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OPENNESS AND GROWTH VOLATILITY

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OPENNESS AND GROWTH VOLATILITY

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Resumen

La volatilidad macroeconómica es producto de la exposición de los países a *shocks* (la magnitud y frecuencia de *shocks* que golpean la economía) y su vulnerabilidad (su capacidad de responder a dichos *shocks*). Este artículo plantea que los países con mayor grado de integración comercial y financiera están mejor preparados para enfrentar un *shock* al crecimiento del producto. En teoría, el impacto de la apertura comercial y financiera es ambiguo. En consecuencia, nuestro problema es empírico. Utilizando una muestra de 82 países para el período 1975-2005, encontramos que la respuesta de la volatilidad del crecimiento a la creciente apertura comercial y financiera depende de algunas características de cada país. Encontramos que: (a) la apertura comercial estabiliza las fluctuaciones del producto en los países que tienen una estructura económica bien diversificada, (b) la apertura financiera mitiga la volatilidad del crecimiento en aquellos países cuya razón deuda/patrimonio es baja, (c) la profundidad financiera del país ayuda a aminorar el efecto desestabilizador de la apertura financiera sobre la volatilidad del crecimiento, (d) los países con mayor apertura comercial son menos propensos a caídas del producto, y (e) los países con mayor apertura financiera tienen mayor probabilidad de experimentar una caída brusca del producto real solo si sus pasivos externos están más sesgados hacia la deuda que hacia el patrimonio.

Abstract

Macroeconomic volatility is the outcome of countries' exposure to shocks (the magnitude and frequency of shocks that hit their economies) and their vulnerability (the ability to respond to these shocks). This paper conjectures that countries with higher degrees of trade and financial integration are better prepared to withstand shocks to output growth. Theoretically, the impact of trade and financial openness is ambiguous. Hence, our problem becomes an empirical one. Using a sample of 82 countries for the period 1975-2005, we find that the response of growth volatility to rising trade and financial openness depends upon some country characteristics. We find that: (a) trade openness stabilizes output fluctuations in countries with well-diversified economic structures, (b) financial openness mitigates growth volatility in countries with low debt-equity ratios, (c) domestic financial depth helps smoothing out the destabilizing effect of financial openness on growth volatility, (d) countries with higher trade openness are less prone to output drops, and (e) countries with higher financial openness are more likely to experience sharp drops in real output only if their external liabilities are more biased towards debt than equity.

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1. Introduction

One of the most salient characteristics of developing countries is their macroeconomic volatility. The frequency and magnitude of output drops, currency crises, and current account does not only raise aggregate volatility but also has negative effects on growth (Ramey and Ramey, 1995; Hnatkovska and Loayza, 2004) and welfare (Pallage and Robe, 2003) as well as deleterious and persistent effects on income distribution and poverty (Calderón and Levy-Yeyati, 2007). Macroeconomic volatility reflects: (i) country *exposure* to shocks —as measured by the frequency and magnitude of the shocks affecting the economy— and (b) country *vulnerability* to these shocks —as characterized by whether countries over-react or mitigate the real effects of shocks. In this context, higher volatility among developing countries is explained not only by the greater exposure to larger shocks – say, to commodity prices and global liquidity– but also by country features that tend to amplify the real effects of shocks, such as high production concentration, and poor institutional quality and economic policies.

However, it has also been argued that the declining volatility of business cycles observed in recent decades may be associated with the rising degree of international trade integration and financial integration. Figure 1 shows that growth volatility has declined substantially in the world and major countries groups over the last 20 years. On average, the standard deviation of growth in real GDP per capita in 2005 is approximately 60% of the standard deviation in 1985 for both industrial and developing countries. At the same time, we observe a substantial trend towards larger trade and financial openness in both industrial and developing countries. Trade openness –measured by real exports and imports as percentage of GDP– has increased from a world median of 48% of GDP in 1975 to 77% of GDP in 2005. Financial openness –measured by foreign liabilities as percentage of GDP– has grown from a world median of 80% of GDP in 1975 to 115% of GDP in 2005 (see figure 1).

Theoretically, the impact of higher integration to world goods and capital markets on output volatility is ambiguous. On the one hand, higher integration will contribute to potential gains in growth and welfare. Trade openness may reduce macroeconomic volatility by de-linking export sectors from the rest of the economy, whereas financial openness reduces volatility by granting access to a wider menu of financial instruments, leading to a reduction of household's exposure to country-specific risks. On the other hand, higher

integration also leads to greater exposure to external shocks. Higher trade openness could raise growth volatility by increasing the volatility of the tradable industries and leading the economy to increased patterns of specialization in production. Higher financial openness grants wider access to world capital markets that could finance the larger production specialization. Hence, more open economies become more vulnerable to traded-industry-specific shocks and their transmission across countries.

Empirically, there is no consensus on the effects of trade and financial openness on growth volatility. We argue in this paper that the impact of openness on growth volatility may vary considerably depending on country features. Using a sample of 82 countries for the period 1975-2005, we examine the effects of trade and financial openness on growth volatility and test for the role of country characteristics –such as the degree of diversification of economic activity and exports, the structure of external liabilities and the depth of local financial markets– in affecting the impact of openness on aggregate volatility and in crisis periods (measured by the incidence of sharp output drops).

Our main findings are the following: first, trade openness mitigates shocks to growth volatility but has destabilizing effects on volatility in countries with higher levels of specialization of production and exports. Second, financial openness stabilizes output fluctuations in countries with external liabilities more biased towards equity (specifically, countries with low debt-equity ratios). Third, deep domestic financial markets soften the blows of any destabilizing output effects arising from greater financial openness. Fourth, we find that countries with higher trade openness are less prone to experience output drops. This finding confirms Cavallo and Frankel's (2007) result on sudden stops. Finally, we find that countries with higher financial openness are more prone to experience output drops if their external liabilities are more biased towards loans. This result is consistent with Levchenko and Mauro's (2007) findings of FDI and portfolio equity resilience to sudden stops and the sharp and persistent fall in bank lending and official flows during and after sudden stops.

The paper is organized as follows: Section 2 briefly reviews the recent theoretical and empirical literature on the links between trade openness and growth volatility, and the relationship between financial openness and growth volatility. Section 3 describes the data used in this paper and discusses the estimation strategy. Section 4 reports the panel data evidence on the links between trade and financial openness on growth volatility and

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examines the sensitivity of the baseline results to changes in the measure of the dependent variable and the sample of countries. We also test for the role of the composition of trade flows and the structure of external liabilities in determining the ability of trade and financial openness to act as output stabilizers. Finally, Section 5 concludes.

2. Literature Review

This section reviews briefly the recent literature on the impact of trade and financial openness on growth volatility. More comprehensive literature reviews of the effects of trade and financial openness on growth and volatility (including earlier work) are presented in Calderón, Loayza and Schmidt-Hebbel (2006) and, with a particular focus on financial openness in Prasad, Rogoff, Wei and Kose (2003, 2004) and Kose, Prasad, Rogoff and Wei (2006).

2.1 Trade openness and volatility

Recent research shows that trade openness (TO) has positive robust effects on growth and income levels, with results robust to the inclusion of institutional variables (Wacziarg, 2001, Irwin and Terviö 2002, Dollar and Kraay, 2003; Alcala and Ciccone 2004). Wacziarg and Welch (2003), focusin on trade liberalization country episodes, show that trade shares and growth increase significantly and substantially after trade regimes are opened. However, it has also been argued that higher trade openness elevates country exposure to external shocks. That is, trade openness (and trade liberalization) may lead to more specialized patterns of production and to more growth volatility if business cycles are mainly driven by industry-specific external shocks. For instance, countries specializing in primary exports may become more vulnerable to terms-of-trade shocks. Hence, trade openness may enhance growth but also may heighten the vulnerability to external shocks, raising growth volatility (Easterly, Islam, and Stiglitz, 2000).

On the other hand, it has been argued that international trade may help countries to diversify away from shocks that are specific to a particular good or trading partner. In this context, efforts of diversification of the export basket (through a more diversified production structure) and the diversification of trading partners would allow trade openness to act as a buffer against (domestic and foreign) country-specific shocks.

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Cavallo (2006) uses a cross-section of 77 countries over the period 1960-2000 to evaluate whether trade openness helps mitigating growth volatility and whether the exposure to terms-of-trade risk may weaken the potential stabilizing role of trade openness. He robustly finds that the stabilizing effects of trade openness outweigh the destabilizing effects that arise from higher exposure to terms-of-trade risk. Quantitatively, he finds that for the representative country, a 25 percentage point increase in the trade to GDP ratio leads to a more than 40% decline in the standard deviation of output growth.

On the other hand, Di Giovanni and Levchenko (2007) argue that the lack of consensus on the relationship between trade openness and macroeconomic volatility lies in the misunderstanding of the mechanisms at work behind the correlation between these variables. Trade may affect volatility through three different channels: (a) raising the level of exposure of industries to external shocks, (b) changing the pattern of co-movement of the trading sectors with the rest of the economy, and (c) allowing the diversification of production across sectors.[1] The authors use data at the industry level (3-digit ISIC Rev. 2) for the period 1963-2003 (at most) for an unbalanced panel data set of (at most) 28 manufacturing sectors in 61 countries to test for these three channels. They specifically find that: (i) higher trade in a sector would increase its own output volatility, (ii) higher trade in a sector reduces the correlation of the sector with the rest of the economy, and (iii) higher trade openness in the economy increases its production specialization. The total effect shows that volatility of aggregate manufacturing sectors increases by about 17.3% if trade openness (measured by the ratio of total trade to output) rises by 60 percentage points (that is, it moves from the 25th to the 75th percentile of the country distribution).

Buch, Döpke and Strotmann (2006) use firm level data for Germany to assess the relationship between export openness and volatility. Theoretically, they argue that the impact of export openness on volatility is ambiguous due to the presence of two offsetting effects: (i) export firms are more exposed to domestic and foreign shocks and react more to exogenous shocks than purely domestic firms if their factor demand and supply schedules are more elastic, thus increasing output volatility, and (ii) the imperfect correlation between domestic and foreign shocks may have a dampening effect on output volatility for firms that trade more. Empirically, the authors find that export firms' sales show lower variability than

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[1] Note that while the trade effects through channels (a) and (c) exacerbate the volatility of aggregate output fluctuations, channel (b) tends to reduce aggregate volatility.

that of non-export firms, and that the impact of the volume of exports on output volatility is negative at the firm level. The latter result, the authors argue, is driven by the diversification effect that arises from the dominance of the effect of lower correlation of domestic and foreign shocks.

Finally, Cavallo and Frankel (2007) evaluates whether openness to trade has an import on the vulnerability to external crises. The authors argue that more open countries are more vulnerable to external shocks and that sudden stops may generate losses in trade credit (especially for imports), with the ensuing reduction in trade hurting more those countries that are more integrated to world markets. On the other hand, it has been argued that trade openness acts as a buffer against external shocks because more open countries are less likely to default on their international debt (Rose, 2002). In the same spirit, Martin and Rey (2006) show that emerging market economies are more prone to financial crisis if they are financially open but a more closed trade regime. Using a sample of 162 countries for the period 1970-2002, Cavallo and Frankel (2007) find that, after controlling for reverse causality of trade openness and other shocks, countries with greater trade linkages are less prone to sudden stops and currency crashes. Quantitatively, the authors find that raising the trade-output ratio by 10 percentage points may reduce the probability of a sudden stop by 40%.

2.2 Financial openness and volatility

Theoretically, the impact of financial integration on output volatility is also ambiguous. On the one hand, financial openness may provide better opportunities to capital-poor developing countries to diversify their production base by granting them access to more financial resources. On the other hand, financial openness may also lead to rising patterns of specialization in production based on comparative advantage, thus heightening the vulnerability to industry-specific shocks in sectors in which they specialize.

Kose, Prasad and Terrones (2003) use a sample of 76 industrial and developing countries for the period 1960-99 to evaluate the impact of financial integration on macroeconomic volatility. The authors find that volatility of output growth has declined in the 1990s (relative to previous decades) and that the ratio of the volatility of consumption growth to the volatility of income growth has increased for more financially integrated economies (MFIEs) in the 1990s —*i.e.* the period of globalization when international financial flows increased significantly. In contrast to predictions of improved international risk-sharing opportunities

through financial integration, the authors find that financial openness has raised the ratio of consumption volatility to income volatility. However, the latter relationship is non-monotonic. Beyond a certain threshold, financial integration may reduce the consumption to income volatility ratio —thus, improving risk-sharing and consumption smoothing possibilities.

Bekaert, Harvey, and Lundblad (2005) assess the impact of equity-market liberalization and capital-account openness on real consumption growth volatility. The negative correlation between financial openness and consumption volatility found by the authors is robust after controlling for other business-cycle determinants, financial development and the quality of institutions, and is not driven by reverse causality. The authors also find that consumption volatility is lower in MFIEs, with the volatility decline being the largest when MFIEs liberalize their equity markets.

Rose and Spiegel (2007) take a different approach to evaluate the link between financial openness and business-cycle volatility. Based on the notion that financial intermediation costs (*e.g.* information costs of monitoring loans) increase with geographical distance, the authors find that: (a) ceteris paribus, countries that are closer to major international financial centers are more financially integrated, and (b) countries that are closer to these financial centers display lower business-cycle volatility. Quantitatively, a one standard deviation increase in *financial remoteness*[2] –say, the distance between Algeria and Kiribati– would raise consumption volatility by approximately 15% from the sample mean.

Using dynamic stochastic general equilibrium models, Sutherland (1996) and Buch et al. (2005) have shown that the relationship between financial openness and business-cycle volatility depends on the nature of the underlying shock. Simulations of their models yield the following results: (a) financial openness tends to exacerbate business-cycle volatility in the event of monetary-policy shocks and risk premium shocks, (b) financial openness only generates moderate changes in business-cycle volatility in the presence of labor shocks, and (c) financial openness mitigates output volatility if business cycles are driven by fiscal shocks. Econometrically, Buch et al. (2005) use a sample of 24 countries for the period 1960-2000 and find that the impact of monetary policy shocks on output volatility are magnified while fiscal policy shocks are constrained in MFIEs during the 1990s.

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[2] Financial remoteness is measured as the physical distance of the country from world financial centers

Finally, Evans and Hnatkovska (2007) build a two-sector (traded and non-traded goods), two-country world economy with production, where bonds and stocks are traded internationally, and incomplete markets that replicate the non-monotonic relationship between financial openness and volatility found in Kose, Prasad, and Terrones (2003). Larger international financial integration may impact aggregate volatility through two main channels: (i) access to a wider array of financial instruments allows greater risk-sharing by households, whose consumption paths will be less correlated with country-specific shocks, and (ii) access to world capital markets leads to larger production specialization within countries, thus magnifying the impact of industry-specific shocks and their transmission across countries. The model produces a hump-shaped relationship between financial integration and consumption volatility. The ability of households to smooth aggregate consumption and maintain a balanced basket of trade and non-traded goods depends on the available set of financial instruments. If countries move from financial autarky to low financial openness, the increase in correlation between consumption and country-specific shocks dominates the decline in volatility of traded goods consumption, hence aggregate consumption volatility rises. On the other hand, moving from low to high levels of financial openness, the correlation effect is dominated by the fall in traded-goods consumption volatility, therefore aggregate consumption volatility falls.

In addition to the theoretical and empirical models on the effects of financial openness and macroeconomic volatility presented above, another strand of the literature examines the impact of financial openness on volatility as crises. Ito (2004) looks at 141 currency-crisis episodes in 62 countries during 1975-2002 and evaluates the impact of capital-account openness on the output losses of the countries affected by crises. He finds that higher financial openness reduces the probability of currency crisis in industrial and developing countries, but not in emerging market economies. Also, output losses associated to currency crises in industrial countries are smaller and shorter in duration if they exhibit large international financial integration before the crisis episode. However, the latter findings are rejected for the samples of developing countries and emerging market economies.

Edwards (2005) evaluates the effects of capital controls on the incidence of financial crises using a new measure of *de jure* financial openness that tries to capture the intensity of capital-account restrictions. Edwards (2006) uses a large sample of countries (157) for the period 1970-2001 and finds that countries with high capital mobility appear to be less prone

to crises and that this result holds for all world regions, except Eastern Europe. He also finds that output drops after a currency crises and that loss in real output growth is mitigated in countries that use reserves to soften the blow. However, Edwards fails to find a significant role for capital controls in dampening the output losses generated by currency crises.

Finally, Levchenko and Mauro (2007) go one step further and examine the type of flows that shield the economy better from external crises. Using a large sample of industrial and developing countries for the period 1970-2003, the authors find that during sudden stops of capital flows (as defined by reductions in net financial flows of more than 5 percentage points of GDP relative to the previous year), foreign direct investment is the most resilient flow and remains stable, thus playing no significant role in sudden stops. Portfolio equity flows play a very limited role. In contrast, portfolio debt experiences a reversal that recovers fast in the aftermath of the sudden stop, whereas bank lending and official flows suffer severe drops and do not attain for years their levels prior to the sudden stop.

3. Data and Estimation Methods[3]

In the present section we describe the data used for our empirical evaluation of growth volatility and openness, and we describe our econometric estimation technique.

3.1 The Data

We have collected annual data on real output and the determinants of output volatility for a sample of 79 countries over the period 1975-2005 (see list of countries in Table A.1). Following Levy-Yeyati and Sturzenegger (2001), we have ignored the Bretton Woods period for two reasons: (a) to focus on the recent period of increasing integration to the world markets of goods and assets, and (b) the predominance of fixed exchange rate regimes implemented for political reasons.

Our dependent variable, *growth volatility,* is the standard deviation of the growth rate of real GDP per capita over a 5-year window:

$$\sigma(dy_{it}) = s.d.(y_{it} - y_{i,t-1}) = \left(\frac{1}{T} \sum (dy_{i,t} - \overline{dy}_{i,t})^2 \right)^{1/2} \tag{1}$$

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[3] This section draws heavily from Calderón and Kubota (2007).

where σ indicates volatility, y_{it} is the log of real output per capita, dy_{it} is the annual growth measured as the first difference of y_{it}, $s.d.$ is the standard deviation, $\overline{dy}_{i,t}$ is the 5-year country average of growth measured as the average of dy, T is the sample period (5), the subscript i denotes the country (i=1, 2, .., N) while the subscript t denotes time (t=1, 2, .., T). Note that for robustness purposes we also calculate our dependent variable as follows (see Table 5): we compute the standard deviation of the cyclical component of real GDP per capita using the band-pass filter and the Hodrick-Prescott filter. Next, we use real GDP rather than output per capita, and we compute the standard deviation of the log differences in real GDP as well as the cyclical component of real GDP (in logs) using the band-pass and the Hodrick-Prescott filters over the time horizon stated above (5-year window).

Openness. We consider *outcome measures* of trade and financial openness. Regarding *trade openness* we use a measure of outward orientation to international markets of goods and services based on the sum of the real value of exports and imports (*i.e.* total foreign trade) as a ratio to GDP. Our analysis will consist not only of evaluating whether rising trade integration may smooth shocks to real output but also whether the composition of trade plays a role. Hence we decompose total trade into manufacturing and non-manufacturing trade (both expressed as ratios to GDP). The data for total trade and its composition is obtained from the World Bank's World Development Indicators (WDI).

Financial Openness is measured using the data on foreign assets and liabilities from Lane and Milesi-Ferretti (2001, 2006). We construct the ratio of total foreign liabilities as a ratio to GDP (which include stocks of liabilities in portfolio equity, foreign direct investment, debt, and financial derivatives). For robustness purposes, we also construct the ratio of the sum of foreign assets and liabilities to GDP. Analogously to the case of trade openness, we also evaluate the role that the composition of capital flows may play in smoothing the volatility of real output. Hence we decompose the measure of financial openness into equity and loan-related foreign liabilities. While the former includes the foreign liability position in foreign direct investment and portfolio equity, the latter includes only the debt liability position. A similar computation is undertaken for the ratio of foreign assets and liabilities to GDP.

Trade and Financial Vulnerabilities. In this paper we evaluate whether the ability of trade and financial openness to mitigate output shocks may be hampered by vulnerabilities in the structure of production and financial liabilities. Regarding *vulnerabilities in trade openness*, we

construct two indicators. First, we measure the extent of *output concentration* using the Herfindahl-Hirschman index of valued added for the 9-sector classification from the 1-digit level ISIC code on economic activity. The data was obtained from the United Nations' National Accounts database. Next, we measure the degree of *export concentration* by computing the Herfindahl-Hirschman index of trade value for the 1-digit SITC classification on foreign trade activities and the data was collected from the UN COMTRADE database. Finally, *financial vulnerabilities* are proxied by the debt-equity ratio of the economy. Here we construct the ratio of debt liabilities to total foreign liabilities as our measure of the debt-equity ratio. The underlying data was obtained from Lane and Milesi-Ferretti (2006).

Other control variables. We include in our regression analysis a set of six domestic and two external control variables that may affect growth volatility and are consistent with previous literature —see Calderón, Loayza and Schmidt-Hebbel (2006). We include the log of real output per capita at the beginning of the 5-year period and the average CPI inflation rate, obtained from the World Bank's WDI. Next, we use the average frequency of *systemic banking crises* over the 5-year period, based on data of Caprio and Klingebiel (2003), and the index of real exchange rate overvaluation –measured as the log of the ratio of actual to equilibrium real effective exchange rate (REER), where the latter is the trend component of the actual REER estimated with the band-pass filter. Data on the REER is obtained from the IMF's International Financial Statistics.

We include two measures of *policy volatility* using the methodology of Fatas and Mihov (2006). To construct our indicator of *fiscal policy volatility*, $Vol(G_i)$, we collect data on general government consumption and isolate changes in government consumption that can be attributed to exogenous policy decisions rather than those associated to the state of the economy. To capture exogenous policy changes, we regress the log of real government consumption spending (G) on real output (Y), the initial level of real government spending, linear and squared inflation (π and π^2) and a deterministic time trend (τ), for each country:

$$\ln(G_{i,t}) = \alpha + \delta\tau + \beta \ln Y_{i,t} + \rho \ln G_{i,t-1} + \phi_1 \pi_{i,t} + \phi_2 \pi_{i,t}^2 + \varepsilon_{i,t} \tag{2}$$

where α, δ, β, ϕ_1 and ϕ_2 are coefficient estimates, ε_{it} is the stochastic error term, and the i and t represent subscripts for country i and period t.

In order to prevent reverse causality from government spending to growth we instrument output growth with lagged values of output growth, and current and lagged

values of oil prices. The data on government expenditure was obtained from the World Bank's World Development indicators, while inflation and the world price of oil was taken from the IMF's International Financial Statistics. [4] We run equation (2) on a country-by-country basis and we consider the standard deviation of the residual of this regression, $\sigma(\varepsilon_{i,t})$ as the estimate of the volatility of discretionary fiscal policy.

We construct analogously the indicator of *monetary policy volatility* despite the difficulties to implement this measure across countries — as outlined by Fatas and Mihov (2006). We use data on the monetary base, collected from the IMF's International Financial Statistics (IFS) and from national sources when the data was unavailable from the IMF.

Finally, we include two external control variables: terms of trade volatility and international real interest rate volatility. The former is measured by the standard deviation of annual changes in the terms of trade index whereas the latter is the standard deviation of the loan prime rate discounted by US inflation. Data on these indicators was collected from the WDI and IFS. A more detailed description of data sources for all variables used in our analysis is provided in Table A.2.

3.2 Estimation Techniques

Our panel-data estimation presents some challenges. First, we need to control for the presence of unobserved period- and country-specific effects. We control for these unobserved effects by including period-specific dummy variables and country dummies which account for time- and country-specific effects, respectively, in our regression analysis. Second, it is highly likely that our key variables of interest — trade and financial openness — are jointly endogenous with growth volatility. Hence we are required to control for potential bias resulting from simultaneous or reverse causation in our growth volatility equation.

The *baseline regression* model for output volatility has the following specification:

$$\ln \sigma(dy_{it}) = \mu_i + \eta_t + \mathbf{O}_{it}\mathbf{\Gamma} + \mathbf{Z}_{it}\mathbf{\Theta} + \varepsilon_{it} \tag{3}$$

where the dependent variable, $\sigma(dy_{it})$, is the (5-year period) standard deviation of annual changes in real GDP per capita, and our dataset consists of 5-year period non-overlapping observations over the period 1975-2005. Our variables of interest, trade and financial openness, are included in the matrix $\mathbf{O}_{it}$, and our benchmark result uses exports and imports

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[4] Note that all standard deviation measures are computed for annual changes during 5-year periods.

as percentage of GDP (in logs) as the indicator of trade openness, and foreign liabilities as percentage of GDP (in logs) as the proxy for financial openness. Finally, the matrix $\mathbf{Z}_{it}$ summarizes the information on the control variables for the output volatility regression: initial output per capita, inflation, real exchange rate overvaluation, the incidence of systemic banking crisis, and monetary-policy volatility, fiscal-policy volatility, terms of trade volatility and international real interest rate volatility.

To account for the likely endogeneity or reverse causality of our variables of interest, we need to find appropriate instruments for our measures of trade and financial openness. We follow closely the strategy pursued by Calderón and Kubota (2007) to identify the impact of openness on RER volatility.

Instrumenting for Trade Openness. To control for reverse causation in trade openness, Calderón and Kubota (2007) follow the methodology of Frankel and Romer (1999) and compute the *geographic component of trade openness* based on the gravity model of bilateral trade. This *geographic* component is highly correlated with trade openness (as guaranteed by the empirical success of the gravity equation model) and it is suspected to be uncorrelated with output volatility.

The gravity equation model in its most parsimonious representation relates bilateral trade (expressed as a ratio to GDP) to geographic measures and indicators of country size; that is, trade between two countries is inversely related to their distance and directly related to their size. The *predicted* trade-to-GDP ratio is a good instrument if it is highly correlated with trade, since it is unlikely that geography would be related to economic outcomes through any channel other than trade (Cavallo and Frankel, 2007).[5] A detailed description on the construction of the instrument for trade openness can be found in Calderón and Kubota (2007).

Instrumenting for Financial Openness. In the similar spirit of Calderon and Kubota (2007), we follow the strategy of Faria, Lane, Mauro, and Milesi-Ferretti (2007). These authors assess some of the dimensions of the external capital structure –that is, total foreign liabilities (as % of GDP), and the share of equity (portfolio and FDI) in total foreign liabilities. Based on previous research by Faria and Mauro (2004), the former authors choose a broad range of

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[5] Cavallo and Frankel (2007) point out that this methodology still poses some limitations. For instance, it does not allow for variation in the instrument over time so as to estimate a model with country fixed effects. However, the authors do not consider this a serious limitation since most of the variation in trade openness is across countries and not over time.

potential determinants of the external capital structure. Following their analysis we use an indicator of institutional quality (the ICRG index of political risk at the start of the five year period), the initial size of the country (as proxied by initial levels of GDP, population, and area), the legal origin of countries (La Porta *et al.* 1998), secondary school enrollment, and the abundance of natural resources. These instruments are again expressed as initial values of the 5-year period of our panel dataset. Consistent with the results in Faria and Mauro (2004), as well as in Faria *et al.* (2007), we find the following: first, countries with higher degrees of international financial integration –as captured by higher ratios of foreign liabilities to GDP– are smaller countries with high quality of institutions, larger dependence on natural resources and a legal tradition based on the French civil code. Second, countries with a higher debt-equity ratio –as proxied by a larger share of debt in external liabilities– are typically smaller countries with lower levels of educational attainment, lower quality of institutions, and lower dependence on natural resources. These results are consistent with those of Faria *et al.* (2007) where higher equity shares in total liabilities are observed in larger countries with better institutional quality and greater reliance on natural resources.

4. Empirical Evidence

4.1 Basic Statistics and Correlations

Basic Statistics. Table 1 reports averages and standard deviations for growth volatility, trade openness, financial openness, and other control variables for the full sample of countries as well as several country groups over 1975-2005. Generally, we find that rela output fluctuations are almost twice as volatile in developing countries as in industrial economies regardless of the measure of output and de-trending technique used. This may be associated to the higher policy volatility in developing countries. Monetary-policy shocks in developing countries are, on average, more than twice as volatile as those in advanced economies, while fiscal-policy shocks are almost five times as volatile in developing countries as those in industrial countries.

Developing countries, on the other hand, display a higher integration to international trade. Data on the sum of real exports and imports as a percentage of GDP show that, on average, developing countries exhibit more trade openness than industrial economies. However, developing countries with higher foreign trade links may be more exposed to

external shocks than industrial economies, considering their higher degree of output and export concentration, as shown by the Herfindahl-Hirschman indices of value added and trade value, respectively. Industrial economies, on average, are more integrated to international financial markets than developing countries, whether we use foreign liabilities or the sum of foreign assets and liabilities as a share to GDP. Industrial countries also exhibit a lower debt- equity ratio than developing countries.

Panel Correlation Analysis. Table 2 reports pair-wise correlations between growth volatility (measured by the standard deviation of GDP per capita growth) and (trade and financial) openness as well as correlations between growth volatility and other control variables for the full sample of countries as well as for country sub-samples according to the level of development and the level of income over the period 1975-2005.

Growth volatility does exhibit a significant correlation with trade openness for the full sample of countries. However, when splitting the sample by the level of development, we find that these two variables are negatively associated in industrial economies and middle-income countries. In contrast, trade openness exhibits a positive correlation with growth volatility in low-income countries. On the other hand, we find little evidence for significant correlation between growth volatility and output concentration. However, we find a positive and significant correlation between growth volatility and export concentration, with the largest correlation observed in low-income countries.

Financial openness –measured by foreign liabilities or the sum of foreign assets and liabilities– displays a negative co-movement with growth volatility in the world sample. That is, countries with higher international financial integration tend to display lower output volatility. However, negative simple correlation is driven mainly by industrial and high-income countries. On the other hand, we find that countries with high debt-to-equity ratios tend to exhibit highly volatile output fluctuations. However, this positive co-movement is not significant for high-income countries.

Finally, we find that higher growth volatility is directly associated to higher volatility in external conditions. Hence we observe positive correlations between growth volatility and terms of trade volatility and between growth volatility and international real interest rate volatility for the world sample as well as in industrial and developing countries.

4.2 Baseline regression

Table 3 reports least squares estimates for our baseline regression equation using our panel dataset of 5-year non-overlapping observations and controlling for time and country fixed effects. Regarding our control variables, in general, we find that countries with higher output volatility usually tend to display at varying levels of significance: (a) higher inflation, (b) more overvalued real exchange rates, (c) higher incidence of systemic banking crisis, (d) higher monetary- and fiscal-policy volatility, (e) more volatile terms of trade, and (f) more volatile international real interest rates.

On the other hand, our variables of interest, trade and financial openness, display the following results: (i) trade openness and growth volatility exhibit a negative relationship although not statistically significant, and (ii) financial openness, measured by either foreign liabilities or the sum of forign assets and liabilities, has a negative and significant association with growth volatility (see Table 3).

Considering that shocks to growth volatility may influence the extent of international trade and financial integration, we conduct an *instrumental variables* (IV) estimation of our baseline regression, instrumenting for trade openness using the *geographic component* highlighted in Frankel and Romer (1999) and instrumenting financial openness following Faria et al. (2006).[6]

Our IV estimates for the baseline growth volatility regression are reported in Table 4. For our control variables, we find that higher output volatility is the result of: (a) higher domestic inflation, (b) a larger real exchange rate overvaluation (although the coefficient is not significant in all specifications), (c) higher monetary- and fiscal-policy volatility, (d) higher terms of trade volatility, and (e) higher volatility of international real interest rates.[7]

In terms of our variables of interest, we find that: (i) the growth volatility effect of trade openness is negative and significant for all specifications. The coefficient estimate implies that doubling trade openness leads to a decline of output volatility by 5.2 to 7.6 percent. (ii)

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[6] Table A.3 in Calderón and Kubota (2007) reports the estimates of the gravity equation model for a sample of country pairs from annual information for 147 countries over the period 1960-2005 as described in Calderon, Chong and Stein (2007). These regression estimates show that bilateral trade intensity between two countries is higher if: (a) they share a border, (b) they are closer in distance, (c) they are not landlocked, (d) the larger they are in size (in terms of population), and (e) they have a common language.

[7] We should also note that larger countries tend to display more stable output fluctuations (although the impact is not robust across specifications).

On the other hand, financial openness has a positive but not significant coefficient for all specifications reported in Table 4.

In the next sections we will disentangle the impact of trade and financial composition on growth volatility. Specifically, we assess whether the impact varies across countries and/or regions. We evaluate whether: (a) the ability of trade to stabilize growth fluctuations is hampered by the concentration of output and/or trade in riskier activities, and (b) financial openness may contribute to smoothin shocks to output growth in countries where the structure of external capital is dominated by flows driven by real shocks. Therefore, we investigate whether the composition of trade and financial flows plays a role in smoothing shocks to output growth.

4.3 Robustness analysis

This subsection conducts econometric analysis to test the robustness of our baseline results. Specifically, we evaluate the sensitivity of our estimates to: (a) changes in the dependent variable, and (b) changes in the sample of countries.

Robustness to different measures of the dependent variable. In addition to the standard deviation of growth in real GDP per capita (that we use in Table 4 as the dependent variable), we add the cyclical component of real GDP per capita based on implementing Hodrick-Prescott and band-pass filters. We also compute these three latter measures of volatility using real GDP. Our IV results for the full sample of countries are reported in Table 5.

The results show that higher output volatility —across most of our six measures of the dependent variable— is the result of: (a) higher inflation, (b) higher monetary- and fiscal-policy volatility, and (c) lower trade openness. Doubling trade openness leads to a decline in output volatility between 5.2 and 5.7 percent. Finally, we find that financial openness —as proxied by foreign liabilities as percentage of GDP— does not show a robust relationship with output volatility.[8]

Robustness to different samples of countries. Table 6 presents the IV results for the baseline regression equation for different samples of countries. In addition to the results for the full world sample, we run regressions for groups of countries classified according to their level

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[8] If we use the sum of foreign assets and liabilities as a ratio to GDP, our results remain unchanged: trade openness has a negative and significant coefficient, while financial openness fails to have a robust relationship with output volatility. These regressions are not reported but are available upon request.

of development (industrial vs. developing economies) and their level of income (high, middle, and low-income countries).

We find the following results: (i) the destabilizing effects of inflation on growth volatility are mainly observed in developing countries and in low-income countries —where episodes of high- and hyper-inflation are more frequent. (ii) Fiscal and monetary-policy volatility cause higher growth volatility in all country samples. (iii) Higher trade openness leads to lower growth volatility in all country groups. Finally, foreign liabilities (as % of GDP), our measure of financial openness, has negligible effect on output volatility.[9]

4.4 Disentangling the effect of trade and financial openness on growth volatility

Our previous IV regression has yielded the following key results: (a) a robust negative relationship between trade openness and growth volatility, (b) a weak relationship between financial openness and growth volatility. Hence more trade integration reduces output volatility, while international financial integration has no apparent relationship with output instability.

However, we expect that the latter relationship may vary a great deal across countries and that the variation would depend on country features such as the composition of trade flows, the structure of external capital, the extent of diversification of production and exports, and the depth of domestic financial markets. Next we disentangle the effects of interactions between the latter features —which have been selected based on our literature review in Section 2— and our openness measures on growth volatility.

4.4.1 The role of real and financial vulnerabilities

We first test whether the ability of trade and financial openness to accommodate shocks to real output growth depends on the extent of diversification of productive activities (as well as export sectors) and on the structure of outstanding external liabilities. Specifically, we test whether: (a) trade openness helps reducing the volatility of output in countries with a diversified output and/or export structures, and (b) financial openness reduces output volatility in countries with lower debt-to-equity ratios —*i.e.* when the structure of external

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[9] If we rather use the sum of foreign assets and liabilities as our measure of financial openness, the fragility of the financial openness coefficient in explaining output volatility holds. These regressions are not reported but are available upon request.

capital is more biased towards the accumulation of equity-related financial flows (FDI and portfolio flows).

Table 7 reports our IV results of our regression model augmented by the interaction between trade openness and the Herfindahl-Hirschman index of output concentration, and the interaction between financial openness and the debt-to-equity ratio (measured by the share of debt to total foreign liabilities). We report results for the full sample of countries and for developing countries.[10] Note that we confirm that higher output volatility is (significantly) caused by: higher inflation, higher fiscal and monetary policy volatility, and a more volatile external environment (as measured by highly volatile terms of trade shocks and world interest rates). Also note that more overvalued real exchange rates would contribute to higher output volatility in developing countries.

Regardless of the sample of countries and the specification used, the coefficient of trade openness is negative and significant while the interaction between trade openness and output concentration is positive and significant. Although rising international trade integration may lead to a reduction in output volatility, the stabilizing effect of trade openness on output fluctuations is diminished (and even lost) in countries with highly-concentrated output structures. Figure 2 shows the response of output volatility to doubling trade openness conditional on the extent of concentration of the economic activity using the estimated coefficient of regression [3] in Table 7. We plot the response of output volatility to higher international trade integration for different values of the Herfindahl-Hirschman index of output concentration (which, theoretically, ranges from 1/n to 1 where n is the number of activities). We observe that the impact of trade openness on output volatility is an increasing function of the degree of output concentration. For countries with low levels of output concentration (below 0.15), the volatility effects of an increase in trade openness is negative or not statistically significant. For higher levels of output concentration (an HH index greater

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[10] We run regressions for industrial countries and we found that the coefficient of trade openness is negative and significant while the interaction term with concentration of output and exports, as well as the coefficients of output and export concentration (when entered separately) are not statistically significant. This result is comparable to the one reported in regression [2] of Table 6. On the other hand, the coefficient of financial openness is now negative but still statistically not different from zero, and the interaction term with debt-equity ratio as well as the coefficient of debt-equity ratio are not statistically different from zero. Again, this result is comparable to that of regression [2] of Table 6. Although these regression results are not reported, they are available from the authors upon request.

than 0.15), the volatility effects are positive and rises as the economic activity becomes more highly concentrated.[11]

In order to give an economic interpretation on the total impact of trade openness on output volatility (direct and indirect through the interaction with output concentration), we assess the volatility effects of doubling trade openness in countries with highly concentrated structures of production as well as countries with well-diversified structures. We use the 10th percentile of the Herfindahl index of value added of the ISIC economic activities as a proxy of diversified economic structure (0.145 in the world sample) and the 90th percentile of that index as the approximation for highly concentrated structures of production (0.236 in the world sample). Using the reported regression [3] in Table 7 for the full sample of countries, we find that doubling the ratio of exports and imports to GDP would lead to increases in growth volatility of: (i) 6% in countries with diversified structures of production, and (ii) 13% in countries with highly concentrated output structure.[12] Finally, we should point out that the number of country episodes with levels of output concentration that guarantee a negative relationship between trade openness and growth volatility is very small.

We had found no significant relationship between financial openness and output volatility in sections 4.2 and 4.3. However, when taking into account the structure of external capital, we find that financial openness plays a role in either mitigating or amplifying shocks to output growth (Table 7). For the full sample of countries (but not for developing countries), we now find that the coefficient of financial openness is negative and robust across specifications whereas the interaction between financial openness and the debt-to-equity ratio enters with a positive and significant coefficient. Figure 2 plots the response of output volatility to doubling financial openness for different levels of the debt shares (that goes from 0 to 100%). We observe that doubling financial openness lowers output volatility and that the output-stabilizing property of financial openness declines as the debt share rises. Note that when the structure of external capital is biased debt (with the debt share exceeding 85%), the impact becomes positive although it is not significant.

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[11] On the other hand, the impact output concentration is negative and significant only for the full sample of countries. This implies that the effect of output concentration on aggregate volatility would depend positively on the extent of openness to international trade.
[12] Note that when we use the regression in column [6] of Table 7 for developing countries, doubling trade openness would lead to an increase in output volatility of 3.6% in countries with diversified economic structures, and an increase of 10.1% in countries with highly concentrated economic activity.

Analogously to the case of trade openness, we interpret economically our regression results by calculating the volatility effects of financial openness for countries with high and low shares of debt liabilities. The low (high) participation of debt liabilities in total foreign liabilities is proxied by the 10th (90th) percentile of the world sample. Using regression [3] of Table 7, we find that doubling financial openness reduces output volatility by more than 40% in countries with low debt shares, whereas output volatility rises by approximately 10% in countries with high debt shares. This implies that rising financial openness may shield the economy from shocks to economic growth in countries with low debt-to-equity ratio, and that this effect declines as debt liabilities become more important in the structure of external capital.

In Table 8, we report the interaction between trade openness and the concentration of export activities rather than concentration of production. The results reported in this table also consider the interaction between financial openness and the participation of debt in the structure of external liabilities. We report IV estimates for the full sample of countries and for the sample of developing countries.

We find that the coefficient of trade openness is negative and significant for all specifications and both country samples, while the interaction between trade openness and export concentration enters with a positive and significant coefficient. This result implies that while trade openness reduces output volatility, the latter effect is reversed by export concentration.[13] Figure 3 plots the response of output volatility to doubling trade openness at different levels of export concentration in the full country sample, based on regression [3] of Table 8. The impact of trade openness on output volatility is negative and not statistically significant at very low levels of export concentration. At higher levels of export concentration (larger than 0.2), higher openness to international trade leads to more volatile output growth.

Again we look at define countries with very low (high) concentration of exports as those at the 10th (90th) percentile of the sample distribution of the Herfindahl-Hirschman index of export revenues. Economically speaking, our results from regression [3] in Table 8 suggest that if we double trade openness: (a) output volatility increases by 7% in countries with very concentrated exports, and (b) output volatility rises by less than 3% in countries with

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[13] Also note that the coefficient of export concentration is negative, but the impact of export concentration on output volatility rises as the export sector of the economy more open to trade.

diversified exports.[14] What is the economic impact of rising trade openness if we use our results for developing countries? Using regression [6] in Table 8, we find that if the ratio of exports and imports to GDP rises by 100%, output volatility increases by 1 percent in countries with well-diversified export structures. The surge in output volatility is close to 6% in countries with highly concentrated exports.

We again find strong evidence on the impact of financial openness on output volatility and on the dependence of this relationship on the structure of external liabilities. Financial openness stabilizes output fluctuations significantly and robustly across specifications and country samples. However, its smoothing ability is significantly weakened in countries with high debt-related liabilities. Using regression [3] in Table 8 we find that doubling financial openness leads to lower output volatility by more than 50% in countries with very low debt liabilities (10th percentile), while it raises output volatility by 21% in countries with high debt shares (90th percentile). Figure 3 depicts the impact of financial openness on output volatility. It is negative and significant for low-to-medium debt shares, whereas it is positive and significant at high debt shares (larger than 85%).

4.4.2 The composition of trade and financial flows

Another way to disentangle the impact of trade and financial openness on growth volatility is to address the role of the composition of trade and the structure of external assets and liabilities in affecting the volatility of output fluctuations. Next, we include in our regression analysis manufacturing and non-manufacturing trade (expressed as ratios to GDP) instead of our aggregate indicator. We also break down foreign liabilities (assets and liabilities) into equity- and loan-related foreign liabilities (assets and liabilities).[15] The results are reported in Table 9.

We find that the ability of trade openness to stabilize output fluctuations is driven by the weight of manufacturing trade. The coefficient of trade openness in manufacturing enters with a negative and significant sign for all specifications and country samples. In contrast to the latter results, the coefficient of non-manufacturing trade enters with a negative sign but is not statistically different from zero. This result is consistent with the combined evidence

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[14] Note that for the full sample of countries, the 10th percentile of the sample distribution of the Herfindahl-Hirschman index of export concentration is 0.145, whereas the 90th percentile is 0.236.
[15] Note that equity-related foreign liabilities comprise the stocks of portfolio equity and FDI liabilities.

of: (a) our finding that openness helps stabilize output fluctuations in countries with well-diversified output and export structures, and (b) Cavallo's (2007) finding that the stabilizing properties of trade openness is weaker in countries with higher terms of trade risk (which are associated to non-manufacturing goods).

Accounting for the structure of external liabilities also yields relevant results: first, equity-related financial openness —either proxied by equity-related foreign liabilities or assets and liabilities— has a negative and significant coefficient in all regressions. Second, the coefficient of loan related financial openness is positive and significant in most specifications. Together, the two latter findings imply that the stabilization properties of financial openness depend on the type of external liabilities. This result is consistent with: (a) our finding that the ability of financial openness to mitigate output fluctuations depends on the country's debt-equity ratio. (b) The findings in Calderon and Kubota (2007) where real exchange rates are found to be more volatile in countries with higher levels of equity-related financial openness, while higher loan-related financial openness tends to exacerbate real exchange rate volatility.

4.4.3 The role of domestic financial development: a more nuanced role?

We suspect that domestic financial depth not only may affect aggregate volatility directly but also through its intermediation of resources available in world financial markets. For this purpose we use the GDP ratio of domestic credit to the private sector as the indicator of domestic financial depth, and including this variable separately and interacting with financial openness and trade openness in our regression analysis. Table 10 reports on the latter role of domestic financial development in stabilizing output fluctuations.[16]

When we introduce local financial depth separately (without the interaction effects), we obtain a positive and significant coefficient in most cases. This implies that the domestic financial sector does not act per se as a buffer against shocks to real output growth. However, when interacted with trade openness and financial openness, we find that domestic financial markets play a significant role in shielding the economy from adverse real output shocks. The interaction coefficient between trade openness and financial depth is

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[16] Note that the results when using the sum of foreign assets and liabilities as the proxy of financial openness are qualititatively similar to those of Table 10. The results are not reported but available from the authors upon request.

negative and significant only for the full sample of countries, but is economically small (see figure 4). On the other hand, the interaction between foreign liabilities (our financial openness proxy) and financial depth is negative and statistically significant for all specifications and country samples. Figure 4 shows that the destabilizing effects of financial openness on growth volatility are mitigated to some extent by the depth of local financial markets.

Economically, if financial openness doubles, what would be the impact on growth volatility in countries with limited financial depth vis-à-vis countries with deep financial markets? Figure 4 suggests some quantitative assessment on this issue. Growth volatility would increase by one third in countries with limited financial depth (as proxied here with domestic credit to the private sector amounting 25% of GDP). On the other hand, RER volatility would only increase by approximately 23% in countries with deeper financial markets (here, approximately, private credit totaling 75% of GDP).

4.5 Openness and "Crisis" Volatility

The incidence of currency crises, sudden stops, and current account reversals are likely to contribute to higher output volatility in developing countries –and, especially in emerging markets. The pro-cyclical nature of access to international capital markets in emerging-market-economies suggests that they may be more likely affected by sudden reversals of inflows which, in turn, may destabilize economic activity. We conjecture that the positive association between financial openness and output volatility may be explained by the incidence of recurrent crisis episodes in developing countries.

Here we evaluate the relationship between output volatility and openness in times of crisis. Our strategy consists in estimating whether countries that are more integrated to international capital markets and/or to world goods markets have a lower likelihood of experiencing an economic crisis. Our dependent variable is a dummy variable that takes the value of 1 whenever there is an economic crisis. In turn, we use two different approaches to define *economic crises*:

First, we use the concept of *output drop* outlined in Beaudry and Koop (1993) to define our *economic crisis* events. Specifically, an *output drop* is the distance between real output in period t, y_t, and the local maximum up to period t, $\overline{y}_t^{\max}$,

$$y^{drop} = \left(\frac{\bar{y}_t^{\max} - y_t}{\bar{y}_t^{\max}} \right) \times 100$$

Hence, our dependent variable is the indicator function that takes the value of 1 when the drop in real GDP goes beyond a certain threshold, κ,

$$I\left(y^{drop}\right) = 1 \quad \text{if} \quad \left(\frac{\bar{y}_t^{\max} - y_t}{\bar{y}_t^{\max}} \right) \times 100 > \kappa$$

where κ is equal to 5 and 10 percent in our regression analysis. Hence, whenever the drop in real output relative to the local maximum exceeds 5 (or 10) percent, our indicator function takes the value of 1 and 0 otherwise.

Second, we define *crisis* episodes based on the operational concept of "*crisis volatility*" implemented by Hnatkovska and Loayza (2004). In fact, *crisis volatility* is the part of the standard deviation of GDP growth that corresponds to downward deviations below a certain threshold. The authors set the threshold equal to one standard deviation of the world distribution of overall volatility measures. They argue that using a common threshold across countries would allow them to generate absolute crisis measures (rather than country-specific measures), thus facilitating cross-country comparisons.

Here our dependent variable takes the value of 1 when our measure of output volatility falls below the one standard deviation of the world distribution of standard deviations of real output growth, and takes the value of 0 otherwise.

4.5.1 Openness and Output Drops

Table 11 reports the baseline probit model where our dependent variable is the incidence of an output drop that is larger than 5 and 10 percent, respectively. Our variables of interest in the regression are trade openness (proxied by real exports and imports as percentage of GDP) and financial openness (as measured by either foreign liabilities or foreign assets and liabilities as percentage of GDP). Our set of controls comprises domestic variables that are usually used in the empirical literature on determinants of economic crisis (Milesi-Ferretti and Razin, 2000; Cerra and Saxena, 2005; Becker and Mauro, 2006): economic growth, ratio of international reserves to imports (or to M2), inflation, and real exchange rate overvaluation. All these control variables are lagged in order to avoid reverse causality issues. We also control for external variables by including current and lagged terms-of-trade shocks

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as well as current and lagged values of the international real interest rate (as proxied by the prime interest rate).

Our regression results (Table 11) show that the likelihood of an output drop rises with (a) lower economic growth, (b) a lower ratio of reserves to imports or to M2, (c) higher inflation, and (d) real exchange rate overvaluation. The impact of external shocks is not robust, but lower terms of trade shocks and higher foreign interest rates may raise the probability of an output drop.

Regarding the impact of our variables of interest on the likelihood of an output drop, we find that trade openness enters with a negative and significant coefficient for all specifications used and output drop sizes. Financial openness –measured as either foreign liabilities or foreign assets and liabilities– has a positive and robust coefficient estimate, thus suggesting that higher financial openness raises the probability of output drops.

Table 12 adds to our *baseline* probit model the interaction between trade openness and concentration in either production or exports, as well as the interaction between financial openness and the debt-equity ratio. The conjecture here is that, in crisis episodes, trade openness and financial openness smooth output volatility in countries with diversified production (and/or exports) and with external liabilities more biased toward FDI and and portfolio equity holdings.

We confirm that countries with more open trade regimes are less likely to suffer an output drop. However, the coefficient of output (and export) concentration as well as its interaction with trade openness is not statistically significant. Hence, the impact of higher openness on output volatility does not seem to be different between countries with highly concentrated output sectors and countries with well-diversified economic structures. On the other hand, we find that financial openness may smoothes output reductions in times of crisis only for countries with low debt-equity ratios.

Table 13 also evaluates the role of the composition of trade flows and external capital on the likelihood of output drops, by decomposing trade into manufacturing and non-manufacturing trade, and by decomposing financial openness into equity-related financial openness and loan-related financial openness. We find that the ability of trade openness to reduce the likelihood of large output drops is driven by the intensity of manufacturing trade. This result holds for all specifications and output drop sizes. We also find that the destabilizing effects of financial openness on output volatility in times of crisis are mainly

driven by high loan-related foreign liabilities. In contrast, equity-related foreign liabilities have no significant effects on the likelihood of output drops.

Finally, Table 14 analyzes the interaction between financial depth and financial openness in mitigating sharp shocks to real output in times of crisis. We find that the coefficient of financial depth in these regressions is not robust, although it is positive and significant in a few regressions. When we use reserve to imports, we find that financial openness (either proxied as foreign liabilities or foreign assets and liabilities) has a positive coefficient estimate and that the interaction between financial openness and financial depth is negative only when the output drop is larger than 5%. Hence there is some margin for financial depth to improve the smoothing abilities of financial openness in times of crises, although the effect is not robust across specifications.

4.5.2 Openness and "Crisis" Volatility

We repeat the probit analysis reported for the likelihood of output drops but using here a binary variable that indicates the incidence of *crisis volatility* episodes, as defined by Hnatkovska and Loayza (2004). Table 15 reports the *baseline* regression, including the same set of explanatory variables used for the analysis of output drops. We find that countries are more likely to experience *crisis volatility* if: (a) economic growth is lower, (b) reserves-to-imports are lower, (c) inflation is higher, (d) real exchange rate overvaluation is larger, and (e) terms of trade shocks are lower. Regarding our variables of interest, we find that the coefficient of trade openness is negative but it is not statistically significant. In contrast to the probit analysis of output drops, we find that in most cases the coefficient of financial openness is negative and significant –that is, financial openness mitigates the incidence of output volatility in crisis times.

Table 16 reports the interplay between trade openness and output concentration as well as that between financial openness and the debt-equity ratio. We show that when controlling for the reserves-to-imports ratio, trade openness mitigates the likelihood of crisis volatility in countries with diversified exports, whereas it amplifies the probability in countries with highly concentrated export structures. We robustly find that financial openness help smooth shocks to real output in crisis volatility periods, especially in countries with low debt-equity ratios. The latter finding holds for all specifications and country samples.

Next we decompose trade openness into manufacturing and non-manufacturing trade as well as financial openness into equity- and loan-related financial openness (Table 17). The results show that the coefficient of manufacturing trade is negative and significant across all specifications, while the coefficient of non-manufacturing is positive and significant in half the cases for the full sample of countries. The trade coefficients fail to be statistically significant in developing countries. On the other hand, we find that any negative impact of financial openness on the likelihood of crisis volatility is driven by loan-related financial openness –which differs from the result for output drops.

Finally, we report in Table 18 that financial openness, when entering alone, has a coefficient that is negative and significant across all specification and samples. Hence, countries with deeper financial markets are less likely to suffer from crisis volatility. However, when interacted with financial openness, we find results that are opposite to the results reported on output drops: financial openness and financial depth seem to be substitutes in smoothing shocks to output volatility in crisis times.

5. Concluding remarks

The present paper aims to evaluate the impact of (trade and financial) openness on output volatility (in normal and crisis times) using a sample of 82 countries for the period 1975-2005. We use outcome measures of trade openness (real exports and imports as percentage of GDP) and financial openness (foreign liabilities and foreign assets and liabilities) and we examine whether the effect of trade and financial openness on macroeconomic volatility depend on the vulnerability of domestic economies to real and financial shocks. Among our main findings we have:

First, we find that trade openness and output volatility are negatively and significantly associated whereas financial openness seems to have a positive although not robust relationship with output volatility (see Table 4). This finding is robust to changes in the measurement of the dependent variable (Table 5) and to changes in the sample of countries (Table 6).

Second, the impact of trade openness on aggregate volatility depends on the degree of concentration of economic activity. We find that in countries with very low degrees of concentration of output and/or exports (i.e. countries with well-diversified structures of production and exports), trade openness may cushion the impact of shocks to output

growth. However, trade openness may exacerbate output volatility in countries with medium to high concentration of output and exports. This finding is consistent with the result that trade openness may magnify shocks to real output growth when the specialization effects resulting from trade dominates the diversification effects found in Di Giovanni and Levchenko (2007) using data at the industry level.

Third, the structure of external capital plays a significant role in determining the impact of financial openness on aggregate volatility. We find that financial openness mitigates shocks to real output growth in countries with low debt-equity ratios –*i.e.* a low share of debt liabilities to total (FDI, portfolio equity, and debt) liabilities. On the other hand, higher international financial integration has a negligible impact or even amplifies the volatility of output fluctuations in countries with very high debt-equity ratios.

Fourth, the smoothing ability of trade openness seems to be mainly driven by the intensity of trade in manufacturing goods. On the other hand, we find that equity-related financial openness (measured as the ratio of FDI and portfolio equity liabilities to GDP) has a negative relationship with output volatility, while loan-related financial openness (as measured by the ratio of debt liabilities to GDP) has a positive relationship with output volatility. This finding is consistent with the results mentioned above and also with the predictions of Sutherland (1996) and Buch et al. (2005) that the link between financial openness and aggregate volatility is positive in the event of nominal shocks while the relationship is negative in the presence of real shocks.[17]

Fifth, we fail to find a direct smoothing impact of domestic financial depth on growth volatility. However, we find a more *nuanced role* for the depth of local financial markets: (i) the stabilizing effect of trade openness on output fluctuations is stronger in countries with deeper domestic financial markets, and (ii) the destabilizing effects of international financial integration on output volatility are partially mitigated in countries where local financial markets are deeper.

Sixth, countries that are more integrated to international trade are less prone to output drops while countries with higher international financial integration are more likely to experience an output drop. Interestingly, we find that the impact of trade openness on the

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[17] This conjecture assumes that equity-related liabilities are mainly driven by real shocks (say, fiscal shocks) while loan-related liabilities are mainly driven by nominal shocks (monetary shocks, and risk premium shocks).

probability of output drops for countries with well-diversified economic structures is not statistically different from that of countries with highly concentrated economic structures. On the other hand, we find that countries are less prone to crises not only if they are highly integrated to international financial markets but also if their structure of external liabilities is dominated by larger holdings of FDI and portfolio equity liabilities. In countries with very high debt-equity ratios, financial openness may increase the probability of output drops.

Seventh, the finding that countries with higher trade openness are less prone to output drops is mainly driven by the higher intensity of trade in manufacturing. On the other hand, we find that equity-related financial openness (i.e. FDI and portfolio equity liabilities) have a limited influence on the likelihood of output drops, while loan-related financial openness (i.e. debt liabilities) raise the probability of sharp output drops. This finding is consistent with the findings of Levchenko and Mauro (2007) that attributes a limited role for FDI and portfolio equity in the event of sudden stops (zero correlation), while bank lending (and official flows) declines substantially. Hence, accumulating FDI and portfolio equity liabilities, and not debt liabilities, is a strategy that may better protect the economy against external shocks.

In sum, we find that trade openness may have destabilizing effects on output when the higher specialization of production due to trade more than offsets the low correlation of traded sectors with the rest of the economy, as a result of product diversification. On the other hand, financial openness may have stabilizing effects when countries have low debt-equity ratios.

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Table 1
Trade Openness, Financial Openness and Growth Volatility: Basic Statistics
Sample of 82 countries, 1975-2005 (5-year period observations)

Variables	All Countries	Industrial Countries	Developing Countries	By Income Level High	By Income Level Middle	By Income Level Low	Emerging Markets
Growth Volatility							
S.D. Growth in real GDP per capita	0,803	0,324	0,979	0,371	0,949	1,028	0,931
(in logs)	(0,74)	(0,58)	(0,72)	(0,59)	(0,71)	(0,74)	(0,69)
Trade Openness							
Trade: Real exports and imports	3,981	3,926	4,001	4,018	3,977	3,949	3,811
(as % of GDP, in logs)	(0,59)	(0,55)	(0,60)	(0,64)	(0,59)	(0,52)	(0,69)
Output Concentration	0,188	0,183	0,190	0,184	0,171	0,216	0,178
(Herfindahl index of 1-digit ISIC economic activities)	(0,04)	(0,02)	(0,05)	(0,02)	(0,04)	(0,05)	(0,04)
Export Concentration	0,359	0,256	0,399	0,258	0,374	0,444	0,266
(Herfindahl index of 1-digit SITC export values)	(0,19)	(0,09)	(0,20)	(0,09)	(0,19)	(0,20)	(0,09)
Financial Openness							
Foreign Liabilities	4,307	4,401	4,271	4,438	4,224	4,292	4,061
(as % of GDP, in logs)	(0,71)	(0,75)	(0,69)	(0,74)	(0,62)	(0,77)	(0,54)
Foreign Assets & Liabilities	4,701	4,984	4,594	5,026	4,596	4,508	4,406
(as % of GDP, in logs)	(0,72)	(0,80)	(0,65)	(0,80)	(0,58)	(0,71)	(0,53)
Debt-Equity Ratio	4,296	4,292	4,298	4,278	4,231	4,417	4,296
(Debt liabilities as % of total liabilities, in logs)	(0,26)	(0,20)	(0,28)	(0,21)	(0,31)	(0,17)	(0,27)
Domestic Conditions							
Initial income per capita	7,73	9,76	6,99	9,74	7,60	5,92	7,46
(Real GDP per capita, in logs)	(1,58)	(0,41)	(1,13)	(0,41)	(0,68)	(0,58)	(1,05)
Inflation	4,769	4,663	4,808	4,673	4,810	4,808	4,838
(CPI inflation rate, in logs)	(0,33)	(0,06)	(0,38)	(0,11)	(0,34)	(0,43)	(0,41)
REER overvaluation index	4,739	4,648	4,772	4,639	4,668	4,937	4,672
(in logs)	(0,55)	(0,13)	(0,63)	(0,13)	(0,36)	(0,88)	(0,36)
Financial Depth	3,486	4,314	3,182	4,321	3,416	2,744	3,661
(Domestic credit to private sector, in logs)	(0,91)	(0,51)	(0,83)	(0,50)	(0,67)	(0,83)	(0,65)
Fiscal Policy Volatility 1/	-3,124	-4,271	-2,703	-4,162	-2,936	-2,353	-3,136
(in logs)	(1,09)	(0,64)	(0,91)	(0,73)	(0,91)	(0,81)	(0,77)
Monetary Policy Volatility 1/	-3,940	-4,520	-3,725	-4,493	-3,848	-3,515	-3,925
(in logs)	(0,84)	(0,67)	(0,79)	(0,67)	(0,77)	(0,78)	(0,82)
External Conditions							
Terms of Trade Volatility	1,629	0,838	1,920	0,836	1,711	2,310	1,661
(std. dev. of terms of trade shocks, in logs)	(1,44)	(0,69)	(1,54)	(0,70)	(1,83)	(0,90)	(0,91)
International Real Interest Rate Volatility	-0,146	-0,146	-0,146	-0,146	-0,146	-0,146	-0,146
(std. dev. of the prime loan rate, in logs)	(0,59)	(0,59)	(0,59)	(0,59)	(0,59)	(0,59)	(0,59)

1/ Monetary and Fiscal Policy volatility are calculated using the methodology of Fatas and Mihov (2003, 2006). For fiscal policy volatility we regress government spending (as a ratio to GDP) on output, lagged government spending and we instrument output growth with lagged output growth and current and lagged values of oil prices. The same methodology is applied to monetary policy using the ratio of money supply to GDP.

Table 2

Trade Openness, Financial Openness and Growth Volatility: Panel Correlation Analysis

Sample panel correlation between output volatility and its determinants

Sample of 82 countries, 1975-2005 (5-year period observations)

Variables	All Countries	By level of development		By income level		
		Industrial	Developing	High	Middle	Low
Trade Openness						
Trade: Real exports and imports	0,006	-0,138 *	0,015	0,045	-0,136 **	0,252 **
Output Concentration	0,045	-0,191 **	0,044	-0,060	0,033	0,012
Export Concentration	0,265 **	0,105	0,158 **	0,153 *	0,081	0,230 **
Financial Openness						
Foreign Liabilities (*as % of GDP*)	-0,050	-0,243 **	0,056	-0,147 *	0,051	0,045
Foreign Assets & Liabilities (*as % of GDP*)	-0,130 **	-0,292 **	0,054	-0,181 **	0,072	0,023
Debt-Equity Ratio	0,143 **	0,138 *	0,154 **	0,017	0,203 **	0,092
Domestic Conditions						
Inflation	0,235 **	0,260 **	0,185 **	0,143 *	0,235 **	0,152 *
REER Overvaluation Index	0,173 **	0,053	0,161 **	0,000	0,021	0,247 **
Fiscal Policy Volatility 1/	0,427 **	0,246 **	0,250 **	0,330 **	0,207 **	0,312 **
Monetary Policy Volatility 1/	0,337 **	0,308 **	0,181 **	0,321 **	0,176 **	0,165 **
Financial Depth	-0,323 **	-0,280 **	-0,115 **	-0,226 **	-0,075 **	-0,138 *
Income per capita	-0,302 **	-0,131	0,019	-0,137 *	0,195	-0,005
External Conditions						
Terms of Trade Volatility	0,275 **	0,159 *	0,171 **	0,103	0,150 **	0,260 **
International Real Interest Rate Volatility	0,140 **	0,232 **	0,129 **	0,190 **	0,046	0,265 **

*Note: The pair-wise correlation are computed between the standard deviation of growth in real GDP per capita and the corresponding explanatory variable. * (**) implies statistical significance at the 10 (5) percent level. For 1/, see footnote in Table 1.*

Table 3

Openness and Growth Volatility: Baseline Regressions

Dependent Variable: Standard deviation of the growth rate of real GDP per capita (in logs)
Methodology: Least squares (accounting for country- and time-specifiic effects)
Sample of 82 countries, 1975-2005 (5-year period observations)

Explanatory Variables	[1]	[2]	[3]	[4]	[5]	[6]
Trade Openness (TO)						
Trade: Real exports and imports	-0,066	-0,040	-0,025	-0,054	-0,033	-0,019
as % of GDP (in logs)	(0,14)	(0,14)	(0,13)	(0,14)	(0,14)	(0,14)
Financial Openness (FO)						
Foreign Liabilities	-0,174 **	-0,179 **	-0,169 **	..	..	..
as % of GDP (in logs)	(0,08)	(0,08)	(0,07)			
Foreign Assets and Liabilities	..	..	..	-0,193 **	-0,190 **	-0,180 **
as % of GDP (in logs)				(0,08)	(0,08)	(0,08)
Domestic Conditions						
Income per capita	0,047	0,116	0,155	0,081	0,145	0,184
(in logs)	(0,14)	(0,14)	(0,14)	(0,15)	(0,14)	(0,14)
Inflation	0,228 **	0,110	0,044	0,227 **	0,107	0,042
(CPI inflation rate, in logs)	(0,11)	(0,11)	(0,11)	(0,11)	(0,11)	(0,11)
REER overvaluation index	0,184 **	0,168 **	0,150 **	0,183 **	0,169 **	0,151 **
(in logs)	(0,07)	(0,07)	(0,07)	(0,07)	(0,07)	(0,07)
Systemic Banking Crisis	0,175 *	0,130	0,073	0,174 *	0,128	0,071
(average frequency of systemic banking crises)	(0,11)	(0,11)	(0,10)	(0,11)	(0,11)	(0,10)
Fiscal Policy Volatility 1/	..	0,232 **	0,217 **	..	0,230 **	0,215 **
		(0,05)	(0,05)		(0,05)	(0,05)
Monetary Policy Volatility 1/	..	..	0,196 **	..	..	0,195 **
			(0,05)			(0,05)
External Conditions						
Terms of Trade Volatility	0,046 *	0,028	0,026	0,044 *	0,027	0,025
(std. dev. of terms of trade shocks, in logs)	(0,03)	(0,03)	(0,02)	(0,03)	(0,03)	(0,02)
International Real Interest Rate Volatility	0,172 **	0,181 **	0,173 **	0,161 **	0,172 **	0,163 **
(std. dev. of the prime loan rate, in logs)	(0,08)	(0,08)	(0,08)	(0,08)	(0,08)	(0,08)
Observations	477	476	474	477	476	474
R**2	0,117	0,164	0,193	0,118	0,164	0,193

*The numbers in parenthesis below the coefficient estimates are the robust standard errors. * (**) implies statistical significance at the 10 (5) percent level.*

1/ Monetary and Fiscal Policy volatility are calculated using the methodology of Fatas and Mihov (2003, 2006). For fiscal policy volatility we regress government spending (as a ratio to GDP) on output, lagged government spending and we instrument output growth with lagged output growth and current and lagged values of oil prices. The same methodology is applied to monetary policy using the ratio of money supply to GDP.

Table 4

Trade Openness, Financial Openness, and Output Volatility: Instrumental Variables

Dependent Variable: Standard deviation of the growth rate of real GDP per capita (in logs)
Methodology: Instrumental variables (accounting for country- and time-specifiic effects)
Sample of 82 countries, 1975-2005 (5-year period observations)

Explanatory Variables	[1]	[2]	[3]	[4]	[5]	[6]
Trade Openness (TO)						
Trade: Real exports and imports	-0,107 **	-0,086 **	-0,076 **	-0,110 **	-0,087 **	-0,076 **
as % of GDP (in logs)	(0,03)	(0,02)	(0,02)	(0,02)	(0,02)	(0,02)
Financial Openness (FO)						
Foreign Liabilities	0,100	0,033	0,023	..	..	..
as % of GDP (in logs)	(0,11)	(0,11)	(0,10)			
Foreign Assets and Liabilities	..	..	..	0,094	0,024	0,014
as % of GDP (in logs)				(0,11)	(0,10)	(0,10)
Domestic Conditions						
Income per capita	-0,095 **	-0,004	0,026	-0,104 **	-0,006	0,025
(in logs)	(0,03)	(0,03)	(0,03)	(0,03)	(0,04)	(0,04)
Inflation	0,128 **	0,120 **	0,111 *	0,121 *	0,116 *	0,109 *
(CPI inflation rate, in logs)	(0,06)	(0,06)	(0,06)	(0,06)	(0,06)	(0,06)
REER overvaluation index	0,247 **	0,135	0,066	0,259 **	0,141	0,069
(in logs)	(0,11)	(0,11)	(0,11)	(0,11)	(0,11)	(0,11)
Systemic Banking Crisis	0,124	0,106	0,062	0,125	0,107	0,063
(average frequency of systemic banking crises)	(0,11)	(0,10)	(0,10)	(0,10)	(0,10)	(0,10)
Fiscal Policy Volatility 1/	..	0,216 **	0,199 **	..	0,216 **	0,199 **
		(0,04)	(0,04)		(0,04)	(0,04)
Monetary Policy Volatility 1/	..	..	0,182 **	..		0,182 **
			(0,04)			(0,04)
External Conditions						
Terms of Trade Volatility	0,046 *	0,036 *	0,034	0,046 *	0,036 *	0,034
(std. dev. of terms of trade shocks, in logs)	(0,02)	(0,02)	(0,02)	(0,02)	(0,02)	(0,02)
International Real Interest Rate Volatility	0,203 **	0,203 **	0,192 **	0,204 **	0,201 **	0,189 **
(std. dev. of the prime loan rate, in logs)	(0,09)	(0,09)	(0,09)	(0,09)	(0,09)	(0,09)
Observations	439	438	437	439	438	437
R**2	0,186	0,244	0,269	0,189	0,246	0,269

*The numbers in parenthesis below the coefficient estimates are the robust standard errors. * (**) implies statistical significance at the 10 (5) percent level.*

1/ Monetary and Fiscal Policy volatility are calculated using the methodology of Fatas and Mihov (2003, 2006). For fiscal policy volatility we regress government spending (as a ratio to GDP) on output, lagged government spending and we instrument output growth with lagged output growth and current and lagged values of oil prices. The same methodology is applied to monetary policy using the ratio of money supply to GDP.

Table 5
Openness and Growth Volatility: Robustness to changes in dependent variable

Dependent Variable: Standard deviation of the growth rate of real GDP per capita (in logs)
Methodology: Instrumental variables (accounting for country- and time-specifiic effects)
Sample of 82 countries, 1975-2005 (5-year period observations)

Explanatory Variables	Std.Dev. Real GDP per capita			Std.Dev. Real GDP		
	First Differences	Band-Pass Filter	H-P Filter	First Differences	Band-Pass Filter	H-P Filter
Trade Openness (TO)						
Trade: Real exports and imports	-0,076 **	-0,075 **	-0,082 **	-0,073 **	-0,081 **	-0,088 **
as % of GDP (in logs)	(0,02)	(0,02)	(0,02)	(0,02)	(0,02)	(0,02)
Financial Openness (FO)						
Foreign Liabilities	0,023	-0,057	-0,104	0,045	-0,082	-0,127
as % of GDP (in logs)	(0,10)	(0,10)	(0,11)	(0,11)	(0,11)	(0,11)
Domestic Conditions						
Income per capita	0,026	0,051	0,056 *	0,018	0,053 *	0,057 *
(in logs)	(0,03)	(0,03)	(0,03)	(0,03)	(0,03)	(0,03)
Inflation	0,111 *	0,121 **	0,136 **	0,114 *	0,127 **	0,139 **
(CPI inflation rate, in logs)	(0,06)	(0,06)	(0,06)	(0,06)	(0,06)	(0,06)
REER overvaluation index	0,066	0,165 *	0,148	0,097	0,181 *	0,161
(in logs)	(0,11)	(0,11)	(0,11)	(0,11)	(0,11)	(0,11)
Systemic Banking Crisis	0,062	-0,006	0,033	0,093	0,021	0,063
(average frequency of systemic banking crises)	(0,10)	(0,10)	(0,10)	(0,10)	(0,10)	(0,10)
Fiscal Policy Volatility 1/	0,199 **	0,212 **	0,198 **	0,197 **	0,212 **	0,197 **
	(0,04)	(0,04)	(0,04)	(0,04)	(0,04)	(0,04)
Monetary Policy Volatility 1/	0,182 **	0,175 **	0,172 **	0,183 **	0,167 **	0,156 **
	(0,04)	(0,04)	(0,04)	(0,05)	(0,04)	(0,04)
External Conditions						
Terms of Trade Volatility	0,034	0,022	0,024	0,035 *	0,021	0,022
(std. dev. of terms of trade shocks, in logs)	(0,02)	(0,02)	(0,02)	(0,02)	(0,02)	(0,02)
International Real Interest Rate Volatility	0,192 **	0,120	0,116	0,244 **	0,090	0,093
(std. dev. of the prime loan rate, in logs)	(0,09)	(0,09)	(0,08)	(0,09)	(0,09)	(0,09)
Observations	437	437	437	437	437	437
R**2	0,269	0,251	0,238	0,281	0,248	0,232

*The numbers in parenthesis below the coefficient estimates are the robust standard errors. * (**) implies statistical significance at the 10 (5) percent level.*
1/ See footnote in Table 4.

Table 6

Openness and Growth Volatility: Robustness to changes in the sample of countries

Dependent Variable: Standard deviation of the growth rate of real GDP per capita (in logs)

Methodology: Instrumental variables (accounting for country- and time-specifiic effects)

Sample of 82 countries, 1975-2005 (5-year period observations)

Explanatory Variables	All Countries	Industrial Countries	Developing Countries	By Income Level High	Middle	Low
Trade Openness (TO)						
Trade: Real exports and imports	-0,076 **	-0,090 **	-0,087 **	-0,059 *	-0,077 *	-0,098 *
as % of GDP (in logs)	(0,02)	(0,04)	(0,03)	(0,04)	(0,05)	(0,06)
Financial Openness (FO)						
Foreign Liabilities	0,023	0,015	-0,076	-0,032	0,275	-0,111
as % of GDP (in logs)	(0,10)	(0,12)	(0,14)	(0,12)	(0,19)	(0,23)
Domestic Conditions						
Income per capita	0,026	0,101	0,150 **	0,027	0,216 **	0,016
(in logs)	(0,03)	(0,17)	(0,05)	(0,16)	(0,10)	(0,16)
Inflation	0,111 *	-0,118	0,144 **	-0,141	-0,037	0,159 *
(CPI inflation rate, in logs)	(0,06)	(0,44)	(0,07)	(0,46)	(0,18)	(0,08)
REER overvaluation index	0,066	1,914	0,019	-0,501	0,116	0,012
(in logs)	(0,11)	(1,79)	(0,12)	(0,56)	(0,16)	(0,22)
Systemic Banking Crisis	0,062	0,113	0,065	0,020	0,061	-0,004
(average frequency of systemic banking crises)	(0,10)	(0,25)	(0,11)	(0,25)	(0,15)	(0,19)
Fiscal Policy Volatility 1/	0,199 **	0,150 *	0,165 **	0,258 **	0,176 **	0,231 **
	(0,04)	(0,09)	(0,05)	(0,08)	(0,06)	(0,10)
Monetary Policy Volatility 1/	0,182 **	0,141 *	0,189 **	0,188 **	0,150 **	0,132
	(0,04)	(0,08)	(0,05)	(0,08)	(0,07)	(0,10)
External Conditions						
Terms of Trade Volatility	0,034	-0,017	0,031	-0,037	0,030	0,042
(std. dev. of terms of trade shocks, in logs)	(0,02)	(0,09)	(0,02)	(0,09)	(0,03)	(0,09)
International Real Interest Rate Volatility	0,192 **	0,224	0,100	0,277 *	0,137	0,230
(std. dev. of the prime loan rate, in logs)	(0,09)	(0,15)	(0,10)	(0,14)	(0,12)	(0,21)
Observations	437	127	310	139	186	112
R**2	0,269	0,241	0,168	0,233	0,200	0,275

*The numbers in parenthesis below the coefficient estimates are the robust standard errors. * (**) implies statistical significance at the 10 (5) percent level.*

1/ Fiscal Policy volatility are calculated using the methodology of Fatas and Mihov (2003, 2006). For fiscal policy volatility we regress government spending (as a ratio to GDP) on output, lagged government spending, and we instrument output growth with lagged output growth and current and lagged values of oil prices. The same methodology is applied to monetary policy using the ratio of money supply to GDP.

Table 7

Openness, Vulnerabilities and Growth Volatility: Output diversification and debt-equity ratios

Dependent Variable: Standard deviation of the growth rate of real GDP per capita (in logs)
Methodology: Instrumental variables (accounting for country- and time-specifiic effects)
Sample of 82 countries, 1975-2005 (5-year period observations)

Explanatory Variables	All Countries			Developing Countries		
	[1]	[2]	[3]	[4]	[5]	[6]
Trade Openness (TO)						
Trade: Real exports and imports (TO)	-0,094 **	-0,073 **	-0,064 **	-0,101 **	-0,082 **	-0,078 **
as % of GDP (in logs)	(0,02)	(0,02)	(0,02)	(0,03)	(0,03)	(0,03)
TO x Output Concentration	1,356 **	1,137 **	1,048 **	1,160 **	0,939 *	0,892 *
	(0,48)	(0,47)	(0,46)	(0,49)	(0,51)	(0,53)
Output Concentration	-4,370 **	-3,670 **	-3,265 **	-2,469	-1,919	-1,717
(Herfindahl index)	(1,69)	(1,66)	(1,63)	(1,78)	(1,81)	(1,87)
Financial Openness (FO)						
Foreign Liabilities (FO)	-5,885 **	-5,570 **	-5,413 **	-3,672 *	-3,550	-3,617
as % of GDP (in logs)	(2,56)	(2,50)	(2,45)	(2,34)	(2,38)	(2,52)
FO x Debt-Equity Ratio	1,331 **	1,256 **	1,224 **	-3,190	0,795	0,812
	(0,59)	(0,57)	(0,56)	(2,47)	(0,55)	(0,58)
Debt-Equity Ratio	-5,850 **	-5,302 **	-5,149 **	0,824 *	-2,959	-3,004
(Debt liabilities as % of total liabilities, in logs)	(2,59)	(2,52)	(2,47)	(0,54)	(2,52)	(2,67)
Domestic Conditions						
Income per capita	-0,069 **	0,021	0,047	0,148 **	0,191 **	0,212 **
(in logs)	(0,03)	(0,03)	(0,03)	(0,05)	(0,05)	(0,05)
Inflation	0,392 **	0,228 *	0,161	0,166	0,061	-0,012
(CPI inflation rate, in logs)	(0,12)	(0,12)	(0,12)	(0,13)	(0,13)	(0,13)
REER overvaluation index	0,025	0,029	0,025	0,097 *	0,099 *	0,101 *
(in logs)	(0,06)	(0,06)	(0,06)	(0,06)	(0,06)	(0,06)
Systemic Banking Crisis	0,075	0,047	-0,001	0,011	0,013	-0,006
(average frequency of systemic banking crises)	(0,11)	(0,11)	(0,11)	(0,12)	(0,11)	(0,11)
Fiscal Policy Volatility 1/	..	0,206 **	0,194 **	..	0,147 **	0,144 **
		(0,04)	(0,04)		(0,05)	(0,05)
Monetary Policy Volatility 1/	..	..	0,159 **	..	..	0,145 **
			(0,04)			(0,05)
External Conditions						
Terms of Trade Volatility	0,057 **	0,050 **	0,049 **	0,049 *	0,044 *	0,041 *
(std. dev. of terms of trade shocks, in logs)	(0,03)	(0,02)	(0,02)	(0,03)	(0,02)	(0,02)
International Real Interest Rate Volatility	0,184 *	0,165 *	0,162 *	0,100	0,094	0,083
(std. dev. of the prime loan rate, in logs)	(0,10)	(0,10)	(0,10)	(0,12)	(0,11)	(0,11)
Observations	431	430	429	304	303	302
R**2	0,170	0,216	0,237	0,147	0,168	0,181

*The numbers in parenthesis below the coefficient estimates are the robust standard errors. * (**) implies statistical significance at the 10 (5) percent level.*
1/ See footnote in Table 4.

Table 8

Openness, Vulnerabilities and Growth Volatility: Export diversification and debt-equity ratios

Dependent Variable: Standard deviation of the growth rate of real GDP per capita (in logs)

Methodology: Instrumental variables (accounting for country- and time-specifiic effects)

Sample of 82 countries, 1975-2005 (5-year period observations)

Explanatory Variables	All Countries			Developing Countries		
	[1]	[2]	[3]	[4]	[5]	[6]
Trade Openness (TO)						
Trade: Real exports and imports (TO)	-0,078 **	-0,063 **	-0,055 **	-0,096 **	-0,080 **	-0,077 **
as % of GDP (in logs)	(0,02)	(0,02)	(0,02)	(0,03)	(0,03)	(0,03)
TO x Export Concentration	0,743 **	0,672 **	0,650 **	0,694 **	0,622 **	0,630 **
	(0,26)	(0,26)	(0,25)	(0,27)	(0,27)	(0,27)
Export Concentration	-2,888 **	-2,817 **	-2,759 **	-2,942 **	-2,816 **	-2,878 **
(Herfindahl index)	(1,09)	(1,07)	(1,05)	(1,14)	(1,12)	(1,11)
Financial Openness (FO)						
Foreign Liabilities (FO)	-7,669 **	-7,682 **	-7,660 **	-5,709 **	-5,721 **	-5,519 **
as % of GDP (in logs)	(2,82)	(2,76)	(2,72)	(2,61)	(2,57)	(2,57)
FO x Debt-Equity Ratio	1,755 **	1,756 **	1,753 **	1,300 **	1,302 **	1,258 **
	(0,65)	(0,64)	(0,63)	(0,60)	(0,59)	(0,59)
Debt-Equity Ratio	-7,834 **	-7,618 **	-7,571 **	-5,483 **	-5,395 **	-5,172 *
(Debt liabilities as % of total liabilities, in logs)	(2,88)	(2,82)	(2,77)	(2,77)	(2,72)	(2,72)
Domestic Conditions						
Income per capita	-0,064 **	0,016	0,041	0,099 **	0,144 **	0,155 **
(in logs)	(0,03)	(0,04)	(0,04)	(0,05)	(0,05)	(0,05)
Inflation	0,374 **	0,217 *	0,154	0,188	0,085	0,043
(CPI inflation rate, in logs)	(0,13)	(0,13)	(0,13)	(0,13)	(0,13)	(0,13)
REER overvaluation index	0,029	0,041	0,036	0,104 *	0,105 *	0,097
(in logs)	(0,07)	(0,07)	(0,06)	(0,07)	(0,07)	(0,07)
Systemic Banking Crisis	0,098	0,073	0,028	0,040	0,030	0,004
(average frequency of systemic banking crises)	(0,12)	(0,11)	(0,11)	(0,12)	(0,12)	(0,12)
Fiscal Policy Volatility 1/	..	0,193 **	0,183 **	..	0,154 **	0,147 **
		(0,05)	(0,05)		(0,05)	(0,05)
Monetary Policy Volatility 1/	..	..	0,149 **	..	..	0,118 **
			(0,05)			(0,05)
External Conditions						
Terms of Trade Volatility	0,050 *	0,047 *	0,047 *	0,049 *	0,049 *	0,049 *
(std. dev. of terms of trade shocks, in logs)	(0,03)	(0,03)	(0,03)	(0,03)	(0,03)	(0,03)
International Real Interest Rate Volatility	0,217 **	0,200 *	0,192 *	0,154	0,156	0,148
(std. dev. of the prime loan rate, in logs)	(0,11)	(0,10)	(0,10)	(0,12)	(0,12)	(0,12)
Observations	439	438	437	312	311	310
R**2	0,133	0,169	0,186	0,107	0,132	0,148

*The numbers in parenthesis below the coefficient estimates are the robust standard errors. * (**) implies statistical significance at the 10 (5) percent level.*

1/ See footnote in Table 4.

Table 9

Openness, Composition of Openness and Growth Volatility

Dependent Variable: Standard deviation of the growth rate of real GDP per capita (in logs)
Methodology: Instrumental variables (accounting for country- and time-specifiic effects)
Sample of 82 countries, 1975-2005 (5-year period observations)

Explanatory Variables	All Countries				Developing Countries			
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Trade Openness (TO)								
Trade in Manufacturing Goods	-0,122 **	-0,081 **	-0,128 **	-0,085 **	-0,111 **	-0,083 **	-0,107 **	-0,079 **
as % of GDP (in logs)	(0,03)	(0,03)	(0,06)	(0,03)	(0,04)	(0,04)	(0,04)	(0,04)
Trade in Non-Manufacturing Goods	-0,037	-0,027	-0,033	-0,043	-0,052	-0,035	-0,067	-0,048
as % of GDP (in logs)	(0,05)	(0,05)	(0,05)	(0,05)	(0,05)	(0,05)	(0,05)	(0,05)
Financial Openness (FO)								
Equity-related Foreign Liabilities	-0,204 *	-0,178 *	..	..	-0,232 *	-0,209 *	..	..
as % of GDP (in logs)	(0,12)	(0,11)			(0,12)	(0,12)		
Loan-related Foreign Liabilities	0,367 **	0,266 *	..	..	0,260	0,217	..	..
as % of GDP (in logs)	(0,17)	(0,16)			(0,18)	(0,17)		
Equity-related Foreign Assets & Liabilities	..	..	-0,253 **	-0,198 *	..	..	-0,255 **	-0,243 **
as % of GDP (in logs)			(0,12)	(0,11)			(0,13)	(0,12)
Loan-related Foreign Assets & Liabilities	..	..	0,414 **	0,279 *	..	..	0,323 *	0,281
as % of GDP (in logs)			(0,18)	(0,17)			(0,19)	(0,19)
Domestic Conditions								
Income per capita	-0,051	0,061	-0,049	0,063	0,156 **	0,204 **	0,140 **	0,197 **
(in logs)	(0,04)	(0,04)	(0,04)	(0,05)	(0,06)	(0,06)	(0,06)	(0,06)
Inflation	0,149	-0,024	0,138	-0,021	0,060	-0,072	0,068	-0,072
(CPI inflation rate, in logs)	(0,13)	(0,12)	(0,13)	(0,12)	(0,13)	(0,13)	(0,13)	(0,13)
REER overvaluation index	0,126 *	0,107 *	0,118 *	0,102 *	0,150 **	0,133 **	0,140 **	0,126 *
(in logs)	(0,07)	(0,06)	(0,07)	(0,06)	(0,07)	(0,07)	(0,07)	(0,07)
Systemic Banking Crisis	0,121	0,052	0,129	0,059	0,078	0,032	0,083	0,037
(average frequency of systemic banking crises)	(0,11)	(0,10)	(0,11)	(0,10)	(0,12)	(0,12)	(0,12)	(0,11)
Fiscal Policy Volatility 1/	..	0,202 **	..	0,198 **	..	0,154 **	..	0,153 **
		(0,04)		(0,04)		(0,05)		(0,05)
Monetary Policy Volatility 1/	..	0,187 **	..	0,186 **	..	0,186 **	..	0,185 **
		(0,05)		(0,05)		(0,05)		(0,05)
External Conditions								
Terms of Trade Volatility	0,041 *	0,029	0,040 *	0,029	0,034	0,027	0,034	0,027
(std. dev. of terms of trade shocks, in logs)	(0,02)	(0,02)	(0,02)	(0,02)	(0,03)	(0,02)	(0,03)	(0,02)
International Real Interest Rate Volatility	0,111	0,119	0,084	0,104	0,001	0,015	0,002	0,006
(std. dev. of the prime loan rate, in logs)	(0,11)	(0,10)	(0,11)	(0,10)	(0,12)	(0,12)	(0,12)	(0,12)
Observations	439	437	439	437	312	310	312	310
R**2	0,171	0,227	0,183	0,238	0,137	0,188	0,138	0,184

*The numbers in parenthesis below the coefficient estimates are the robust standard errors. * (**) implies statistical significance at the 10 (5) percent level.*

1/ See footnote in Table 4.

Table 10

Openness, Financial Development and Growth Volatility

Dependent Variable: Standard deviation of the growth rate of real GDP per capita (in logs)
Methodology: Instrumental variables (accounting for country- and time-specifiic effects)
Sample of 82 countries, 1975-2005 (5-year period observations)

Explanatory Variables	All Countries				Developing Countries			
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Trade Openness (TO)								
Trade: Real exports and imports (TO)	-0,108 **	-0,086 **	-0,079 **	-0,058 *	-0,078 *	-0,059	-0,063 *	-0,048
as % of GDP (in logs)	(0,04)	(0,03)	(0,03)	(0,03)	(0,04)	(0,04)	(0,04)	(0,04)
Trade Openness x Financial Depth	..	..	-0,004 **	-0,004 **	..	..	-0,002	-0,002
			(0,00)	(0,00)			(0,00)	(0,00)
Financial Openness (FO)								
Foreign Liabilities (FO)	1,002 **	0,752 **	1,100 **	0,898 **	0,814 **	0,582 **	0,906 **	0,721 **
as % of GDP (in logs)	(0,31)	(0,28)	(0,34)	(0,31)	(0,29)	(0,28)	(0,31)	(0,31)
Foreign Liabilities x Financial Depth	-0,176 **	-0,140 **	-0,160 **	-0,132 **	-0,126 **	-0,089 *	-0,133 **	-0,109 **
	(0,06)	(0,06)	(0,06)	(0,05)	(0,05)	(0,05)	(0,05)	(0,05)
Domestic Conditions								
Income per capita	-0,127 *	-0,017	-0,105 *	0,005	0,109	0,166 **	0,124 *	0,172 **
(in logs)	(0,07)	(0,07)	(0,06)	(0,06)	(0,08)	(0,08)	(0,07)	(0,07)
Inflation	0,257 *	0,083	0,208	0,026	0,180	0,049	0,152	0,015
(CPI inflation rate, in logs)	(0,13)	(0,13)	(0,14)	(0,13)	(0,12)	(0,12)	(0,13)	(0,13)
REER overvaluation index	-0,073	-0,036	-0,029	0,023	0,041	0,064	0,068	0,088
(in logs)	(0,09)	(0,09)	(0,09)	(0,09)	(0,09)	(0,08)	(0,09)	(0,09)
Systemic Banking Crisis	0,281 **	0,195 *	0,346 **	0,259 **	0,191 *	0,140	0,234 *	0,188
(average frequency of systemic banking crises)	(0,13)	(0,12)	(0,14)	(0,13)	(0,12)	(0,12)	(0,13)	(0,13)
Fiscal Policy Volatility 1/	..	0,228 **	..	0,235 **	..	0,171 **	..	0,185 **
		(0,05)		(0,06)		(0,06)		(0,06)
Monetary Policy Volatility 1/	..	0,132 **	..	0,138 **	..	0,128 **	..	0,136 **
		(0,06)		(0,06)		(0,06)		(0,07)
Financial Depth	0,72 **	0,619 **	1,275 **	1,194 **	0,513 *	0,351	0,831 *	0,796 *
(Domestic credit to private sector as % GDP, logs)	(0,33)	(0,30)	(0,53)	(0,49)	(0,31)	(0,29)	(0,51)	(0,49)
External Conditions								
Terms of Trade Volatility	0,042	0,027	0,033	0,017	0,033	0,020	0,027	0,014
(std. dev. of terms of trade shocks, in logs)	(0,03)	(0,03)	(0,03)	(0,03)	(0,03)	(0,03)	(0,03)	(0,03)
International Real Interest Rate Volatility	0,141	0,146 *	0,075	0,079	0,082	0,100	0,044	0,040
(std. dev. of the prime loan rate, in logs)	(0,10)	(0,10)	(0,12)	(0,11)	(0,12)	(0,11)	(0,13)	(0,12)
Observations	375	374	375	374	268	267	268	267
R**2	0,085	0,168	0,075	0,145	0,131	0,186	0,106	0,149

*The numbers in parenthesis below the coefficient estimates are the robust standard errors. * (**) implies statistical significance at the 10 (5) percent level.*

1/ Fiscal and monetary policy volatility are calculated using the methodology of Fatas and Mihov (2003, 2006). For fiscal policy volatility we regress government spending (as a ratio to GDP) on output, lagged government spending and we instrument output growth with lagged output growth and current and lagged values of oil prices. The same methodology is applied to monetary policy using the ratio of money supply to GDP.

Table 11
Openness and Output Drops

Dependent Variable: Output Drops (dummy = 1 if real output is at least x% below its local maximum)
Methodology: Panel data Probit, instrumenting for trade and financial openness
Sample of 82 countries, 1975-2005 (annual data)

	Output Drop > 5%				Output Drop > 10%			
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Trade Openness (TO)								
Trade: Real exports and imports (TO)	-0,222 **	-0,225 **	-0,173 **	-0,180 **	-0,409 **	-0,399 **	-0,339 **	-0,336 **
as % of GDP (in logs)	(0,07)	(0,07)	(0,07)	(0,07)	(0,08)	(0,08)	(0,08)	(0,08)
Financial Openness (FO)								
Foreign Liabilities (FO)	0,466 **	..	0,464 **	..	0,559 **	..	0,351 **	..
as % of GDP (in logs)	(0,14)		(0,14)		(0,16)		(0,16)	
Foreign Assets & Liabilities (FO)	..	0,379 **	..	0,396 **	..	0,440 **	..	0,263 *
as % of GDP (in logs)		(0,14)		(0,15)		(0,16)		(0,16)
Domestic Conditions								
Economic Growth	-8,172 **	-8,231 **	-7,694 **	-7,757 **	-11,416 **	-11,463 **	-11,000 **	-11,059 **
(growth rate of real GDP per capita)	(1,10)	(1,10)	(1,07)	(1,07)	(1,32)	(1,32)	(1,27)	(1,27)
Reserves to Imports	-0,254 **	-0,283 **	..	..	-0,281 **	-0,312 **	..	..
(ratio, in logs)	(0,08)	(0,08)			(0,09)	(0,09)		
Reserves to M2	..	..	-0,119 **	-0,130 **	..	..	-0,225 **	-0,235 **
(ratio, in logs)			(0,05)	(0,05)			(0,06)	(0,06)
Inflation	0,527 **	0,522 **	0,585 **	0,582 **	0,385 **	0,382 **	0,444 **	0,444 **
(CPI inflation rate, in logs)	(0,18)	(0,18)	(0,17)	(0,17)	(0,19)	(0,19)	(0,17)	(0,17)
REER overvaluation index	1,114 **	1,087 **	1,008 **	0,978 **	0,963 **	0,930 **	0,386 **	0,363 **
(in logs)	(0,18)	(0,18)	(0,17)	(0,17)	(0,19)	(0,18)	(0,13)	(0,13)
External Conditions								
Terms-of-Trade Shocks	-0,006 *	-0,006 *	-0,006 *	-0,006 *	-0,001	-0,001	-0,003	-0,003
(log changes in the terms of trade index)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)
Terms-of-Trade Shocks, Lagged	-0,005	-0,005	-0,004	-0,005	-0,002	-0,002	-0,003	-0,003
	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)
International Real Interest Rate	-0,672	-0,548	-2,583	-2,279	-0,962	-0,760	0,578	0,687
(Prime rate, in real terms, logs)	(4,29)	(4,29)	(4,20)	(4,20)	(5,18)	(5,16)	(4,89)	(4,89)
International Real Interest Rate, Lagged	4,812	5,434	6,088 *	6,561 *	6,066	6,871	7,205 *	7,901 *
	(3,98)	(3,97)	(3,98)	(3,98)	(4,79)	(4,77)	(4,67)	(4,68)
Countries	79	79	68	68	79	79	68	68
Observations	1877	1877	1643	1643	1877	1877	1643	1643
Pseudo-R**2	0,374	0,372	0,374	0,372	0,444	0,441	0,406	0,405

*The numbers in parenthesis below the coefficient estimates are the robust standard errors. * (**) implies statistical significance at the 10 (5) percent level.*

Table 12

Openness, Vulnerabilities and Output Drops

Dependent Variable: Output Drops (dummy = 1 if real output is at least x% below its local maximum)
Methodology: Panel data Probit, instrumenting for trade and financial openness
Sample of 82 countries, 1975-2005 (annual data)

	Output Drop > 5%				Output Drop > 10%			
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Trade Openness (TO)								
Trade: Real exports and imports (TO)	-0,085	-0,190	-0,038	-0,140	-0,551 **	-0,681 **	-0,387 **	-0,410 *
as % of GDP (in logs)	(0,14)	(0,21)	(0,13)	(0,20)	(0,16)	(0,25)	(0,15)	(0,24)
TO x Output Concentration	-0,489		-0,577		1,008	..	0,530	..
	(0,68)		(0,65)		(0,81)		(0,76)	
TO x Export Concentration	..	0,131	..	0,038	..	1,583	..	0,606
		(1,04)		(0,99)		(1,27)		(1,16)
Output Concentration	1,940	..	0,566		0,863	..	0,439	..
(Herfindahl index)	(2,38)		(2,26)		(2,77)		(2,57)	
Export Concentration	..	-0,219	..	-1,013	..	-0,593	..	-0,153
(Herfindahl index)		(2,70)		(2,52)		(3,19)		(2,84)
Financial Openness (FO)								
Foreign Liabilities (FO)	-4,752 **	-4,529 **	-5,581 **	-5,383 **	-3,334 *	-3,142 *	-4,325 **	-4,190 **
as % of GDP (in logs)	(1,71)	(1,74)	(1,47)	(1,50)	(1,93)	(1,97)	(1,59)	(1,61)
FO x Debt-Equity Ratio	1,137 **	1,092 **	1,332 **	1,293 **	0,860 *	0,820 *	1,053 **	1,025 **
	(0,39)	(0,40)	(0,34)	(0,35)	(0,45)	(0,46)	(0,37)	(0,37)
Debt-Equity Ratio	-4,285 **	-4,131 **	-5,184 **	-5,074 **	-3,112 *	-2,956	-4,124 **	-4,027 **
(Debt liabilities as % of total liabilities, in logs)	(1,75)	(1,76)	(1,48)	(1,49)	(2,01)	(2,05)	(1,63)	(1,64)
Domestic Conditions								
Economic Growth	-7,733 **	-7,637 **	-7,396 **	-7,318 **	-10,776 **	-10,686 **	-10,616 **	-10,536 **
(growth rate of real GDP per capita)	(1,07)	(1,07)	(1,05)	(1,05)	(1,27)	(1,28)	(1,22)	(1,23)
Reserves to Imports	-0,250 **	-0,254 **	..	..	-0,265 **	-0,284 **	..	..
(ratio, in logs)	(0,08)	(0,08)			(0,09)	(0,09)		
Reserves to M2	..	..	-0,134 **	-0,134 **	..	..	-0,229 **	-0,243 **
(ratio, in logs)			(0,05)	(0,05)			(0,06)	(0,06)
Inflation	0,398 **	0,421 **	0,506 **	0,517 **	0,252	0,237	0,356 **	0,347 **
(CPI inflation rate, in logs)	(0,18)	(0,18)	(0,17)	(0,17)	(0,19)	(0,19)	(0,17)	(0,17)
REER overvaluation index	1,058 **	1,097 **	0,984 **	1,004 **	1,051 **	1,098 **	0,461 **	0,454 **
(in logs)	(0,18)	(0,18)	(0,17)	(0,17)	(0,19)	(0,20)	(0,13)	(0,14)
External Conditions								
Terms of Trade Shocks	-0,006 *	-0,006 *	-0,007 *	-0,006 *	-0,001	-0,001	-0,004	-0,003
(log changes in the terms of trade index)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)
Terms of Trade Shocks, Lagged	-0,005	-0,005	-0,005 *	-0,005	-0,003	-0,002	-0,004	-0,004
	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)
International Real Interest Rate	1,857	1,009	0,554	-0,198	1,587	0,359	2,009	1,283
(prime loan rate, in real terms, logs)	(4,16)	(4,18)	(4,11)	(4,13)	(5,06)	(5,10)	(4,78)	(4,81)
International Real Interest Rate, Lagged	6,372 *	5,579	7,013 *	6,337 *	5,798	6,232	6,949	7,085
	(4,04)	(4,04)	(4,04)	(4,05)	(4,91)	(4,93)	(4,74)	(4,77)
Countries	77	77	66	66	77	77	66	66
Observations	2041	1971	1780	1718	2041	1991	1780	1718
Pseudo-R**2	0,372	0,377	0,372	0,378	0,447	0,454	0,406	0,411

*The numbers in parenthesis below the coefficient estimates are the robust standard errors. * (**) implies statistical significance at the 10 (5) percent level.*

Table 13
Openness, Composition of Openness and Output Drops
Dependent Variable: Output Drops (dummy = 1 if real output is at least x% below its local maximum)
Methodology: Panel data Probit, instrumenting for trade and financial openness
Sample of 82 countries, 1975-2005 (annual data)

	Output Drop > 5%				Output Drop > 10%			
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Trade Openness (TO)								
Trade in Manufacturing Goods	-0,137 **	-0,129 *	-0,110 *	-0,104 *	-0,270 **	-0,232 **	-0,323 **	-0,296 **
as % of GDP (in logs)	(0,07)	(0,07)	(0,07)	(0,07)	(0,09)	(0,09)	(0,09)	(0,08)
Trade in Non-Manufacturing Goods	-0,076	-0,075	-0,073	-0,067	-0,094	-0,114	0,008	0,005
as % of GDP (in logs)	(0,09)	(0,09)	(0,09)	(0,09)	(0,11)	(0,11)	(0,11)	(0,11)
Financial Openness (FO)								
Equity-related Foreign Liabilities	0,024	..	0,028	..	-0,036	..	-0,011	..
as % of GDP (in logs)	(0,08)		(0,07)		(0,09)		(0,09)	
Loan-related Foreign Liabilities	0,316 **	..	0,284 **	..	0,591 **	..	0,471 **	..
as % of GDP (in logs)	(0,13)		(0,12)		(0,15)		(0,14)	
Equity-related Foreign Assets & Liabilities	..	0,020	..	-0,004	..	-0,068	..	-0,048
as % of GDP (in logs)		(0,08)		(0,08)		(0,10)		(0,09)
Loan-related Foreign Assets & Liabilities	..	0,223 *	..	0,248 *	..	0,516 **	..	0,416 **
as % of GDP (in logs)		(0,15)		(0,14)		(0,17)		(0,16)
Domestic Conditions								
Economic Growth	-7,795 **	-7,971 **	-7,269 **	-7,420 **	-10,973 **	-11,185 **	-10,515 **	-10,678 **
(growth rate of real GDP per capita)	(1,11)	(1,11)	(1,08)	(1,08)	(1,33)	(1,33)	(1,30)	(1,29)
Reserves to Imports	-0,264 **	-0,301 **	..	..	-0,276 **	-0,344 **	..	..
(ratio, in logs)	(0,08)	(0,08)			(0,09)	(0,09)		
Reserves to M2	..	..	-0,117 **	-0,131 **	..	..	-0,242 **	-0,267 **
(ratio, in logs)			(0,05)	(0,05)			(0,06)	(0,06)
Inflation	0,465 **	0,479 **	0,497 **	0,501 **	0,293 *	0,318 *	0,352 **	0,371 **
(CPI inflation rate, in logs)	(0,18)	(0,18)	(0,17)	(0,17)	(0,19)	(0,19)	(0,18)	(0,18)
REER overvaluation index	1,050 **	0,988 **	0,913 **	0,863 **	0,935 **	0,881 **	0,317 **	0,287 **
(in logs)	(0,19)	(0,19)	(0,19)	(0,19)	(0,20)	(0,20)	(0,14)	(0,14)
External Conditions								
Terms of Trade Shocks	-0,007 *	-0,007 *	-0,006 *	-0,006 *	-0,002	-0,002	-0,003	-0,003
(log changes in the terms of trade index)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)
Terms of Trade Shocks, Lagged	-0,005	-0,005	-0,005	-0,005	-0,002	-0,003	-0,003	-0,004
	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)
International Real Interest Rate	0,309	0,265	-1,868	-1,706	-0,351	-0,287	0,660	0,655
(prime loan rate, in real terms, logs)	(4,33)	(4,32)	(4,26)	(4,25)	(5,23)	(5,20)	(5,03)	(5,00)
International Real Interest Rate, Lagged	5,480	6,405 *	7,410 *	8,036 **	5,962	7,193 *	7,465 *	8,424 *
	(3,99)	(3,97)	(4,01)	(4,00)	(4,80)	(4,78)	(4,73)	(4,72)
Countries	79	79	68	68	79	79	68	68
Observations	1836	1836	1582	1582	1836	1836	1582	1582
Pseudo-R**2	0,384	0,381	0,390	0,388	0,454	0,448	0,431	0,427

*The numbers in parenthesis below the coefficient estimates are the robust standard errors. * (**) implies statistical significance at the 10 (5) percent level.*

Table 14
Openness, Financial Development and Output Drops

Dependent Variable: Output Drops (dummy = 1 if real output is at least x% below its local maximum)
Methodology: Panel data Probit, instrumenting for trade and financial openness
Sample of 82 countries, 1975-2005 (annual data)

	Output Drop > 5%				Output Drop > 10%			
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Trade Openness (TO)								
Trade: Real exports and imports (TO)	-0,221 **	-0,221 **	-0,175 **	-0,178 **	-0,406 **	-0,403 **	-0,341 **	-0,340 **
as % of GDP (in logs)	(0,07)	(0,07)	(0,07)	(0,07)	(0,08)	(0,08)	(0,08)	(0,08)
Financial Openness (FO)								
Foreign Liabilities (FO)	0,747 **	..	0,550 **	..	0,461 *	..	0,244	..
as % of GDP (in logs)	(0,26)		(0,22)		(0,30)		(0,27)	
Foreign Liabilities x Financial Depth	-0,127 *	..	-0,054	..	0,009	..	0,035	..
as % of GDP (in logs)	(0,07)		(0,06)		(0,09)		(0,08)	
Foreign Assets & Liabilities	..	0,823 **	..	0,601 **	..	0,564 *	..	0,299
as % of GDP (in logs)		(0,27)		(0,25)		(0,31)		(0,28)
Foreign Assets & Liabilities x Financial Depth	..	-0,173 **	..	-0,095	..	-0,049	..	-0,003
		(0,08)		(0,07)		(0,09)		(0,08)
Domestic Conditions								
Economic Growth	-8,039 **	-8,102 **	-7,573 **	-7,687 **	-11,253 **	-11,342 **	-10,857 **	-10,955 **
(growth rate of real GDP per capita)	(1,11)	(1,11)	(1,08)	(1,08)	(1,33)	(1,33)	(1,28)	(1,28)
Reserves to Imports	-0,250 **	-0,267 **	..	..	-0,280 **	-0,307 **	..	..
(ratio, in logs)	(0,08)	(0,08)			(0,09)	(0,09)		
Reserves to M2	..	..	-0,112 **	-0,119 **	..	..	-0,226 **	-0,237 **
(ratio, in logs)			(0,05)	(0,05)			(0,06)	(0,06)
Inflation	0,531 **	0,530 **	0,575 **	0,572 **	0,373 **	0,381 **	0,428 **	0,432 **
(CPI inflation rate, in logs)	(0,18)	(0,18)	(0,17)	(0,17)	(0,19)	(0,19)	(0,17)	(0,17)
REER overvaluation index	1,074 **	1,046 **	1,028 **	0,987 **	0,978 **	0,945 **	0,424 **	0,400 **
(in logs)	(0,17)	(0,17)	(0,17)	(0,17)	(0,19)	(0,18)	(0,13)	(0,13)
Financial Depth	0,653 *	0,917 **	0,245	0,450	0,024	0,296	-0,167	-0,003
(Domestic credit to private sector as % GDP, logs)	(0,35)	(0,38)	(0,28)	(0,36)	(0,41)	(0,45)	(0,39)	(0,42)
External Conditions								
Terms of Trade Shocks	-0,006	-0,006 *	-0,006 *	-0,006 *	-0,001	-0,001	-0,003	-0,003
(log changes in the terms of trade index)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)
Terms of Trade Shocks, Lagged	-0,004	-0,004	-0,004	-0,004	-0,002	-0,002	-0,003	-0,003
	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)
International Real Interest Rate	-0,466	-0,597	-2,199	-2,194	-0,468	-0,640	0,970	0,881
(prime loan rate, in real terms, logs)	(4,31)	(4,32)	(4,23)	(4,23)	(5,20)	(5,19)	(4,92)	(4,91)
International Real Interest Rate, Lagged	5,325	5,938	6,255 *	6,940 *	6,098	6,920	6,897	7,550 *
	(3,97)	(3,96)	(3,98)	(3,97)	(4,75)	(4,74)	(4,65)	(4,64)
Countries	79	79	68	68	79	79	68	68
Observations	1859	1859	1628	1628	1859	1859	1628	1628
Pseudo-R**2	0,379	0,378	0,378	0,377	0,445	0,443	0,408	0,407

*The numbers in parenthesis below the coefficient estimates are the robust standard errors. * (**) implies statistical significance at the 10 (5) percent level.*

Table 15
Openness and "Crisis" Volatility

Dependent Variable: "Crisis" Volatility (dummy = 1 whenever volatility falls below one world standard deviation) 1/
Methodology: Panel data Probit, instrumenting for trade and financial openness
Sample of 82 countries, 1975-2005 (annual data)

	All Countries				Developing Countries			
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Trade Openness (TO)								
Trade: Real exports and imports (TO)	-0,045	-0,040	-0,044	-0,039	-0,026	-0,023	-0,052	-0,047
as % of GDP (in logs)	(0,04)	(0,04)	(0,04)	(0,04)	(0,04)	(0,04)	(0,04)	(0,04)
Financial Openness (FO)								
Foreign Liabilities	-0,235 **	..	-0,089	..	-0,218 **	..	-0,076	..
as % of GDP (in logs)	(0,10)		(0,07)		(0,10)		(0,07)	
Foreign Assets & Liabilities	..	-0,230 **	..	-0,167 *	..	-0,160 *	..	-0,116
as % of GDP (in logs)		(0,10)		(0,10)		(0,11)		(0,09)
Domestic Conditions								
Economic Growth	-4,834 **	-4,857 **	-5,036 **	-5,098 **	-4,549 **	-4,546 **	-4,912 **	-4,910 **
(growth rate of real GDP per capita)	(1,12)	(1,12)	(1,07)	(1,07)	(1,13)	(1,13)	(1,07)	(1,07)
Reserves to Imports	-0,155 **	-0,133 *	..	..	-0,116 *	-0,091	..	..
(ratio, in logs)	(0,07)	(0,07)			(0,07)	(0,07)		
Reserves to M2	..	..	-0,059 *	-0,052	..	..	-0,050	-0,045
(ratio, in logs)			(0,04)	(0,04)			(0,04)	(0,04)
Inflation	0,225 *	0,214 *	0,231 **	0,235 **	0,207 *	0,193 *	0,196 **	0,198 **
(CPI inflation rate, in logs)	(0,12)	(0,12)	(0,10)	(0,10)	(0,11)	(0,11)	(0,09)	(0,09)
REER overvaluation index	0,269 **	0,267 **	0,229 **	0,220 **	0,192 **	0,199 **	0,160 **	0,159 **
(in logs)	(0,09)	(0,09)	(0,08)	(0,08)	(0,08)	(0,08)	(0,07)	(0,07)
External Conditions								
Terms of Trade Shocks	-0,007 *	-0,007 *	-0,006 *	-0,006	-0,006 *	-0,006 *	-0,006	-0,006
(log changes in the terms of trade index)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)
Terms of Trade Shocks, Lagged	-0,007 *	-0,007 *	-0,005	-0,005	-0,006	-0,006	-0,004	-0,004
	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)
International Real Interest Rate	4,805	4,834	3,415	2,988	7,566	7,899	4,328	4,341
(prime loan rate, in real terms, logs)	(4,77)	(4,77)	(4,50)	(4,51)	(5,28)	(5,29)	(4,90)	(4,90)
International Real Interest Rate, Lagged	-1,536	-1,781	-2,532	-2,081	-3,617	-4,291	-3,824	-3,817
	(4,54)	(4,51)	(4,38)	(4,38)	(4,66)	(4,65)	(4,44)	(4,44)
Countries	79	79	68	68	57	57	58	58
Observations	2096	2096	1840	1840	1332	1332	1407	1407
Pseudo-R**2	0,309	0,309	0,259	0,261	0,342	0,340	0,275	0,276

The numbers in parenthesis below the coefficient estimates are the robust standard errors. * (**) implies statistical significance at the 10 (5) percent level.

1/ The definition of "crisis" volatility follows Hnatkovska and Loayza (2004)

Table 16
Openness, Vulnerabilities and "Crisis" Volatility

Dependent Variable: "Crisis" Volatility (dummy = 1 whenever volatility falls below one world standard deviation) 1/
Methodology: Panel data Probit, instrumenting for trade and financial openness
Sample of 82 countries, 1975-2005 (annual data)

	All Countries				Developing Countries			
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Trade Openness (TO)								
Trade: Real exports and imports (TO)	-0,105	-0,144 *	-0,088	-0,064	-0,147	-0,186 **	-0,154	-0,136 *
as % of GDP (in logs)	(0,14)	(0,09)	(0,13)	(0,08)	(0,14)	(0,09)	(0,12)	(0,08)
TO x Output Concentration	0,383	..	0,292	..	0,602		0,507	
	(0,71)		(0,62)		(0,65)		(0,57)	
TO x Export Concentration	..	0,301 *	..	0,084	..	0,358 *	..	0,176
		(0,20)		(0,17)		(0,19)		(0,16)
Output Concentration	-1,217	..	-0,897	..	-1,870		-1,621	
(Herfindahl index)	(2,11)		(1,78)		(1,94)		(1,66)	
Export Concentration	..	0,016	..	0,331	..	-0,500	..	-0,031
(Herfindahl index)		(0,47)		(0,40)		(0,47)		(0,39)
Financial Openness (FO)								
Foreign Liabilities (FO)	-4,125 **	-3,444 *	-3,520 **	-2,746 *	-4,139 **	-3,758 *	-3,637 **	-2,871 *
as % of GDP (in logs)	(1,96)	(1,91)	(1,56)	(1,55)	(2,08)	(2,04)	(1,62)	(1,61)
FO x Debt-Equity Ratio	0,891 **	0,740 *	0,771 **	0,593 *	0,892 *	0,808 *	0,792 **	0,617 *
	(0,45)	(0,44)	(0,36)	(0,36)	(0,48)	(0,47)	(0,37)	(0,37)
Debt-Equity Ratio	-3,763 **	-3,100 *	-3,142 **	-2,471 *	-3,823 *	-3,513 *	-3,331 **	-2,708 *
(Debt liabilities as % of total liabilities, in logs)	(1,88)	(1,84)	(1,49)	(1,48)	(2,01)	(1,98)	(1,56)	(1,55)
Domestic Conditions								
Economic Growth	-4,571 **	-4,619 **	-4,909 **	-4,600 **	-4,389 **	-4,387 **	-4,803 **	-4,393 **
(growth rate of real GDP per capita)	(1,14)	(1,12)	(1,08)	(1,08)	(1,12)	(1,10)	(1,07)	(1,07)
Reserves to Imports	-0,174 **	-0,142 *	..	..	-0,134 *	-0,107	..	..
(ratio, in logs)	(0,08)	(0,08)			(0,08)	(0,07)		
Reserves to M2	..	..	-0,051	-0,065 *	..	..	-0,061 *	-0,071 **
(ratio, in logs)			(0,04)	(0,04)			(0,04)	(0,04)
Inflation	0,193 *	0,195 *	0,201 **	0,226 **	0,157	0,143	0,179 *	0,184 *
(CPI inflation rate, in logs)	(0,13)	(0,12)	(0,10)	(0,11)	(0,12)	(0,12)	(0,10)	(0,11)
REER overvaluation index	0,286 **	0,231 **	0,234 **	0,214 **	0,221 **	0,179 **	0,186 **	0,167 **
(in logs)	(0,09)	(0,08)	(0,08)	(0,08)	(0,08)	(0,08)	(0,07)	(0,07)
External Conditions								
Terms of Trade Shocks	-0,006	-0,007 *	-0,005	-0,005	-0,006	-0,006 *	-0,005	-0,005
(log changes in the terms of trade index)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)
Terms of Trade Shocks, Lagged	-0,007 *	-0,007 *	-0,005	-0,006 *	-0,006	-0,007 *	-0,005	-0,006
	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)
International Real Interest Rate	4,365	4,998	2,625	4,580	6,482	7,281	3,574	5,838
(prime loan rate, in real terms, logs)	(4,94)	(4,82)	(4,66)	(4,61)	(5,12)	(4,99)	(4,74)	(4,70)
International Real Interest Rate, Lagged	-0,446	-1,702	-1,052	-3,100	-1,295	-2,499	-1,125	-3,290
	(4,67)	(4,56)	(4,49)	(4,46)	(4,79)	(4,69)	(4,54)	(4,51)
Countries	77	79	66	68	55	57	56	58
Observations	2041	2049	1780	1771	1430	1438	1511	1502
Pseudo-R**2	0,337	0,321	0,288	0,290	0,332	0,315	0,259	0,262

*The numbers in parenthesis below the coefficient estimates are the robust standard errors. * (**) implies statistical significance at the 10 (5) percent level.*

1/ The definition of "crisis" volatility follows Hnatkovska and Loayza (2004)

Table 17

Openness, Composition of Openness and "Crisis" Volatility

Dependent Variable: "Crisis" Volatility (dummy = 1 whenever volatility falls below one world standard deviation) 1/

Methodology: Panel data Probit, instrumenting for trade and financial openness

Sample of 82 countries, 1975-2005 (annual data)

	All Countries				Developing Countries			
	[1]	**[2]**	**[3]**	**[4]**	**[5]**	**[6]**	**[7]**	**[8]**
Trade Openness (TO)								
Trade in Manufacturing Goods	-0,112 **	-0,107 **	-0,069 *	-0,064 *	-0,053	-0,053	-0,042	-0,040
as % of GDP (in logs)	(0,04)	(0,04)	(0,04)	(0,04)	(0,04)	(0,04)	(0,04)	(0,04)
Trade in Non-Manufacturing Goods	0,119 **	0,114 *	0,049	0,043	0,029	0,031	-0,018	-0,018
as % of GDP (in logs)	(0,06)	(0,06)	(0,05)	(0,05)	(0,06)	(0,06)	(0,05)	(0,05)
Financial Openness (FO)								
Equity-related Foreign Liabilities	-0,041	..	-0,047	..	-0,029	..	-0,034	..
as % of GDP (in logs)	(0,06)		(0,05)		(0,06)		(0,05)	
Loan-related Foreign Liabilities	-0,191 *	..	-0,090	..	-0,210 **	..	-0,130	..
as % of GDP (in logs)	(0,10)		(0,09)		(0,10)		(0,09)	
Equity-related Foreign Assets & Liabilities	..	-0,065	..	-0,070	..	-0,033	..	-0,039
as % of GDP (in logs)		(0,06)		(0,05)		(0,06)		(0,05)
Loan-related Foreign Assets & Liabilities	..	-0,135	..	-0,048	..	-0,136	..	-0,088
as % of GDP (in logs)		(0,11)		(0,10)		(0,11)		(0,10)
Domestic Conditions								
Economic Growth	-4,653 **	-4,647 **	-4,692 **	-4,655 **	-4,499 **	-4,458 **	-4,527 **	-4,460 **
(growth rate of real GDP per capita)	(1,15)	(1,15)	(1,12)	(1,12)	(1,14)	(1,14)	(1,11)	(1,11)
Reserves to Imports	-0,131 *	-0,100	..	..	-0,109 *	-0,074	..	..
(ratio, in logs)	(0,07)	(0,07)			(0,07)	(0,07)		
Reserves to M2	..	..	-0,042	-0,037	..	..	-0,050	-0,046
(ratio, in logs)			(0,04)	(0,04)			(0,04)	(0,04)
Inflation	0,256 **	0,229 **	0,236 **	0,221 **	0,217 *	0,191 *	0,206 *	0,195 *
(CPI inflation rate, in logs)	(0,11)	(0,11)	(0,11)	(0,11)	(0,11)	(0,11)	(0,11)	(0,11)
REER overvaluation index	0,169 **	0,168 **	0,164 **	0,161 **	0,154 **	0,160 **	0,148 **	0,152 **
(in logs)	(0,08)	(0,08)	(0,08)	(0,08)	(0,08)	(0,08)	(0,07)	(0,07)
External Conditions								
Terms of Trade Shocks	-0,007 *	-0,007 *	-0,006	-0,006	-0,006 *	-0,006 *	-0,005	-0,005
(log changes in the terms of trade index)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)
Terms of Trade Shocks, Lagged	-0,006	-0,006	-0,005	-0,005	-0,006	-0,005	-0,005	-0,005
	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)
International Real Interest Rate	4,632	4,639	5,263	5,275	7,156	7,449	6,707	6,846
(prime loan rate, in real terms, logs)	(5,02)	(5,04)	(4,87)	(4,88)	(5,26)	(5,29)	(5,00)	(5,01)
International Real Interest Rate, Lagged	-1,672	-2,113	-4,374	-4,535	-3,256	-3,990	-4,881	-5,238
	(4,49)	(4,48)	(4,44)	(4,44)	(4,65)	(4,65)	(4,53)	(4,54)
Countries	79	79	68	68	57	57	58	58
Observations	1836	1836	1582	1582	1291	1291	1343	1343
Pseudo-R**2	0,357	0,357	0,337	0,337	0,350	0,347	0,310	0,308

*The numbers in parenthesis below the coefficient estimates are the robust standard errors. * (**) implies statistical significance at the 10 (5) percent level.*

1/ The definition of "crisis" volatility follows Hnatkovska and Loayza (2004)

Table 18

Openness, Financial Development and "Crisis" Volatility

Dependent Variable: "Crisis" Volatility (dummy = 1 whenever volatility falls below one world standard deviation) 1/

Methodology: Panel data Probit, instrumenting for trade and financial openness

Sample of 82 countries, 1975-2005 (annual data)

	All Countries				Developing Countries			
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Trade Openness (TO)								
Trade: Real exports and imports (TO)	-0,017	-0,021	-0,012	-0,009	-0,019	-0,024	-0,041	-0,038
as % of GDP (in logs)	(0,04)	(0,04)	(0,04)	(0,04)	(0,04)	(0,04)	(0,04)	(0,04)
Financial Openness (FO)								
Foreign Liabilities	-0,852 **	..	-0,400 **	..	-0,919 **	..	-0,389 **	..
as % of GDP (in logs)	(0,24)		(0,15)		(0,25)		(0,16)	
Foreign Liabilities x Financial Depth	0,216 **	..	0,135 **	..	0,248 **	..	0,128 **	..
	(0,07)		(0,06)		(0,08)		(0,06)	
Foreign Assets & Liabilities	..	-0,762 **	..	-0,591 **	..	-0,904 **	..	-0,652 **
as % of GDP (in logs)		(0,25)		(0,22)		(0,26)		(0,22)
Foreign Assets & Liabilities x Financial Depth	..	0,182 **	..	0,162 **	..	0,253 **	..	0,187 **
		(0,07)		(0,07)		(0,08)		(0,07)
Domestic Conditions								
Economic Growth	-4,843 **	-4,867 **	-4,984 **	-5,055 **	-4,431 **	-4,481 **	-4,755 **	-4,835 **
(growth rate of real GDP per capita)	(1,15)	(1,16)	(1,09)	(1,09)	(1,14)	(1,15)	(1,08)	(1,08)
Reserves to Imports	-0,121 *	-0,106	..	..	-0,093	-0,069	..	..
(ratio, in logs)	(0,07)	(0,07)			(0,07)	(0,07)		
Reserves to M2	..	..	-0,041	-0,031	..	..	-0,048	-0,039
(ratio, in logs)			(0,04)	(0,04)			(0,03)	(0,03)
Inflation	0,281 **	0,264 **	0,224 **	0,243 **	0,254 **	0,239 **	0,221 **	0,243 **
(CPI inflation rate, in logs)	(0,12)	(0,12)	(0,10)	(0,10)	(0,11)	(0,11)	(0,09)	(0,09)
REER overvaluation index	0,186 **	0,199 **	0,145 *	0,141 *	0,148 *	0,159 **	0,126 *	0,114 *
(in logs)	(0,08)	(0,08)	(0,07)	(0,07)	(0,08)	(0,08)	(0,07)	(0,07)
Financial Depth	-1,083 **	-0,977 **	-0,726 **	-0,882 **	-1,044 **	-1,138 **	-0,595 **	-0,898 **
(Domestic credit to private sector as % GDP, logs)	(0,34)	(0,36)	(0,27)	(0,32)	(0,37)	(0,39)	(0,28)	(0,33)
External Conditions								
Terms of Trade Shocks	-0,007	-0,007 *	-0,006	-0,006	-0,006	-0,006	-0,006	-0,006
(log changes in the terms of trade index)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)
Terms of Trade Shocks, Lagged	-0,005	-0,005	-0,003	-0,004	-0,004	-0,004	-0,003	-0,003
	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)
International Real Interest Rate	4,955	5,289	3,258	3,342	6,887	7,561	4,129	4,367
(prime loan rate, in real terms, logs)	(5,03)	(5,04)	(4,78)	(4,77)	(5,28)	(5,29)	(4,89)	(4,87)
International Real Interest Rate, Lagged	-2,076	-2,619	-3,512	-3,261	-3,258	-4,367	-3,721	-3,820
	(4,54)	(4,52)	(4,39)	(4,38)	(4,69)	(4,68)	(4,46)	(4,44)
Countries	79	79	68	68	57	57	58	58
Observations	1859	1859	1628	1628	1318	1318	1389	1389
Pseudo-R**2	0,361	0,358	0,317	0,318	0,358	0,356	0,285	0,288

*The numbers in parenthesis below the coefficient estimates are the robust standard errors. * (**) implies statistical significance at the 10 (5) percent level.*

1/ The definition of "crisis" volatility follows Hnatkovska and Loayza (2004)

Table A.1
Sample of Countries

Latin America and the Caribbean (21)

ARG	Argentina	ECU	Ecuador	PAN	Panama
BOL	Bolivia	GTM	Guatemala	PER	Peru
BRA	Brazil	HND	Honduras	PRY	Paraguay
CHL	Chile	HTI	Haiti	SLV	El Salvador
COL	Colombia	JAM	Jamaica	TTO	Trinidad and Tobago
CRI	Costa Rica	MEX	Mexico	URY	Uruguay
DOM	Dominican Republic	NIC	Nicaragua	VEN	Venezuela

East Asia and the Pacific (8)

CHN	China	MYS	Malaysia	SGP	Singapore
IDN	Indonesia	PHL	Philippines	THA	Thailand
KOR	Korea, Rep.	PNG	Papua New Guinea		

Industrial Economies (22)

AUS	Australia	ESP	Spain	JPN	Japan
AUT	Austria	FIN	Finland	NLD	Netherlands
BEL	Belgium-Luxembourg	FRA	France	NOR	Norway
CAN	Canada	GBR	United Kingdom	NZL	New Zealand
CHE	Switzerland	GRC	Greece	PRT	Portugal
DEU	Germany	IRL	Ireland	SWE	Sweden
DNK	Denmark	ISL	Iceland	USA	United States
		ITA	Italy		

Middle East and North Africa (9)

DZA	Algeria	ISR	Israel	SYR	Syrian Arab Republic
EGY	Egypt, Arab Rep.	JOR	Jordan	TUN	Tunisia
IRN	Iran, Islamic Rep.	MAR	Morocco	TUR	Turkey

South Asia (4)

BGD	Bangladesh	IND	India	PAK	Pakistan
		LKA	Sri Lanka		

Sub-Saharan Africa (18)

BFA	Burkina Faso	KEN	Kenya	SLE	Sierra Leone
BWA	Botswana	MDG	Madagascar	TGO	Togo
CIV	Côte d'Ivoire	MWI	Malawi	ZAF	South Africa
COG	Congo, Rep.	NER	Niger	ZAR	Congo, Dem. Rep.
GHA	Ghana	NGA	Nigeria	ZMB	Zambia
GMB	Gambia, The	SEN	Senegal	ZWE	Zimbabwe

Table A.2

Definitions and Sources of Variables Used in Regression Analysis

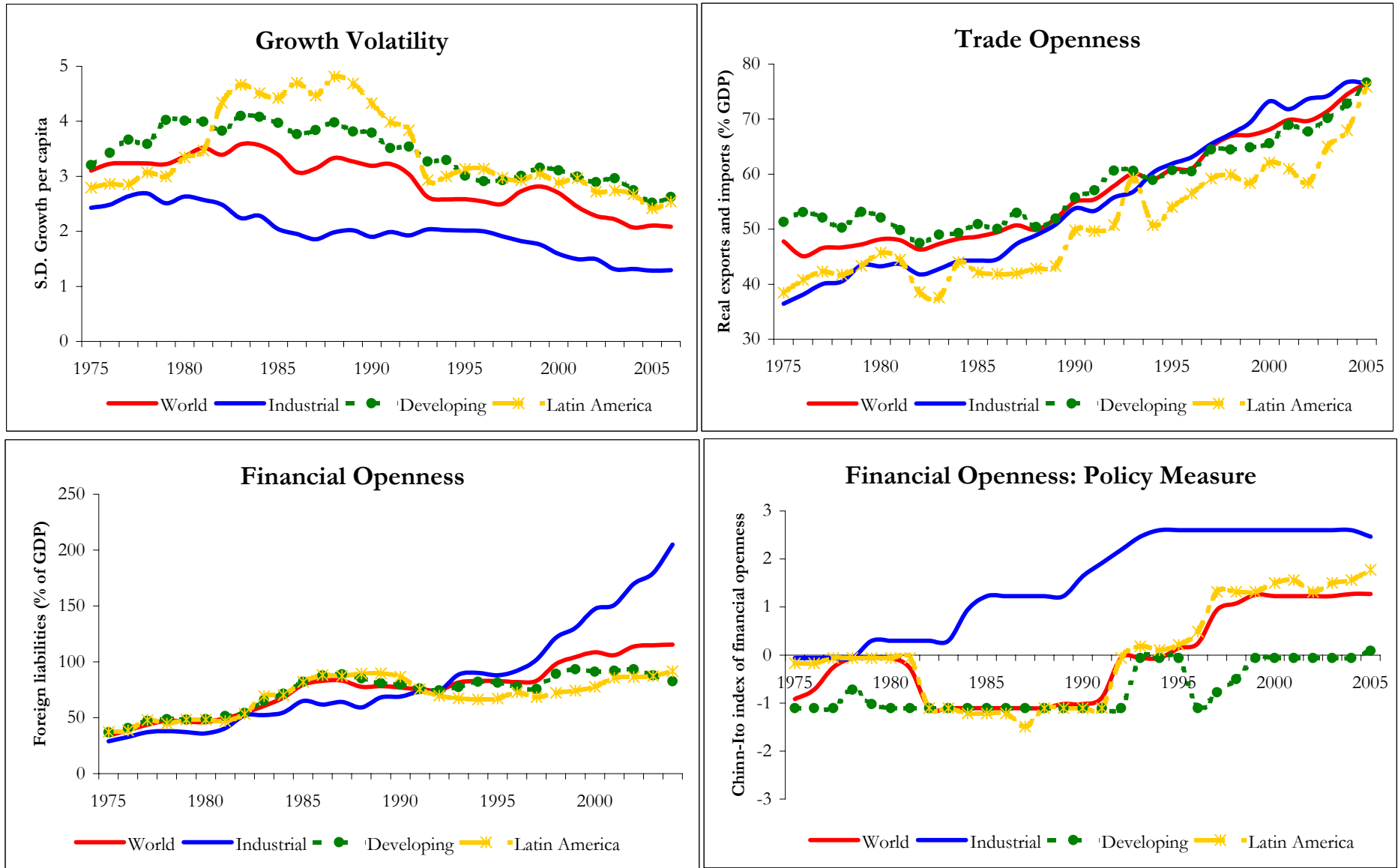| Variable	Definition and Construction	Source
GDP	Real Gross Domestic Product. GDP is in 2000 PPP-adjusted US$.	Authors' construction using Summers, Heston and Aten (2006) and The World Bank's World Development Indicators
Growth Rate in GDP	Log differences of Real GDP.	Authors' construction using Summers, Heston and Aten (2006) and The World Bank's World Development Indicators
Growth Volatility	Standard deviation of the log difference of real GDP per capita.	Authors' construction using Summers, Heston and Aten (2006) and The World Bank's World Development Indicators
Trade Openness	Real exports and imports expressed as a percentage of GDP (in logs).	The World Bank's World Development Indicators.
Composition of Trade	Trade (real exports and imports) in manufacturing goods and in non-manufacturing goods. Both expressed as % of GDP.	UN COMTRADE Database, The World Bank's World Development Indicators.
Financial Openness	Measures: (a) Foreign Liabilities as % of GDP, and (b) Foreign Assets and Liabilities as % of GDP. Both variables are in logs.	Lane and Milesi-Ferreti (2001, 2006).
Composition of Financial Openness	Measures of equity-related foreign assets and liabilities (FDI and portfolio-equity stocks) and loan-related assets and liabilities	Lane and Milesi-Ferreti (2001, 2006).
Fiscal Policy Volatility	Standard Deviation of the discretionary measure of fiscal policy: general government consumption. This measure was obtained using the methodology in Fatas and Mihov (2003, 2006)	Authors' construction using The World Bank's World Development Indicators.
Monetary Policy Volatility	Standard Deviation of the discretionary measure of monetary policy: money supply. This measure was obtained using the methodology in Fatas and Mihov (2003, 2006)	Authors' construction using International Monetary Fund's International Financial Statistics
Inflation	CPI Inflation rate (in logs)	Authors' construction using International Monetary Fund's International Financial Statistics
Systemic Banking Crises	Dummy taking the value of 1 whenever there is an episode of systemic banking crisis.	Caprio and Klingebiel (2003)
Real Exchange Rate Overvaluation	Index of real exchange rate overvaluation as defined by Dollar (1992)	Authors' construction using the methodology in Dollar (1992)
Terms of Trade Changes	Log differences of the terms of trade index	Authors' construction using The World Bank's World Development Indicators.
Volatility of Terms of Trade Changes	Standard deviation of the log difference of the terms of trade.	Authors' construction using The World Bank's World Development Indicators.
Real world interest rate	Prime loan rate in real terms (deflated by the US GDP deflator), in logs.	IMF International Financial Statistics
Volatility of the real world interest rate	Standard deviation of the real world interest rate.	IMF International Financial Statistics

Figure 1
Openness and Growth Volatility

Growth Volatility

S.D. Growth per capita

World — Industrial — Developing — Latin America

Trade Openness

Real exports and imports (% GDP)

World — Industrial — Developing — Latin America

Financial Openness

Foreign liabilities (% of GDP)

World — Industrial — Developing — Latin America

Financial Openness: Policy Measure

Chinn-Ito index of financial openness

World — Industrial — Developing — Latin America

Figure 2
Output volatility effect of trade openness conditional on output concentration
(Impact on the standard deviation of growth per capita of doubling trade openness)
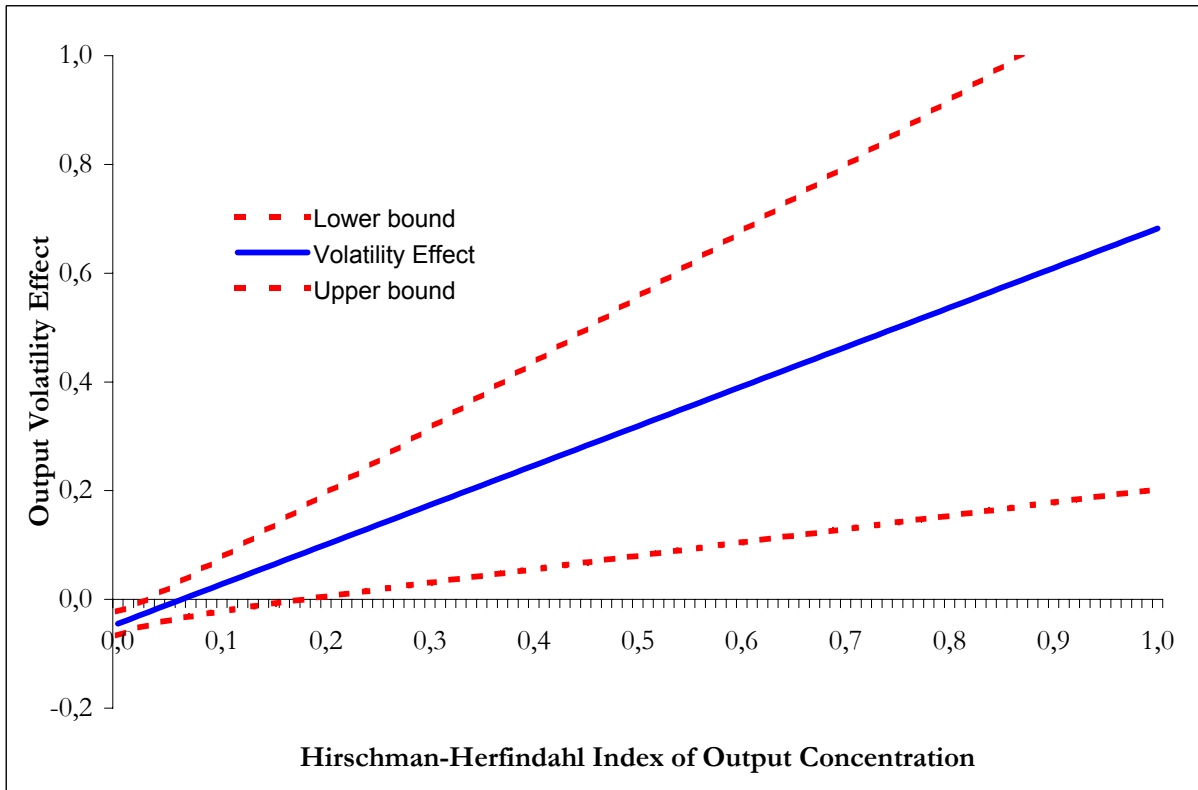
Output volatility effect of financial openness conditional on debt-equity ratio
(Impact on the standard deviation of growth per capita of doubling financial openness)
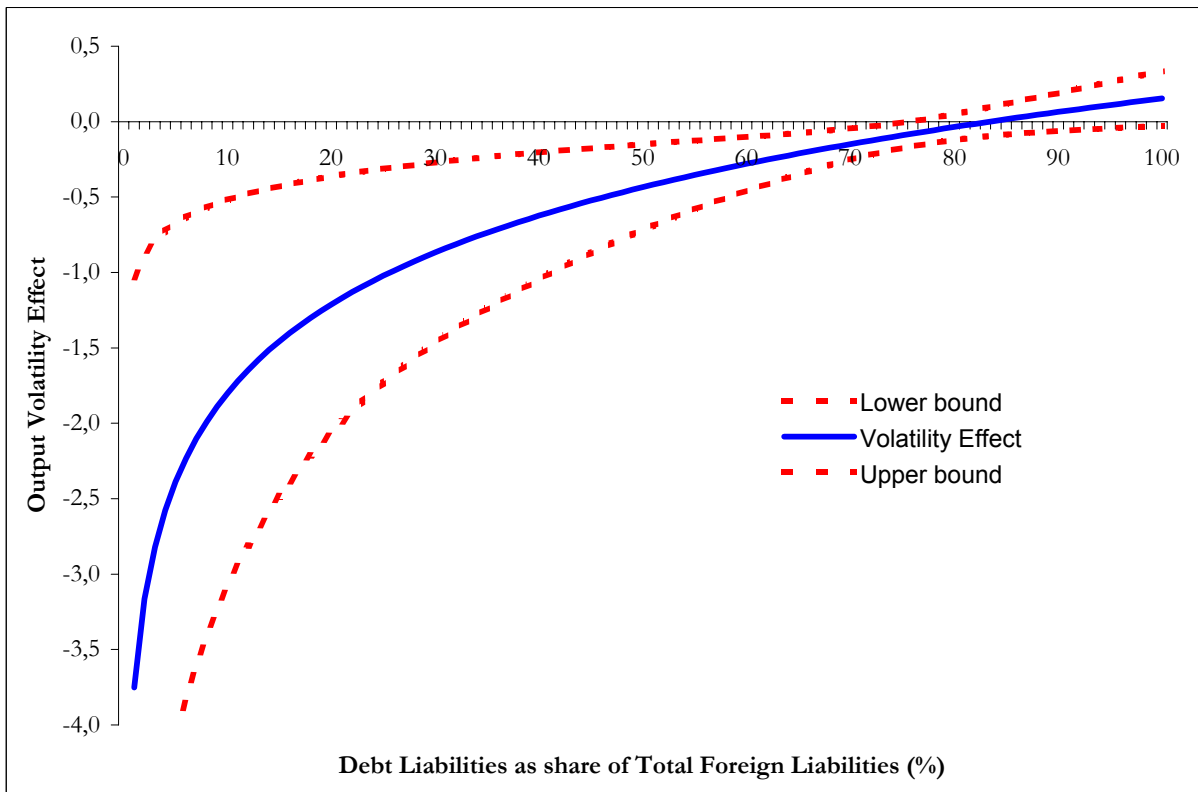
Note: Calculations were made based on regression [3] of Table 7 (Full sample of countries)

Figure 3
Output volatility effect of trade openness conditional on export concentration
(Impact on the standard deviation of growth per capita of doubling trade openness)
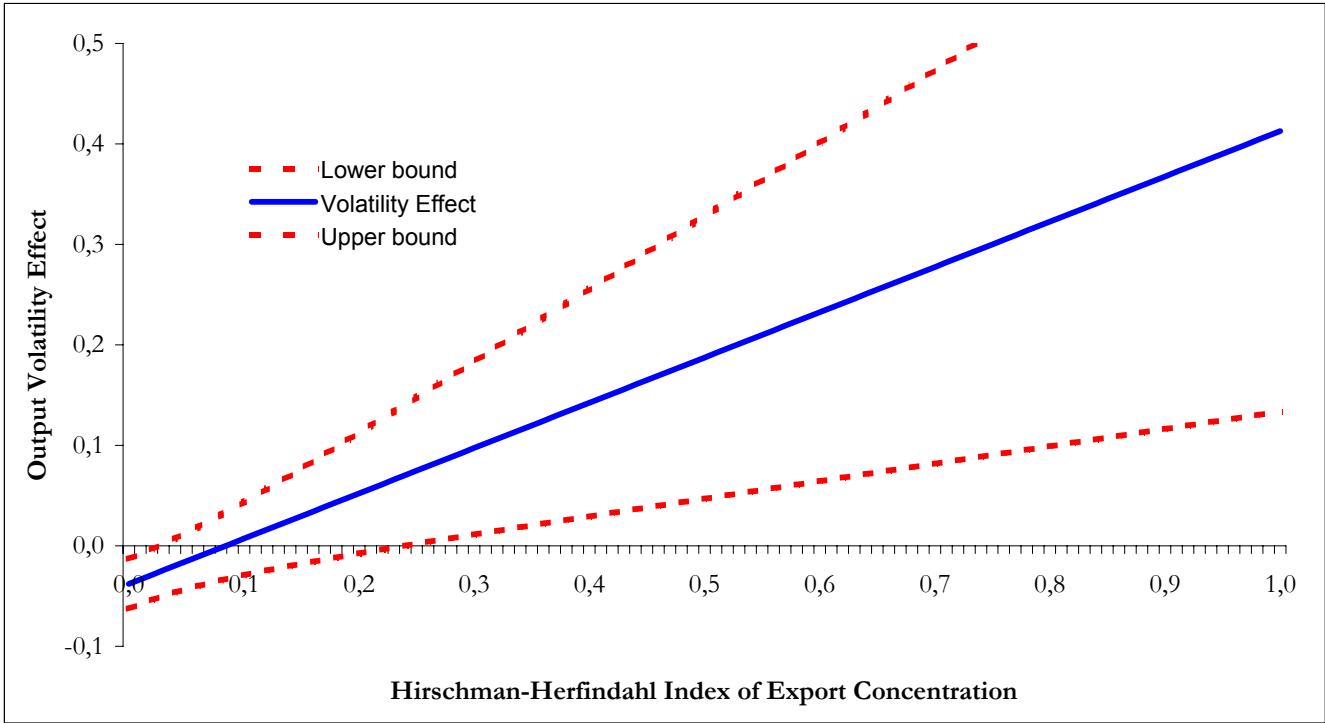
Output volatility effect of financial openness conditional on debt-equity ratio
(Impact on the standard deviation of growth per capita of doubling financial openness)
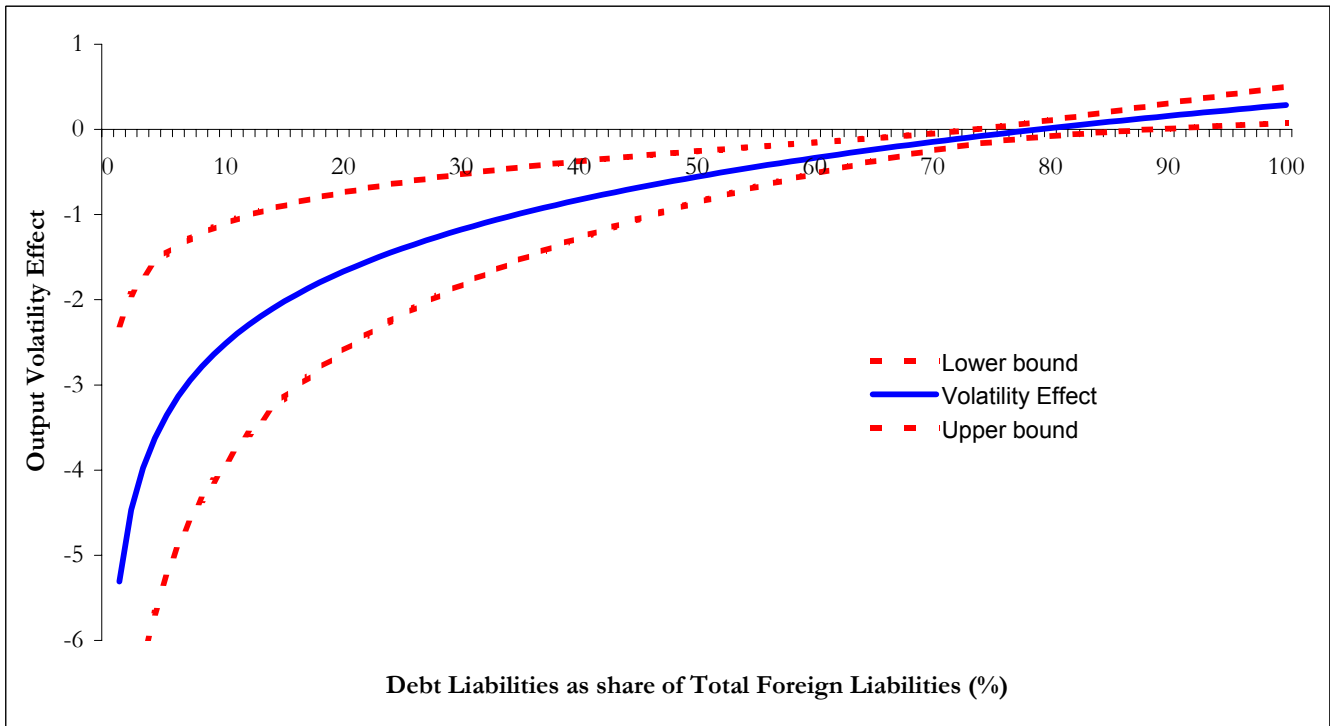
Note: Calculations were made based on regression [3] of Table 8 (Full sample of countries)

Figure 4

Output volatility effect of trade openness conditional on financial depth

(Impact on the standard deviation of growth per capita of doubling trade openness)
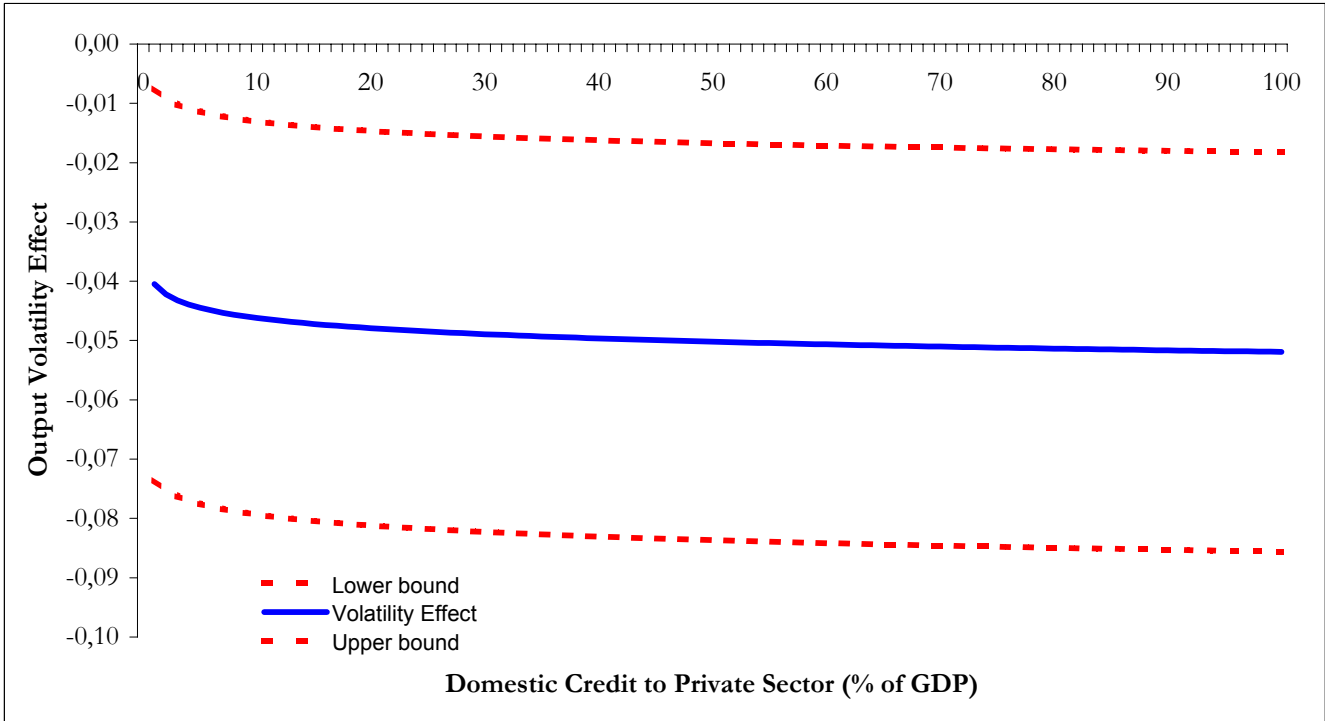
Output volatility effect of financial openness conditional on financial depth

(Impact on the standard deviation of growth per capita of doubling financial openness)
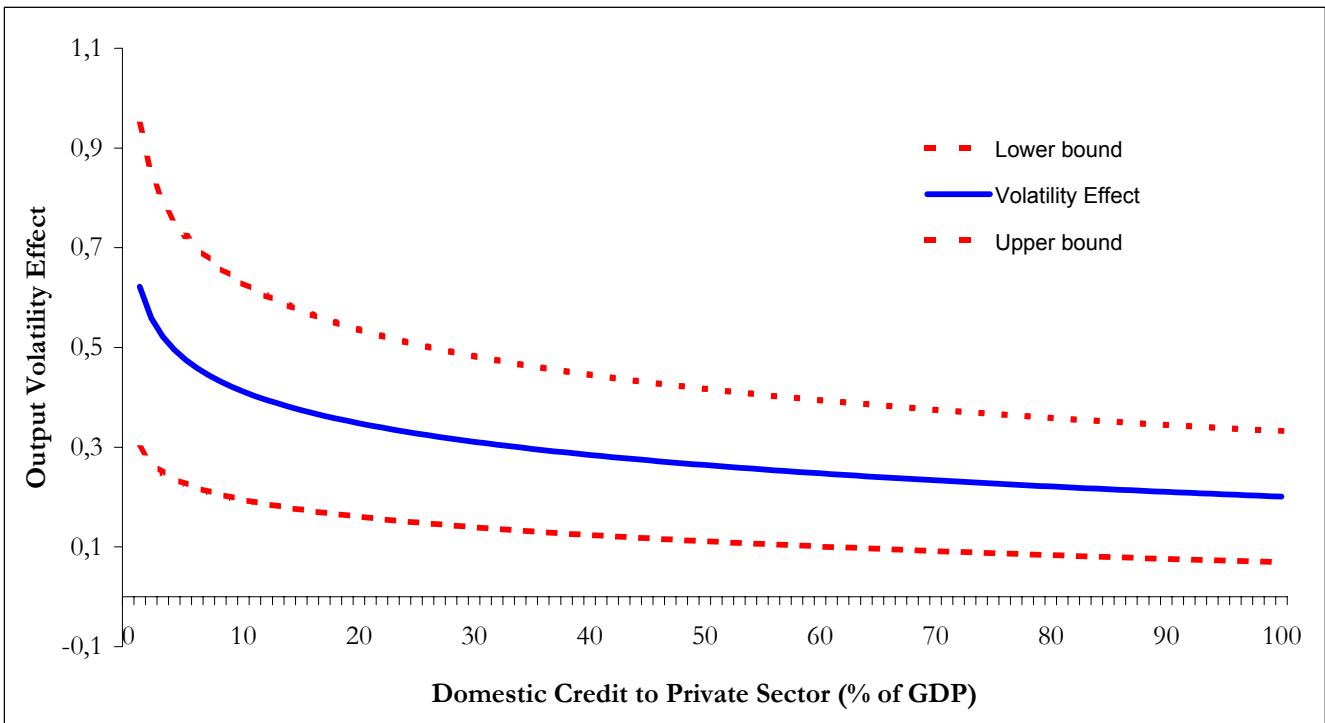
Note: Calculations were made based on regression [4] of Table 10 (Full sample of countries)

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