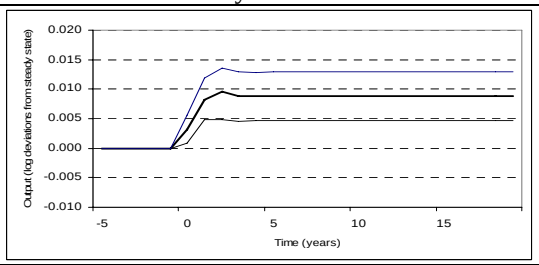
Low Labor Market Flexibility



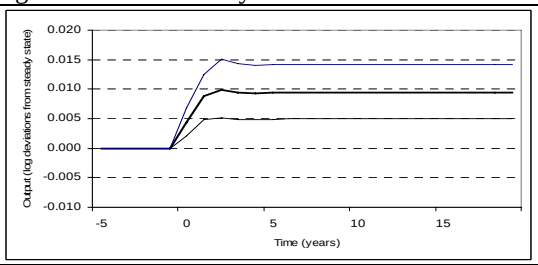
High Labor Market Flexibility



Low Ease of Firm Entry



High Ease of Firm Entry



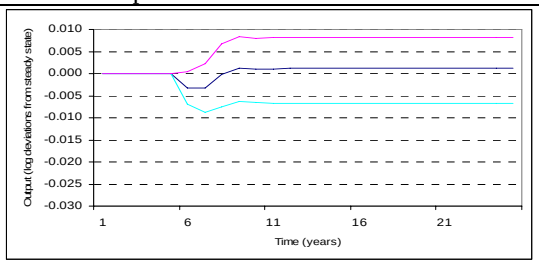
Notes:

a) See Table 1 for variable definitions.

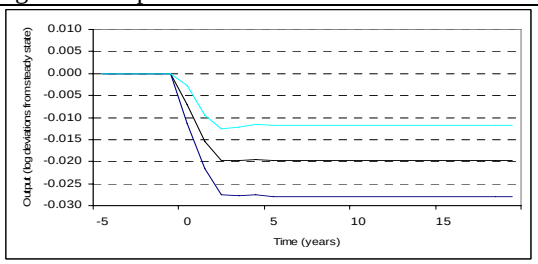
b) Bands are 90% confidence intervals.

Figure 2. Cumulative Output Impact of Negative Terms-of-Trade Shock

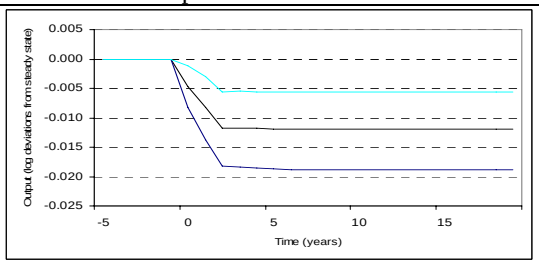
Low Trade Openness



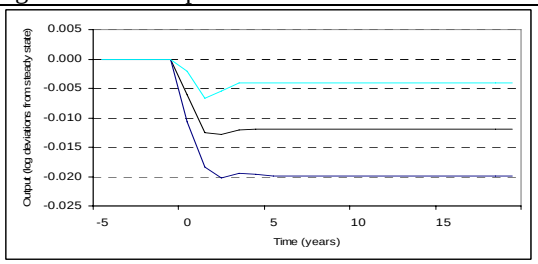
High Trade Openness



Low Financial Depth



High Financial Depth



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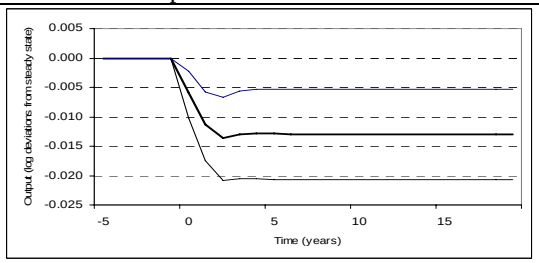

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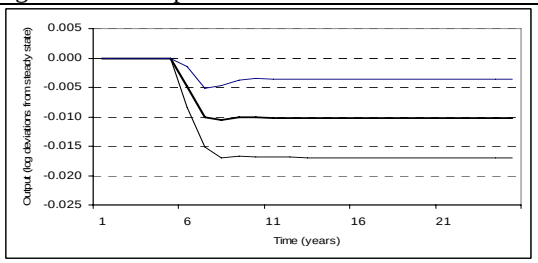
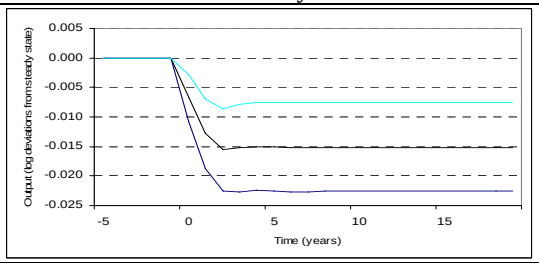
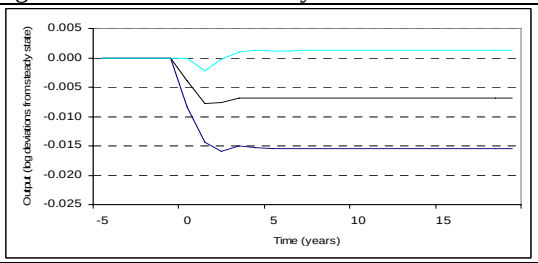


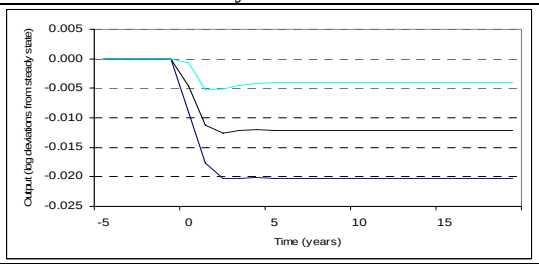
Low Labor Market Flexibility



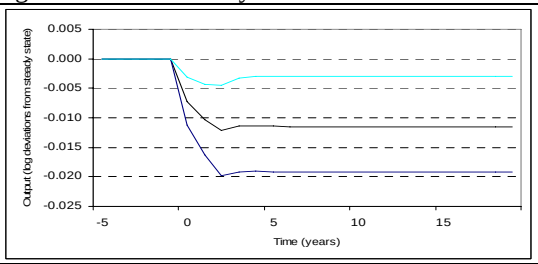
High Labor Market Flexibility



Low Ease of Firm Entry



High Ease of Firm Entry



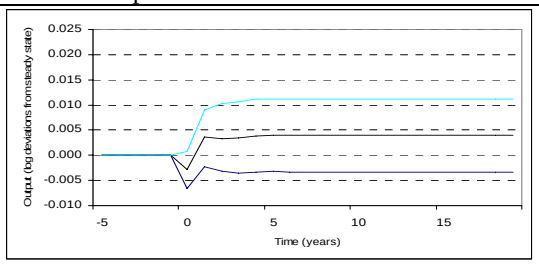
Notes:

a) See Table 1 for variable definitions.

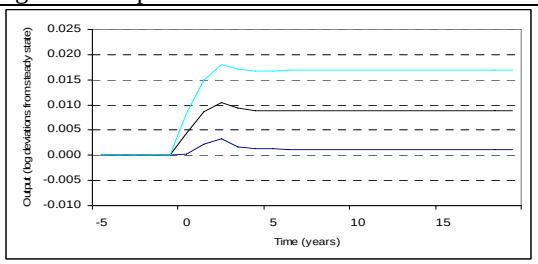
b) Bands are 90% confidence intervals.

Figure 3. Cumulative Output Impact of Positive Terms-of-Trade Shock

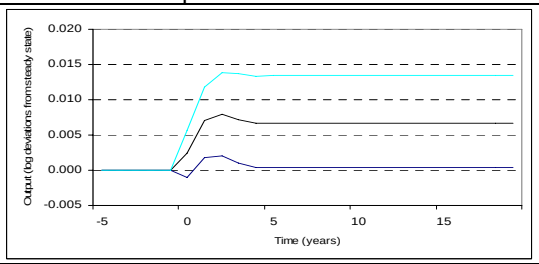
Low Trade Openness



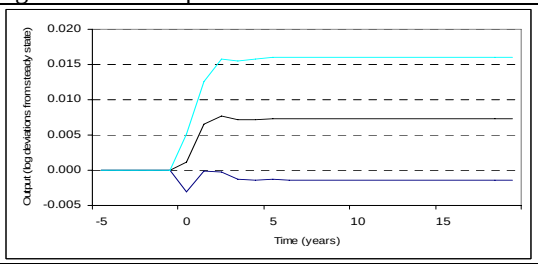
High Trade Openness



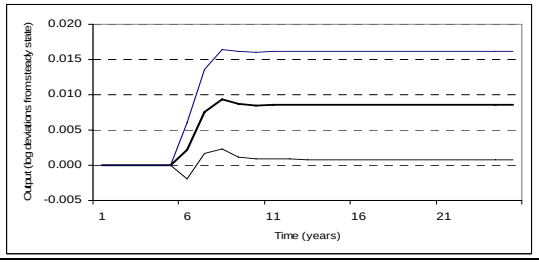
Low Financial Depth



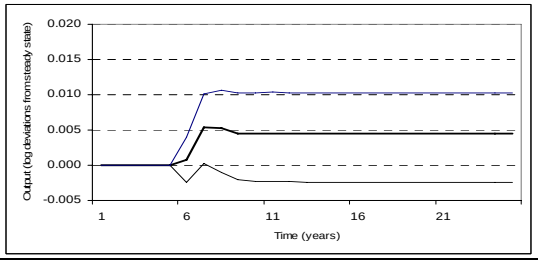
High Financial Depth



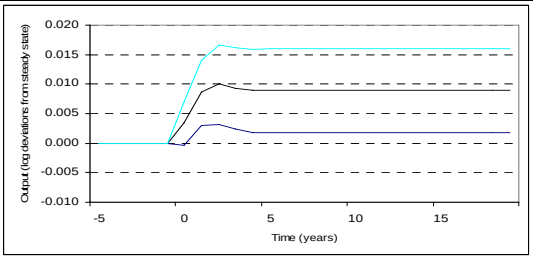
Low Financial Openness



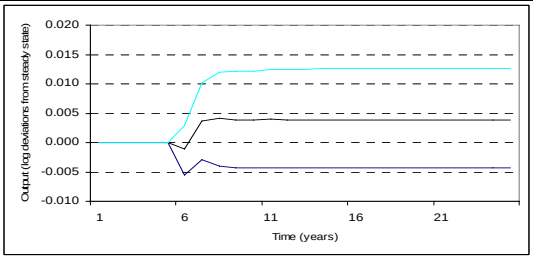
High Financial Openness



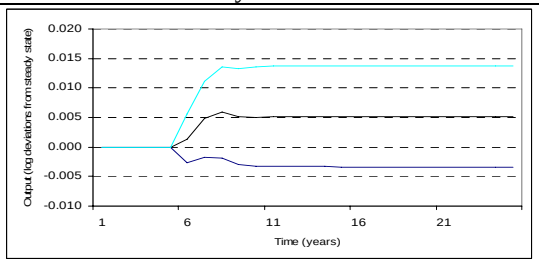
Low Labor Market Flexibility



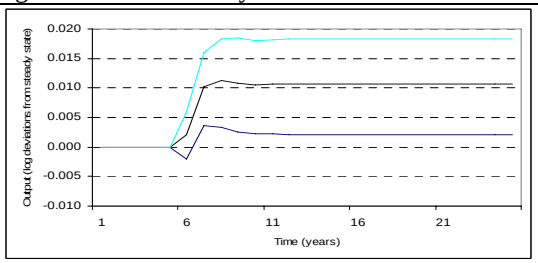
High Labor Market Flexibility



Low Ease of Firm Entry



High Ease of Firm Entry



Notes:

a) See Table 1 for variable definitions.

b) Bands are 90% confidence intervals.