

DOES OPENNESS IMPLY GREATER EXPOSURE?*

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Abstract

External exposure can be measured by the sensitivity of first and second moments of economic growth to openness and foreign shocks. This paper provides an empirical evaluation of external exposure using panel data methods for a worldwide sample of countries. Controlling for domestic conditions, the paper examines the growth and volatility effects of outcome measures of trade and financial integration as well as four types of foreign shocks: terms of trade changes, trading partners' growth rates, international real interest rate changes, and net regional capital inflows. The paper analyzes the possibility of non-linearities by allowing the growth and volatility effects of openness to vary with the general level of economic development and by letting the effects of foreign shocks to depend on the degree of trade and financial integration. The findings point toward strong non-monotonic effects of openness and external shocks on growth and volatility. Moreover, all in all, the results contradict the view that international integration increases external vulnerability by hurting growth and increasing volatility or by amplifying the adverse effect of external shocks.

Key Words: External Shocks, Openness, Volatility, Growth, Non-linearities

JEL Classification: F36, F41, F43

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I. Introduction

A central dimension of globalization is the world trend toward larger financial and trade openness, observed in most industrial and developing economies. Financial openness has increased from a world median of 5% of GDP in 1970 to 45% of GDP in 2000 and trade openness has grown from a world median of 44% of GDP in 1970 to 70% of GDP in 2000 (see Figure 1 for annual data and definitions).

More openness implies higher integration of world goods and capital markets, contributing to potential gains in growth and welfare. However, more international integration could also lead to heightened external exposure, measured by the sensitivity of first and second moments of economic growth to openness and foreign shocks. This vulnerability may be particularly important in poor countries, due to their production specialization, non-diversified sources of income, unstable policies, incomplete financial markets, and/or weak institutions.

A growing empirical literature is addressing the links between openness and macroeconomic performance, uncovering complex relationships but offering only partial perspectives on them. In fact, the existing literature does not provide a systematic and symmetric empirical analysis of the relationship between financial and trade openness, financial- and trade-related foreign shocks, and macroeconomic performance as represented by the average and volatility of economic growth. This paper attempts to fill this void by analyzing the experience of a large sample of developed and developing countries in the decades spanning 1970-2000.

The plan of the paper is the following. Section II provides a comprehensive review of the relevant literature. Section III presents the empirical contribution of the paper, including its methodology, worldwide data sample, and panel-data regression results for average growth and growth volatility. In this section we report first the simple linear effects of measures of trade and financial openness as well as four types of foreign shocks: terms of trade changes, trading partners' growth rates, foreign real interest rate changes, and net regional capital inflows. Then we analyze empirically the possibility of non-linearities by assessing the dependence of the effects of trade and financial openness on the level of per capita income. Third, we measure the amplification or dampening of the effects of external

shocks depending on the degree of trade and financial openness. Section IV concludes briefly.

II. Review of Previous Empirical Literature

A growing empirical literature has analyzed the effects of financial openness, trade openness, and foreign shocks on growth levels and growth volatility. In this section we proceed to review briefly the analytical underpinnings and existing empirical results on the core relations that are the focus of this paper: those between financial openness, trade openness, foreign shocks, GDP growth, and GDP growth volatility.

A. Financial Openness and Growth

The empirical literature on financial openness (FO) – as well as the research on trade openness (TO) reviewed below – is based on two classes of openness measures. Policy or legal measures reflect policy and regulatory restrictions or barriers imposed domestically on international trade volumes and financial flows and/or holdings. In contrast, outcome or *de facto* measures reflect actual trade volumes and financial flows or stocks between the domestic economy and the rest of the world. On one hand, the strength of the first class of FO / TO measures is that it reflects policy restrictions while the second class is influenced by country-specific features – including size, distance, production specialization, and risk – in addition to domestic restrictions. Hence the first class may represent more exogenous policy conditions while the second class of FO/TO measures is likely to be endogenous to variables that are often explained by integration, including growth. On the other hand, outcome measures may reflect more truly country integration into world markets, while policy measures may not reflect binding policy restrictions and be subject to measurement bias. Moreover, outcome indicators represent continuous variables that are more easily measured and are more widely available than the discrete measures of policy restrictions.

The policy measure of FO is largely based on information on capital controls in the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions, which has spawned construction of several discrete indicators of capital-flow restrictions on cross-

border or cross-residence flows.¹ The outcome measure reflects an actual measure of FO, based on cross-country capital flows or capital stocks, defined as ratios to GDP.^{2 3}

There is a growing literature on the effects of capital-account liberalization and FO on growth – Edison, Klein et al. (2002) provide an excellent survey. Here we discuss the previous work only briefly, in those dimensions that are relevant to this paper. (See Table 1 for a selective summary).

Preceding studies diverge significantly in FO measures, empirical methods, data samples, and results. The studies conducted during the past decade – most of them on measures based on the *de jure* IMF restrictions – show mixed results. While Quinn (1997) and Edison, Klein et al. (2002) report positive significant growth effects of IFI for the world at large, many others do not find any evidence or reject robust evidence of FO growth effects, including Grilli and Milesi-Ferretti (1995), Kraay (1998), Rodrik (1998), O'Donnell (2001), Edison, Levine et al. (2002), and Razin and Rubinstein (2004).

Other studies have tested for FO measures and their interaction with third variables, in order to reflect non-linearities and non-monotonicities in the relationship between growth and FO. Here the general finding is that FO and external financial liberalization tend to reduce growth in countries that are either not industrialized (Klein and Olivei 2000), feature ethnic heterogeneity (Chanda 2001), have low income (Edwards 2001), or exhibit high black-market premiums (Arteta et al. 2001), while FO raises growth in countries with the opposite features. Klein (2003) reports quadratic interaction terms of FO with government quality and with per capita GDP, implying that FO only raises growth in middle-income countries and reduces growth in low- and high-income countries.

¹ Policy or legal measures of capital-flow restrictions include a dummy variable based directly on the IMF measure, the Share measure reflecting the number of years of IMF-measured restrictions, and the Quinn index that allows varying degrees of restrictions based on the IMF information (Quinn 1997), all available for varying country and annual samples. In addition, the OECD computes a measure of capital-flow restrictions for 21 OECD countries. Finally, Montiel and Reinhart (1999) compute an index of restrictions for 15 emerging economies. For detailed discussion of legal and actual measures of capital restrictions see Edison, Klein et al. (2002).

² Actual measures of FO include large country samples for capital flows (Kraay 1998) and stocks on gross capital flows accumulated from flows (Lane and Milesi-Ferretti 2001, 2003, Kose, Prasad and Terrones 2004).

³ More partial dimensions of financial restrictions and liberalization, even if they have some bearing for FO, are not considered in this paper. Among the latter are measures of stock market liberalization and the literature on the effects of the latter on growth, reviewed by Edison, Klein et al. (2002).

Therefore the latter evidence suggests strongly that FO and growth display a non-monotonic relationship. At low levels of development – for several measures of development – financial liberalization and/or FO tend to lower growth, while the opposite is observed in developed nations, where FO contributes to growth. This result should not come as surprise. It reflects that international financial liberalization in non-OECD countries – frequently hampered by low-quality governments, poor institutions, or lack of effective banking regulation and supervision – takes place jointly with domestic financial liberalization. After the subsequent boom phase of massive credit growth, capital inflows, and domestic spending, frequently a hard landing ensues, reflected in a banking crisis and domestic recession, and hence depressing medium-term growth.

Finally Kose et al. (2005) do not find robust growth effects of FO separately but, interestingly, show that FO interaction with growth volatility turns the negative effect of volatility on growth into a positive one. This suggests that FO may alleviate adverse growth effects stemming from high GDP volatility by strengthening access to external counter-cyclical lending and allowing for international portfolio diversification by domestic agents.

B. Trade Openness and Growth

Like FO measures, policy or legal measures of TO are based on measures of trade policy or trade restrictions and the standard measure of outcome or *de facto* TO is the GDP share of total trade (exports plus imports).

As compared to the empirical literature on FO and growth, there is a longer and broader cross-country growth literature on the effects of trade liberalization and TO.⁴ Again, here we discuss the previous work only briefly, in those dimensions that are relevant to this paper. (See Table 1 for a selective summary).

Previous work differs strongly in many dimensions – dependent variable (GDP growth, per capita income level, per capita income convergence), TO measures, controls, data samples, and econometric techniques. Earlier work finds significant, positive, and often very large effects of TO on growth, income levels, or income convergence (Dollar 1992, Ben-David 1993, Sachs and Warner 1995, Edwards 1998, Frankel and Romer 1999). Much of the latter research has been subsequently criticized for possible bias stemming

⁴ Edwards (1993) provides a survey of the older literature.

from endogeneity of trade to income levels or GDP growth, lack of robustness due to exclusion of relevant controls and/or use of inadequate data samples and estimation techniques. Rodrik and Rodriguez (2000) report that TO effects on growth are not robust to inclusion of geographic latitude and Rodrik et al. (2004) find that TO is not robust to inclusion of institutional quality. Rigobon and Rodrik (2005), based on a technique of identification through heteroskedasticity, is the only recent study reporting negative significant effects of TO on per capita income levels, controlling for institutions and geography. A subsequent study based on the same technique, by Lee, Ricci, and Rigobon (2004), shows that TO has positive but small effects on growth.

In contrast to the latter studies, there is recent research that finds significant and robust effects of TO on growth or income levels (Wacziarg 2001, Irwin and Terviö 2002, Alcalá and Ciccone 2004, Kose et al. 2005). Some other recent work reports more qualified results: TO effects are not robust in cross-section estimations but they are significant in panel studies and robust to inclusion of institutional variables (Dollar and Kraay 2003, Wacziarg and Welch 2003). The latter study, focusing on trade liberalization country episodes, shows that trade shares and growth increase significantly and substantially after trade is liberalized. Finally, two recent studies look at interaction effects between TO measures and other variables. Kose et al. (2005), complementing their research on FO and growth, report robust positive effects of TO on growth and find that TO turns the negative effect of volatility on growth into a positive one. Alesina et al. (2005), controlling for country size and interaction effects between TO and size, find that TO has large effects in small countries but these effects become zero as country size tends to maximum size.

C. Foreign Shocks and Growth

Foreign variables relevant to open economies comprise financial and real variables associated to capital flows and trade flows, respectively. They include price variables (international interest rates, terms of trade) and quantity variables (capital flows to emerging economies). For truly small countries (those facing infinite demand/supply elasticities for their exports/imports of capital and goods), only price variables matter for determining domestic performance, including growth. For countries that have some monopolic or monopsonic power in international markets – reflecting their size and/or their

specialization in trading differentiated goods under conditions of monopolistic competition – quantities matter for domestic performance too. However, here it is important to isolate the exogenous determinant (or the instrument) of quantities as the relevant predetermined quantity variable. In this vein, the world or regional supply of capital could be an adequate instrument for the supply of capital to the domestic economy, while average growth of all trading partners could be an adequate instrument for the foreign demand of exports by the domestic economy.

Foreign shocks are measured in two ways: the rate of growth or deviation of a foreign variable from its preceding level and the standard deviation of the variable in a given time period. Most empirical growth studies include one or two foreign shock variables based on the first measure, typically as control variables. Here we refer only selectively to recent cross-country empirical studies that quantify the effects of terms of trade, the foreign interest rate, capital inflows, and trade partner growth on domestic growth and growth volatility (Table 1).

The rate of growth of the terms of trade is the most widely used measure of foreign shocks (among representative studies are Easterly, Loayza, and Montiel 1997, Fernández-Arias and Montiel 2002, Loayza, Fajnzylber, and Calderón 2004, Barro and Sala-i-Martin 2004). In most studies terms-of-trade shocks turn out to be significantly positive determinants of growth.

In a highly integrated world, open economies are also influenced by growth in the rest of the world. Arora and Vamvakidis (2005) find that a 1% increase in economic growth of the countries' trading partners leads to higher domestic growth by 0.8 percentage points.⁵ Other studies have included the ratio of private capital inflows to GDP as a growth determinant and have also evaluated the impact of different types of capital flows on growth (Calderón and Schmidt-Hebbel 2003). Most of these studies have found a positive impact of private capital inflows on growth, with a stronger effect in the case of foreign direct investment.⁶

⁵ They argue that this result is consistent with the literature on the impact of cross-country spillovers (Arora and Vamvakidis 2004, Ahmed and Loungani 1999).

⁶ Most of these studies instrumentalize capital inflows using lagged values, legal origin variables or investor protection measures in order to avoid endogeneity bias from the response of capital flows to growth.

D. Growth and Growth Volatility

Since the influential work by Ramey and Ramey (1995) that pointed out the negative cross-country relation between average GDP growth and GDP volatility, research has focused on providing explanations and more evidence on this negative relation found for the world sample and among low-income countries but not among industrial economies (Table 2). Elbadawi and Schmidt-Hebbel (1998) provide evidence that measures of macroeconomic volatility and low macroeconomic performance have a negative effect on growth, hypothesizing that the latter is behind the changing sign in the volatility-growth relation between low-income and high-income countries. Hnatkovska and Loayza (2004) provide robust evidence for the negative effect of GDP volatility on growth. By including interaction effects between volatility and relevant variables, they report that the negative effect of growth volatility on output is larger in economies with low-income levels and weak institutions and policies, and that the negative effect has grown in recent decades due to deep recessions.

E. Financial Openness, Trade Openness, and Growth Volatility

Easterly, Islam, and Stiglitz (2000) explore the sources of GDP growth volatility in industrial and developing countries (Table 2). They find that higher TO leads to larger growth volatility, especially in developing countries. However they do not find a significant impact of FO on output volatility. O'Donnell (2001) finds that larger FO is associated with lower (higher) output volatility in OECD (non-OECD) countries. His results also suggest that countries with more developed financial sectors are able to reduce output volatility through financial integration.

Kose et al. (2003) reports that none of four FO and TO measures has any robust effect on GDP volatility. However terms of trade volatility, financial depth, and M2 volatility raise output volatility in the world. Bekaert et al. (2004) provide cross-section and time-series evidence of the relationship between FO and GDP growth volatility. Using two indicators of capital account openness, they find considerable evidence of lower GDP volatility after capital account liberalization in the world sample, with somewhat weaker results for developing countries.

Cavallo (2005) presents evidence that suggests that TO lowers output volatility in net terms. According to the author, this is due to two countervailing effects. Larger TO raises growth volatility through the terms-of-trade channel but this is more than offset by the finding that TO lowers growth volatility due to lower financial vulnerability to external shocks, sudden stops, and currency crashes.

Finally, regarding the influence of openness on the effect of growth volatility on growth levels, we mentioned above the result by Kose et al. (2005) that both FO and TO turn the latter negative effect into a positive one. Hnatkovska and Loayza (2004), however, reject an ameliorating influence of TO on the negative volatility-growth effect.

F. Foreign Shocks and Growth Volatility

Foreign shocks – measured as deviation of a foreign variable from its trend or average level, or as the standard deviation of the variable – have been shown to be significant in determining business-cycle fluctuations of GDP or GDP volatility.

Kose (2002) evaluates the importance of fluctuations in world prices —fluctuations in the prices of primary, capital, and intermediate goods, and in the world interest rate— in driving business cycle fluctuations in small open developing countries (Table 2). He finds that roughly 88% of aggregate output fluctuations can be explained by world price shocks. Rodrik (2001) shows that GNP volatility in Latin America and the Caribbean is driven by both external shocks and domestic policy failures – with the terms of trade and capital flows as key contributors on the external front.

Mendoza (1995) was among the first attempts to evaluate the quantitative importance of terms of trade shocks in explaining business cycles, using a stochastic dynamic small open economy model. He found that terms of trade disturbances explain 56% of output variation.

Early research found that world interest rates do not have a significant role in explaining the dynamics of small open economies, including output fluctuations (Mendoza, 1991, Correia et al. 1992, 1995, Schmitt-Grohe 1998). However, using a dynamic stochastic small open economy model, Blankenau et al. (2001) find that world real interest rate shocks explain 33% of Canada's output variation. The above mentioned research by Kose (2002) finds that world interest rate shocks account for roughly 1% of output

volatility in developing countries. Neumeyer and Perri (2004) report large effects of country risk fluctuations and small effects of world interest rate fluctuations on the high volatility of output in emerging economies.

Finally, Rodrik (2001) suggests that the instability of private capital flows has been the most important determinant of macroeconomic volatility in Latin America and the Caribbean during the 1990s. Together with per capita income, capital flow volatility accounts for close to half of the cross-national variation in GNP volatility in the region during the 1990s, compared to 20% in the 1980s.

G. Summing Up and Open Questions

A rich empirical literature has developed on the relations between TO, FO, foreign shocks, growth, and growth volatility. At this stage of the cross-country and panel data research we conclude that neither FO nor TO does show a linear or even monotonic relation with economic growth and growth volatility. Financial liberalization and FO tend to lower growth at low levels of development while the opposite is observed in developed economies. In the case of TO and trade liberalization, the non-monotonicity with growth is not quite so strong as for FO and financial liberalization, as all studies, less one, show that the lower bound of growth effects of TO is zero. Non-monotonicities between openness and growth show up as strong interaction effects between measures of openness and various measures of development (per capita income, institutional quality, and growth volatility, among others) and country size. Yet the discussion about inclusion of adequate controls and their possible interaction with measures of openness, and their implications for the robustness of the role of the latter in determining growth, is still raging.

Regarding the behavior of growth volatility and cyclical output fluctuations, the evidence on the effects of FO and TO is contradictory and inconclusive. There is not even agreement on the intensifying or ameliorating effects that openness has on the traditionally negative relation between growth volatility and growth levels.

There is much more agreement regarding growth effects of foreign relevant variables, particularly the terms of trade. The latter variable is a frequently-used control variable in many empirical studies, and is typically found to be positive and significant in explaining growth. Some studies also report positive domestic growth gains from higher world growth and larger capital inflows.

The existing evidence on growth volatility and cyclical output fluctuations shows generally significant and large positive effects of volatility in relevant external variables.

Therefore, in the light of this review, we conclude that the existing literature does not provide a systematic and symmetrical empirical analysis of:

- relationships between average economic growth and both financial and trade openness,
- relationships between growth volatility and both financial and trade openness,
- foreign shocks (financial and real; exogenous price- and quantity-related) and their influence on growth and growth volatility, and
- interaction between openness and foreign shocks in their effect on average growth and growth volatility.

The rest of the paper is devoted to address these issues.

III. Empirical Analysis

We conduct two analogous empirical analyses. The first focuses on economic growth and the second on growth volatility. In both cases, the dependent variable is constructed using the annual per capita real GDP growth rate as the main input. For economic growth, the dependent variable is the *average* rate of growth over a medium-run time window; and for growth volatility, the dependent variable is the *standard deviation* of the growth rate over the same time window.

For both empirical analyses, our objective is, first, to study the simple linear effects of trade and financial openness as well as of various external shocks; second, to examine how the effects of trade and financial opening vary with the level of per capita income; and third, consider whether the effects of external shocks are amplified or reduced by the degree of trade and financial openness. By conducting these exercises, we aim to provide a comprehensive empirical assessment of openness and external conditions for macroeconomic performance.

A. Sample and Methodology

We work with a pooled data set of cross-country and time-series observations. It consists of 76 countries and, for each of them, at most 6 non-overlapping five-year periods

spanning the 1970-2000 period. See Appendix 1 for the list of countries in the sample. Appendix 2 provides full definitions and sources of all variables used in the paper, and Appendixes 3 and 4 present basic descriptive statistics for the data used in the economic growth and growth volatility regressions, respectively.

We use an estimation method that is suited to panel data, deals with static or dynamic regression specifications, controls for unobserved time- and country-specific effects, and accounts for some endogeneity in the explanatory variables. This is the generalized method of moments (GMM) for dynamic models of panel data developed by Arellano and Bond (1991) and Arellano and Bover (1995).

The general regression equation to be estimated is the following

$$y_{i,t} = \beta' X_{i,t} + \mu_t + \eta_i + \varepsilon_{i,t} \quad (1)$$

where the subscripts i,t represent country and time period, respectively. y is the dependent variable of interest, that is, economic growth or growth volatility. X is a set of time- and country-varying explanatory variables that may include a lagged dependent variable, proxies of trade and financial openness, measures of various external shocks, interaction terms, and control variables. Finally, μ_t is an unobserved time-specific effect, η_i is an unobserved country-specific effect, and ε_{it} is the error term.

The method deals with unobserved time effects through the inclusion of period-specific intercepts. Dealing with unobserved country effects is not as simple given the possibility that the model is dynamic and contains endogenous explanatory variables. Unobserved country effects are controlled for by differencing and instrumentation. Likewise, the method relies on instrumentation to control for joint endogeneity. Specifically, it allows relaxing the assumption of strong exogeneity of the explanatory variables by allowing them to be correlated with current and previous realizations of the error term ε .

Parameter identification is achieved by assuming that future realizations of the error term do not affect current values of the explanatory variables, that the error term ε is serially uncorrelated, and that *changes* in the explanatory variables are uncorrelated with the unobserved country-specific effect. As Arellano and Bond (1991) and Arellano and Bover (1995) show, this set of assumptions generates moment conditions that allow estimation of the parameters of interest. The instruments corresponding to these moment

conditions are appropriately lagged values of both levels and differences of the explanatory and dependent variables (the latter if the model is dynamic). Since typically the moment conditions over-identify the regression model, they also allow for specification testing through a Sargan-type test.

B. Economic Growth Regressions

As is standard in the literature, the dependent variable is the average rate of real per capita GDP growth. The regression equation is dynamic in the sense that it includes the initial level of per capita GDP as an explanatory variable. As additional control variables, the regression includes the average rate of secondary school enrollment to account for human capital investment, the average ratio of private credit to GDP as a measure of financial depth, the average inflation rate to account for monetary discipline, and the average ratio of government consumption to GDP as a measure of government burden. The regression equation also allows for both unobserved time-specific and country-specific effects.

The explanatory variables of interest are measures of trade and financial openness, measures of external shocks, and various interaction terms. Given that we want to evaluate the effects of the economy's actual contact with international markets, we work with *outcome* measures of trade and financial openness. These measures are related to policies but are also the result of structural characteristics of the economy, such as size, natural and social endowments, and public infrastructure. The outcome measures we use are the ratio of exports and imports to GDP in the case of trade, and the ratio of portfolio and FDI liabilities to GDP in the case of financial openness.

We consider four types of external shocks; the first two primarily related to trade in goods and the latter two mainly related to financial transactions. All of them are defined so that they can be considered as exogenous to the country in question. They are the average growth of the terms of trade, the average weighted output growth rate of trade partners, the average amount of capital flows to the region where the country is located, and the average change of the international interest rate. Whereas the first two variables vary by country and time period, the third varies only by *region* and period, and the fourth varies only by time period. Because of its limited sample variation, the effect of the international interest

rate shock cannot be distinguished from the unobserved time-specific effect; however, it is still possible to evaluate the effect of its interaction with the measures of trade and financial openness.

Linear Effects of Openness and External Shocks

In the basic case, the effects of openness and shocks on growth are independent from each other and independent from other characteristics of the economy. This corresponds to the most common treatment of growth determinants in the literature. The regression equation we estimate in this case is the following,

$$y_{i,t} = \beta_0' CV_{i,t} + \beta_1' OPE_{i,t} + \beta_2' EXT_{i,t} + \mu_t + \eta_i + \varepsilon_{i,t} \quad (2)$$

where CV is the set of control variables, OPE is the set of openness variables, and EXT is the set of foreign-shock variables.

The estimation results are presented in the first column of Table 3. We find that both financial and trade openness are positively related to economic growth. As mentioned in the introduction, the effect of financial and trade opening on growth is found to be ambiguous in the literature. However, ambiguity gives way to positive effects when the time-series dimension is taken into account: the beneficial impact of opening is most clearly seen in the experience of countries before and after liberalization (see, for instance, Wacziarg and Welch 2003). Our panel-data results confirm this finding as they are based not only on cross-country comparisons but also on over-time changes for individual countries. Furthermore, since our methodology controls for country-specific effects and the joint endogeneity of openness, our results are not subject to the criticism that the positive growth effect of openness is not robust to the inclusion of variables such as geographical location (see Rodrik and Rodríguez 2000 for the case of trade) or is due to reverse causation.

Regarding the growth effects of external shocks, they are all significant and carry the expected signs. That is, increases in favorable terms of trade, in the growth rate of trade partners, and in capital flows to the region produce a rise in average economic growth. These results together with the estimated size and significance of the period shifts confirm the substantial importance of external conditions as growth determinants.

All control variables carry significant coefficients of expected signs. The Sargan and serial-correlation specification tests do not reject the null hypothesis of correct specification, lending support to our estimation results. This is the case in all exercises presented below, and to avoid redundancy we only mention it here.

The Effect of Openness Depending on the Level of Income

Increasingly there is the notion that the growth effect of openness may not be homogeneous across countries. Indeed, in part motivated by the work of Klein and Olivei (2000) in the case of financial openness, researchers have lately considered the possibility that the growth effect of opening the economy may depend on country characteristics such as income and institutional quality (see Edwards 2001 and Klein 2003). In the framework of our panel-data methodology, we now reassess this possibility by allowing the effect of each measure of openness to vary with the level of real per capita GDP, which serves as a proxy for overall development. We do this by interacting each openness measure with linear and quadratic per capita GDP (*Inc*) in each country at the start of the corresponding period. The regression equation we estimate in this case is the following

$$y_{i,t} = \beta_0' CV_{i,t} + \beta_1' OPE_{i,t} + \beta_2' EXT_{i,t} + \beta_3' OPE_{i,t} * Inc_{i,t} + \beta_4' OPE_{i,t} * Inc_{i,t}^2 + \mu_t + \eta_i + \varepsilon_{i,t} \quad (3)$$

The last two columns of Table 3 present the estimation results. We consider the interaction between per capita GDP and the financial and trade openness variables one at a time; we do this in order to both simplify the interpretation of the results and do not overextend the parameter requirements on the data. Thus, column 2 shows the results when financial openness is interacted with income, and column 3, when trade openness is interacted with income. Interestingly, the regression results are *qualitatively* similar whether we deal with financial or trade openness and can be summarized as follows. The coefficient on the corresponding openness indicator by itself is negative and significant, and the coefficients on the linear and quadratic interaction terms are significantly positive and negative, respectively. Therefore, the growth effect of opening the economy appears to depend on per capita income or, taking a broader interpretation, on the overall level of development. A corollary is that the net growth effect could in theory be positive or negative, and we should examine which is the case for the actual levels of per capita GDP found in our sample.

Figure 2 illustrates what the estimated pattern of coefficients implies for the change in growth produced by an increase in each openness measure. Specifically, Figure 2 uses the regression point estimates to plot the growth effect of a one-standard-deviation increase in openness as a function of per capita GDP for the full range of the sample. For both financial and trade opening, their growth effect is nearly zero for low levels of per capita GDP, it increases at a decreasing rate as income rises, and it reaches a maximum but only at high levels of income (higher in the case of trade openness). The growth effect of rising openness appears to be economically significant for middle- and high-income countries. In relation to the previous literature, we also find non-linear growth effects of opening, but we have some differences in the precise nature of the non-linearity. For instance, we differ from Edwards (2001) in that we do not find negative effects of increasing financial openness for low-income countries; and we differ from Klein (2003) in that we find that the growth effects of financial opening remain positive even for high-income countries. However, we agree with these papers that middle-income countries can expect to improve their growth performance as they become more integrated with the rest of the world.

Our coefficient estimates suggest significant economic effects. For instance, a one-standard-deviation increase in the degree of financial openness would lead to higher per capita growth rates by: (a) 0.67 percentage points for country observations at the 25th percentile of the sample distribution of output per capita during the 1970-2000 period (corresponding approximately to Pakistan in the mid 1990s), (b) 0.9 percentage points for observations at the 75th percentile (Malaysia around 1995), and (c) 0.8 percentage points for countries at the 95th percentile (Italy around 1995). The highest growth effect of larger international financial integration, 0.91 percentage points, is achieved by middle-income country observations at the 62th percentile (corresponding approximately to the levels of income per capita of Chile, Mexico, and Uruguay in 1995).

Similarly, an analogous increase in the degree of trade openness will generate an increase in the growth rate of GDP per capita of 0.33 percentage points for countries at the 25th percentile of the sample distribution of output per capita, 0.53 for the median country in the sample (Indonesia around 1995), 0.67 for countries at the 75th percentile, and 0.74 for countries at the 95th percentile of the world distribution of output per capita.

The Interaction between Openness and External Shocks

The previous exercises analyze the potential effect that openness can have on economic growth, controlling for various external shocks. Here we focus on whether openness makes the economy more or less responsive to external shocks. Ideally for the beneficial role of openness, it would amplify the growth effect of positive shocks and dampen the effect of negative ones. However, we find no evidence of asymmetric interaction effects (in results not presented here) and limit ourselves to the issue of whether the economic growth effect of shocks depends on the openness of the economy.

We address this question by considering interaction terms between each of the shocks and the openness variables. The regression equation we estimate in this case is the following,

$$y_{i,t} = \beta_0' CV_{i,t} + \beta_1' OPE_{i,t} + \beta_2' EXT_{i,t} + \beta_3' OPE_{i,t} * EXT_{i,t} + \mu_t + \eta_i + \varepsilon_{i,t} \quad (4)$$

There are a large number of possibilities for these interactions, but in order to avoid overextending the parameter requirements on the data, we consider the interactions between financial and trade openness indicators with the external shocks *one shock at a time*. This will also allow us to simulate the effect of each shock independently. The results are presented in Table 4, with each column devoted to the interactions with each of the four external shocks. An interesting pattern emerges. Larger trade openness decreases the economic growth effect of trade-related shocks --the growth of terms of trade and the GDP growth of trade partners-- while increasing the economic growth effect of financial market shocks --international interest rate changes and regional capital inflows. Conversely, larger financial openness increases the economic growth effect of trade-related shocks while reducing the impact of regional capital inflows, one of the financial market shocks. The exception to this pattern is that financial openness seems to increase the economic growth effect of international interest rate changes.

Since the growth effect of a shock now depends on three coefficients plus the levels of trade and financial openness, it is not immediately clear what the net effect is. Figure 3 helps to make this assessment by graphing the economic growth effect of one-standard-deviation *increase* in each shock as a function of, first, trade openness and, then, financial

openness.⁷ In the former case, we use the sample average of financial openness in the calculation of the partial effects; and in the latter, the sample average of trade openness.⁸ The economic growth effect of an increase in terms of trade growth is positive for low and medium levels of trade openness; but as this increases further, the growth effect declines and may even become negative. The economic growth effect of the positive terms of trade shock increases with financial openness and is positive throughout the relevant range.

The economic growth effect of an increase in trade partners GDP growth is always positive, and, as noted above, it decreases with trade openness and increases with financial openness. In the case of the international interest rate shock, its direct impact on economic growth cannot be separated from the time effects; however, based on an exercise where we compare the period shifts with and without the interest rate shock interactions, we estimate that the direct impact of an increase in international interest rates is significantly negative. Once we take into account the interactions, the total economic growth effect of the interest rate jump continues to be negative, but it approaches zero as either type of openness rises. Finally, regarding the positive capital flow shock, its effect on economic growth is positive throughout most of the relevant ranges; but, as indicated above, larger trade openness increases its economic growth effect, while financial openness reduces it. All in all, these results challenge the conventional wisdom that trade openness increases the exposure to trade-related shocks and that financial openness magnifies financial-market shocks. The channels of transmission seem to be more complex.

We can use the numbers to draw several quantitative implications. Consider the following, for instance. First let's consider the growth effects of external shocks at various levels of trade openness and given the sample average level of financial openness (corresponding approximately to that of India in the late 1990s). A one-standard-deviation decline in the terms of trade would lead to a fall of growth in real GDP per capita of 0.98 percentage points for country observations at the 25th percentile of the sample distribution of trade openness (approximately Pakistan in the late 1990s), 0.50 percentage points for the median country (Italy, 1996-2000), and nearly zero for country observations at the 75th

⁷ Considering their effect on growth, an increase in terms of trade, partners' GDP, and capital inflows are regarded as beneficial shocks in the following discussion, while an increase in international interest rates is regarded as a detrimental shock.

⁸ For these simulations, we restrict the range of the financial openness indicator to values where the stock of foreign liabilities is positive.

percentile (Paraguay, 1996-2000). Analogously, a one-standard-deviation decline in the growth rate of a country's trading partners would lead to a reduction in the growth rate of 0.96 percentage points for country observations at the 25th percentile of the sample distribution of trade openness and 0.78 percentage points for countries at the 75th percentile. Now let's consider the growth effects of external shocks at various levels of financial openness and given the sample average level of trade openness (approximately corresponding to Indonesia and Ecuador in the late 1990s). A one-standard-deviation decline in regional capital inflows would generate a reduction in per capita GDP growth of 0.35 percentage points for country observations at the 25th percentile of the sample distribution of financial openness (approximately Algeria in the late 1990s), 0.28 percentage points for the median country (El Salvador, 1996-00), and 0.2 percentage points for countries at the 75th percentile (South Korea, 1990-00).

Finally, openness and external shocks may have a significant effect on macroeconomic volatility, and this in turn has been found to have a harmful influence on economic growth (see Fatás 2002, and Hnatkovska and Loayza 2003). Therefore, there is the possibility that the growth effects of openness and external shocks that we just described occur through their impact on macroeconomic volatility. To consider this possibility, we add the standard deviation of economic growth as an additional explanatory variable. The results are presented in Table 5, and although growth volatility carries the expected negative and significant coefficient, the coefficients on all other relevant variables retain their sign, significance, and, to a large extent, size. Therefore, the growth effects of openness, external shocks, and their interactions can be considered independently of their volatility effects, to which we turn next.

C. Volatility Regressions

In this case, the dependent variable is the standard deviation of annual real per capita GDP growth, calculated over each 5-year period. The control variables represent some of the main sources of domestically induced volatility and are calculated over the same periods. They are the standard deviation of annual inflation, an average index of real exchange rate overvaluation, and the average number of years under systemic banking

crisis. The volatility regression equation also allows for both unobserved time-specific and country-specific effects.

The explanatory variables of interest are measures of trade and financial openness, the volatility of external shocks, and various interaction terms. The outcome measures of trade and financial openness are the same as those described above for the case of growth. Note, however, that for growth volatility regressions, the relevant indicator of the external shock is given by its volatility. For this reason, we use the *standard deviation* of each external shock as the measure of interest (and not its *average* value, as we did in the case of growth regressions).

Linear Effects of Openness and External Shocks

The regression we estimate in this case is analogous to equation (2). The estimation results are presented in the first column of Table 6. We find that whereas an increase in financial openness tends to reduce volatility, larger trade openness increases it. This would indicate that financial opening has an unambiguous beneficial impact on the economy by both increasing average growth and reducing its volatility. In contrast, the effect of larger trade openness would be ambiguous as it induces higher but also more volatile growth. Regarding external shocks, we find that an increase in the volatility of terms of trade changes, the growth rate of trade partners, and capital flows to the region produce an increase in the volatility of economic growth. As expected, then, countries facing a more volatile external environment would undergo higher volatility.

All control variables carry positive and significant coefficients, as expected. The Sargan and serial-correlation specification tests do not reject the null hypothesis of correct specification, lending support to our estimation results. This is also the case in all remaining volatility regressions presented below.

The Effect of Openness Depending on the Level of Income

We consider now the possibility that the volatility effect of openness vary with the level of real per capita GDP in the country at the start of the corresponding period. As in the case of growth regressions, we do this by interacting each openness measure with linear

and quadratic per capita GDP. Then, the regression we estimate in this group of exercises is analogous to equation (3).

The estimation results are presented in the last two columns of Table 6. As with growth regressions, we consider the interaction between per capita GDP and the openness variables one at a time. Figure 4 takes the regression point estimates to graph the volatility effect of each openness indicator as a function of per capita GDP. There is a remarkable degree of similarity in the pattern of coefficients related to financial and trade openness indicators. The coefficient on the corresponding measure of openness by itself is always negative, and the coefficients on the linear and quadratic interaction terms are positive and negative, respectively. All of them are statistically significant. The interaction coefficients indicate that the volatility effect of a change in both types of openness varies convexly with income. The total volatility effect of a change in openness can be positive or negative depending on the size of the coefficients, and in this regard the effect of financial openness is different from that of trade openness, as discussed next.

Figure 3 illustrates that a rise in financial openness leads to a decrease in volatility at all income levels. The volatility reducing effect of financial opening is smallest in magnitude in medium-income countries and largest at the both ends of the cross-country income distribution. The case of trade openness is somewhat different. A rise in trade openness leads to an increase in volatility at all levels of national income. Poorest countries are the most vulnerable to the volatility inducing impact of trade openness. This effect decreases gradually as national income rises. Regarding the size of the volatility effect, the beneficial impact of financial opening is considerably larger than the detrimental effect of trade opening. This is important to keep in mind when financial and trade opening are undertaken together and their joint effects on vulnerability are considered.

The Interaction between Openness and External Shocks

The last exercise considers to what extent the volatility effect of external shocks depends on the economy's trade and financial openness. To do so, we include interaction terms between each of the shocks and the openness variables in the volatility regression. Then, in this case the regression we estimate is analogous to equation (4).

The estimation results are presented in Table 7, with each column devoted to the interactions with each of the four external shocks. Figure 5 illustrates how the volatility effects of each shock vary with the level of, first, trade openness and, then, financial openness. We find that the interaction between any shock and financial openness always carries a significantly negative coefficient. This implies that financial openness helps reduce the volatility effect of all shocks considered, possibly by helping diversify away risk. Trade openness also reduces the volatility effect of terms of trade shocks. However, it appears to increase increases the volatility effect of the growth rate of trade partners, while it has no significant interaction with interest rate and capital flow shocks.

IV. Conclusions

This paper tries to shed light on the question as to whether international integration increases a country's external vulnerability. There are two sides to this question. The first is whether openness by itself hurts macroeconomic performance by decreasing average economic growth and increasing its volatility. The second one is whether openness magnifies the impact of adverse foreign shocks and exacerbates the contagion of external volatility. The cross-country and over-time empirical evaluation conducted in the paper provides some answers to these questions, and around them we organize these concluding remarks.

First, we find no evidence that financial or trade openness by themselves induce a decline in economic growth. On the contrary, there is strong indication that financial and trade opening leads to growth improvement. Granted, this positive impact appears to be small in poor countries, but it becomes substantial as the country develops.

Second, we find no evidence that higher financial openness increases growth volatility. In fact, it appears that financial opening helps a country reduce its growth volatility, particularly if its domestic financial system is not in the transitional turmoil that characterizes medium-income countries. Trade opening does seem to increase volatility, but the effect is small and only significant for medium-income countries. For poor and middle-income countries, financial and trade openness present some trade-offs, but they are

mostly in favor of international integration. Moreover, as countries develop, the beneficial impact of trade and financial openness becomes strong and unambiguous.

Third, on whether financial and trade openness magnify the growth effect of adverse external shocks, the evidence is mixed. On the positive side, financial openness dampens the harmful growth impact of financial market shocks (such as higher international interest rates and lower capital inflows) while trade openness limits the adverse effect of trade-related shocks (such as unfavorable terms of trade changes and lower foreign growth). On the negative side, financial openness tends to exacerbate the growth effect of trade-related shocks while trade openness magnifies the effect of falling capital flows.

Fourth, the evidence regarding the ability of financial and trade openness to limit the contagion of external volatility is quite in favor of openness. With only one exception, we find no evidence that openness leads to higher volatility contagion. It's quite the contrary. Trade openness attenuates the effect of terms-of-trade volatility on domestic volatility. More impressively, financial openness dampens the volatility inducing effect coming from all external shocks, both financial- and trade-related. It appears that financial openness (and to some extent trade openness) provides the means for the economy to diversify away the external sources of risk.

All in all, the results presented in the paper cast a favorable light on financial and trade openness as engines of growth and stability. They question the view that international integration increases external vulnerability by hurting growth and increasing volatility or by amplifying the adverse effect of external shocks. For future research, there remains to understand the mechanisms through which development affects the link between openness and growth and the channels by which integration prepares the economy to deal with external instability.

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Table 1
Literature Review on Trade Openness, Financial Openness, Foreign Shocks, and Growth 1/

Authors	Main findings	Measures	Largest sample
I. Financial Openness (FO) and Growth			
Grilli and Milesi-Ferretti (1995)	[0]: No robust evidence	Share measure, other measures	Cross-section: 61 countries, 1971-1994
Quinn (1997)	[+] effects	Quinn restrictions	Cross-section: 58 countries, 1958-1988
Kraay (1998)	No effects. [+] effects of FO interactions with capital flows.	Share measures, Quinn restrictions	Cross-section: 100 countries, 1985-1997
Rodrik (1998)	No evidence	Share measure	Cross-section: 100 countries, 1975-1995
Klein and Olivei (2000)	[+] effect of FO on financial depth (FD) in OECD countries, but not in non-OECD countries. FD has [+] effect on growth	Share measure	Cross-section: 67 countries, 1976-1995
Chanda (2001)	Significant interaction of FO and ethnic heterogeneity; FO lowers growth in ethnically heterogeneous countries	Share measure	Cross-section: 57 non-OECD countries
Edwards (2001)	[-] effect of FO and [+] effect of FO interaction with per capita GDP; FO lowers (raises) growth in low- (high-) income countries.	Share measure (not significant) Quinn restrictions (significant)	Cross-section: 62 countries, 1980-1989
Arteta et al. (2001)	[-] effect of FO and [-] effect of FO interaction with black market premium. FO lowers growth in countries with high black market premiums	Quinn restrictions	Cross-section and pooled data: 59 countries, 1973-1992
O'Donnell (2001)	No robust results for FO and for FO interaction with financial depth	Share measure (not significant) Capital flows (significant)	Cross-section: 94 countries, 1971-1994
Edison, Levine et al. (2002)	Considering interaction with several variables, no robust findings	IMF restrictions, Quinn restrictions, LMF capital flows and stocks	Panel: 57 countries, 25 years
Edison, Klein et al. (2002)	[+] in world, OECD, East Asia; [-] in non-OECD	IMF restrictions (share); Quinn restrictions, others.	Cross-section: 89 countries, 1976-1995
Klein (2003)	Quadratic interaction with per capita GDP and government quality, only [+] effect on middle-income countries, [0] for others	IMF restrictions (share); Quinn restrictions	Cross-section: 85 countries, 1976-1995
Razin and Rubinstein (2004)	Level of FO has no robust effects on growth but switching to capital controls reduces growth	Weighted avge of several restrictions on capital-account transactions, IMF	Panel: 100 countries, 1970-1998
Kose et al. (2005)	FO has no robust effect but FO turns the [-] effect of volatility growth into a [+] one	LM and KPT capital flows	Cross-section and panel: 85 countries, 1960-2000

Table 1 (continued)

Literature Review on Trade Openness, Financial Openness, Foreign Shocks, and Growth 1/

Authors	Main findings	Measures	Largest sample
II. Trade Openness (TO) and Growth			
Dollar (1992)	[+] effect of TO	Measure based on international price deviations.	Panel: 95 developing countries, 1976-1985
Ben-David (1993)	[+] effects on absolute convergence in income levels	Binary measure of trade restrictions	Cross section: 1970-1989
Sachs and Warner (1995)	TO leads to 2% higher growth than in closed economies	Binary measure of trade restrictions	Cross section: 1970-1989
Edwards (1998)	[+] effects of eight out of nine TO measures on TFP.	9 measures of trade restrictions and trade shares	Panel: 93 countries, 1960-1990
Frankel and Romer (1999)	[+]: a 1% increase in trade volume raises level of per capita income by about 2%	Trade shares	Cross section: 1985, 100 countries
Rodrik and Rodríguez (2000)	TO effects not robust to inclusion of other variables, including geographic latitude. However, lower bound of TO effects is [0]	Broad set of measures used in the literature	Several samples according to different authors
Wacziarg (2001)	[+]: 1 s.d. rise in trade volume to GDP increases growth by 1%	Trade shares	Panel: 57 countries, 1970-1989
Irwin and Terviö (2002)	Confirms results of Frankel and Romer (1999). But TO effect on income per capita income is not robust to inclusion of latitude	Bilateral trade flows	8 annual cross sections: 146 countries, between 1913 and 1990
Dollar and Kraay (2003)	Cross-section: TO is not robust to inclusion of institutions Panel-data: TO effects are [+], more important than institutions	Trade shares	Cross-section and panel: 154 countries, 1970-2000
Wacziarg and Welch (2003)	[0] in cross-section. Updates Sachs and Warner's (1995) liberalization events; trade shares rise by 5 pp, growth by 1.5-2% after liberalization, compared to pre-liberalization period	Trade policy measure and trade shares	Cross-section, panel, and country case studies: 116 countries, 1950-1998
Alcala and Ciccone (2004)	[+] TO effects, robust to controlling for institutional quality	Trade shares (in PPP \$)	Cross section: 98 countries, 1985
Rodrik et al. (2004)	TO effects are not robust to controlling for institutional quality	Trade shares	Cross section: 80 countries, 1995
Rigobon and Rodrik (2004)	[-] effect on income pc, after controlling for geography and institutions	Trade shares	Cross section: 86 countries, 1990s
Kose et al. (2004)	[+] effect. Changes sign of volatility on growth into [+]	Binary trade policy measure. Trade shares: not robust	Cross-section and panel: 85 countries, 1960-2000
Lee, Ricci, and Rigobon (2004)	TO has positive but small effects on growth	4 measure of openness: trade size tariff indicator, import duties, and BMP	Panel: 100 countries, 5-year periods from 1961-65 to 1996-2000
Alesina et al. (2005)	[+] and large in small countries, [0] in large countries	Trade shares (current prices, PPP \$)	Panel: 113 countries, 4-periods of 10-yr avge 1960-2000
III. Foreign Shocks and Growth			
Easterly et al. (1997)	[+] and large significant effect on GDP growth	Terms of trade changes	Panel: LAC and World, 1986-1993
Fernández-Arias et al. (2002)	[+] and large significant effect on GDP growth	Terms of trade changes	Panel: 69 countries, 1961-1995
Calderón and Schmidt-Hebbel (2003)	[+] effect of private capital inflows on growth. Composition does matter: FDI is the only significant component	Capital inflows and components: FDI, portfolio equity, debt and official flows	Panel: 56 developing countries, 1970-2000
Barro and Sala-i-Martin (2004)	[+] and large significant effect on GDP growth	Terms of trade changes	Cross-section: 97 countries, 1975-1985
Loayza et al. (2005)	[+] and large significant effect on GDP growth	Terms of trade changes	Panel: LAC and World, 1960-2000
Arora and Vamvakidis (2005)	[+] and significant effect on GDP growth	Trade partners' growth per capita	Panel: 101 countries, 1960-1999

[+] implies a positive and robust relationship found in the literature, [-] indicates a negative one, and [0] reflects the inability of finding a robust relationship between the variables. 1/ Quinn restrictions based on Quinn (1967), Share measure is based on number of years of IMF restrictions in place, LM is Lane and Milesi-Ferretti's (2002) measure of capital flows or stocks, KPT is Kose, Prasad and Terrones' (2004) measure of capital flows or stocks.

Table 2
Literature Review on Trade Openness, Financial Openness, Foreign Shocks, and Growth Volatility 1/

Authors	Main findings	Key Variables	Largest sample
I. Growth and Growth Volatility			
Ramey and Ramey (1995)	Growth and growth volatility are [+] -ly correlated among industrial countries, and [-] -ly correlated among developing countries	Mean GDP growth and s.d. of GDP growth	Cross-section: 92 countries, 1960-1985
Elbadawi and Schmidt-Hebbel (1998)	Growth and growth volatility are [+] -ly correlated among industrial countries, and [-] -ly correlated among developing countries performance and macro volatility lower growth.	Mean GDP growth and s.d. of GDP growth s.d. of macro policy fundamentals and crisis measures	Panel: 56 countries, 1961-1994
Hnatkovska and Loayza (2004)	Growth volatility lowers growth robustly. [-] effect larger in low-income economies, and countries with institutional and policy weaknesses	s.d. of output gap and of growth per capita	Panel: 79 countries, 1960-2000
II. Financial Openness (FO), Trade Openness (TO), and Growth Volatility			
Easterly et al. (2000)	TO raises growth volatility, particularly in developing countries [0]: FO has no impact on output volatility	Growth volatility: s.d. of growth per capita	Panel: 74 countries, 1960-1997
O'Donnell (2001)	[-] effect on output volatility of OECD countries [+] effect on volatility of non-OECD countries	Growth volatility: s.d. of growth per capita	Panel: 93 countries, 1971-1994
Kose et al. (2003)	[0]: no effect of FO, TO on volatility [+]: Terms-of-trade volatility raises GDP volatility	Volatility: s.d. growth. TO, FO: two (policy and outcome) measures	Panel: 55 countries, 1960-1999
Bekaert et al. (2004)	[-]: Capital account liberalization lowers growth volatility in world sample. Weaker results for emerging market economies	Growth volatility: s.d. of growth per capita. FO: two measures, IMF and Quinn restrictions	Cross-section and time-series: 95 countries, 1980-2000
Cavallo (2005)	[-]: TO reduces growth volatility	Growth volatility: s.d. of growth per capita	Cross section: 77 countries, 1960-2000
III. Foreign Shocks and Growth Volatility			
Mendoza (1995)	Terms-of-trade disturbances explain 56% of output variation	Terms of trade is the ratio of export to import unit values	Model calibrated for G7 countries and developing countries
Rodrik (2001)	Capital flow volatility accounts for 1/2 of cross-national variation in GNP volatility in LAC	Private capital inflows	Panel: LAC countries, 2-periods of 10-yr avge 1980-2000
Blankenau et al. (2002)	World real interest rate shocks explain 33% of output variation in Canada	Model calibrated to Canadian data	Model calibrated for Canadian data, 1961-1996
Kose (2002)	World interest rate shocks account for 1% of output volatility in developing countries	World interest rate: LIBOR, deflated by export unit value index	Model calibrated for a developing, small open economy
Neumeyer and Perri (2005)	Large effects of country risk fluctuations and small effects of world rate fluctuations on output volatility in emerging-market economies	3-month ex-ante real interest rate at which firms borrow in international markets	Model calibrated for Argentinean data, 1983-2001

1/ See footnote in Table 1.

Table 3
Economic Growth and the Interaction between Openness and Real GDP Per Capita

Sample of 76 Countries, 1970-2000 (5-year period observations)

Dependent Variable: Growth in real GDP per capita

Estimation Method: GMM-IV System Estimator

Measures of Trade and Financial Openness:	Baseline Regression	Non-Linear Effects	
		Financial	Trade
Constant	7.142 ** (2.25)	2.105 (2.57)	23.419 ** (2.37)
<i>Control Variables</i>			
Initial GDP per capita (in logs)	-0.177 ** (0.09)	-0.704 ** (0.24)	-2.883 ** (0.27)
Education (Secondary Enrollment, in logs)	1.058 ** (0.16)	2.443 ** (0.24)	2.062 ** (0.15)
Financial Depth (Private Domestic Credit to GDP, in logs)	0.631 ** (0.10)	0.354 ** (0.15)	0.402 ** (0.13)
Lack of Price Stability (inflation rate, in log[100+inf.rate])	-2.275 ** (0.37)	-1.434 ** (0.43)	-1.605 ** (0.34)
Government Burden (Government Consumption to GDP, in logs)	-1.488 ** (0.22)	-1.184 ** (0.24)	-1.460 ** (0.32)
<i>Openness:</i>			
Trade Openness (TO) (Real Exports and Imports to GDP, in logs)	0.403 ** (0.13)	0.449 ** (0.10)	-8.214 ** (0.77)
Financial Openness (FO) (Stock Equity-related Foreign liabilities to GDP, logs)	0.051 ** (0.01)	-2.274 ** (0.35)	-0.050 ** (0.01)
Openness * Inc	...	0.562 ** (0.10)	1.832 ** (0.19)
Openness * Inc squared	...	-0.031 ** (0.01)	-0.089 ** (0.01)
<i>Foreign Shocks:</i>			
Terms of Trade Shocks (Growth rate of Terms of Trade)	0.038 ** (0.01)	0.041 ** (0.01)	0.055 ** (0.01)
Foreign Growth (Growth rate of the country's trading partners)	1.536 ** (0.17)	1.749 ** (0.12)	1.666 ** (0.11)
Regional Capital Inflows (Private capital inflows to the country's region)	0.098 ** (0.02)	0.115 ** (0.03)	0.115 ** (0.03)
<i>Period Shifts</i>			
- 76-80 Period:	-1.119 **	-1.359 **	-1.110 **
- 81-85 Period:	-1.284 **	-1.627 **	-1.099 **
- 86-90 Period:	-1.865 **	-2.322 **	-1.873 **
- 91-95 Period:	-0.517 *	-0.832 **	-0.260
- 96-00 Period:	-1.843 **	-2.610 **	-1.609 **
Countries / Observations	76 / 438	76 / 438	76 / 438
Specification Tests (p-values)			
- Sargan Test	(0.41)	(0.18)	(0.45)
- 2nd. Order Correlation	(0.90)	(0.94)	(0.79)

*Numbers in parenthesis are robust standard errors. * (**) denotes statistical significance at the 10 (5) percent level.*

Table 4
Economic Growth and the Interaction between Openness and Foreign Shocks
Sample of 76 Countries, 1970-2000 (5-year period observations)
Dependent Variable: Growth in real GDP per capita
Estimation Method: GMM-IV System Estimator (Arellano and Bover, 1995; Blundell and Bond, 1998)

	[1] Terms of Trade Changes	[2] Foreign Growth	[3] World Int. Rate Changes	[4] Regional Capital Inflows
Foreign Shock:				
Constant	5.242 ** (2.41)	12.005 ** (2.94)	9.444 ** (2.44)	10.804 ** (3.06)
<u>Control Variables</u>				
Initial GDP per capita (in logs)	-0.138 * (0.09)	-0.280 ** (0.13)	-0.176 * (0.11)	-0.152 * (0.09)
Education (Secondary Enrollment, in logs)	1.284 ** (0.19)	1.419 ** (0.19)	1.110 ** (0.17)	0.977 ** (0.16)
Financial Depth (Private Domestic Credit to GDP, in logs)	0.592 ** (0.07)	0.669 ** (0.14)	0.578 ** (0.11)	0.628 ** (0.10)
Lack of Price Stability (inflation rate, in log[100+inf.rate])	-1.786 ** (0.39)	-3.936 ** (0.33)	-2.400 ** (0.42)	-2.733 ** (0.49)
Government Burden (Government Consumption to GDP, in logs)	-1.597 ** (0.24)	-1.523 ** (0.28)	-1.547 ** (0.26)	-1.384 ** (0.23)
<u>Openness:</u>				
Trade Openness (TO) (Real Exports and Imports to GDP, in logs)	0.133 * (0.08)	1.227 ** (0.46)	0.404 ** (0.12)	-0.190 (0.15)
Financial Openness (FO) (Stock Equity-related Foreign liabilities to GDP, logs)	0.080 ** (0.01)	-0.159 ** (0.04)	0.071 ** (0.01)	0.146 ** (0.02)
<u>Foreign Shocks:</u>				
Terms of Trade Shocks (Growth rate of Terms of Trade)	1.175 ** (0.12)	0.033 ** (0.01)	0.050 ** (0.01)	0.039 ** (0.01)
Foreign Growth (Growth rate of the country's trading partners)	1.703 ** (0.17)	2.756 ** (0.75)	1.499 ** (0.16)	1.618 ** (0.19)
Regional Capital Inflows (Private capital inflows to the country's region)	0.025 (0.02)	0.057 ** (0.01)	0.086 ** (0.02)	-0.374 ** (0.12)
<u>Interaction: Openness and Foreign Shock</u>				
TO * Foreign Shock	-0.276 ** (0.03)	-0.361 * (0.19)	0.397 ** (0.11)	0.151 ** (0.03)
FO * Foreign Shock	0.010 ** (0.00)	0.067 ** (0.02)	0.118 ** (0.02)	-0.043 ** (0.01)
<u>Period Shifts</u>				
- 76-80 Period:	-1.239 **	-1.087 **	-5.122 **	-0.993 **
- 81-85 Period:	-1.413 **	-1.290 **	-2.605 **	-1.099 **
- 86-90 Period:	-2.495 **	-1.807 **	-3.443 **	-1.638 **
- 91-95 Period:	-0.564 **	-0.545 *	-1.359 **	-0.169
- 96-00 Period:	-1.900 **	-1.911 **	-3.075 **	-1.604 **
Countries / Observations	76 / 438	76 / 438	76 / 438	76 / 438
Specification Tests (p-values)				
- Sargan Test	(0.22)	(0.38)	(0.37)	(0.38)
- 2nd. Order Correlation	(0.81)	(0.59)	(0.96)	(0.67)

Numbers in parenthesis are robust standard errors. * (**) denotes statistical significance at the 10 (5) percent level.

Table 5
Economic Growth and the Interaction between Openness and Foreign Shocks: Controlling for Macroeconomic Volatility

Sample of 76 Countries, 1970-2000 (5-year period observations)

Dependent Variable: Growth in real GDP per capita

Estimation Method: GMM-IV System Estimator (Arellano and Bover, 1995; Blundell and Bond, 1998)

	[1] Terms of Trade Changes	[2] Foreign Growth	[3] World Int. Rate Changes	[4] Regional Capital Inflows
Foreign Shock:				
Constant	0.139 (1.85)	1.107 (1.81)	2.011 (2.08)	4.385 ** (1.91)
<u>Control Variables</u>				
Initial GDP per capita (in logs)	-0.284 * (0.16)	-0.226 * (0.13)	-0.342 * (0.18)	-0.351 ** (0.13)
Education (Secondary Enrollment, in logs)	1.233 ** (0.20)	0.861 ** (0.12)	0.821 ** (0.19)	0.836 ** (0.12)
Financial Depth (Private Domestic Credit to GDP, in logs)	0.670 ** (0.18)	0.826 ** (0.15)	1.080 ** (0.18)	0.972 ** (0.16)
Lack of Price Stability (inflation rate, in log[100+inf.rate])	-0.390 (0.32)	-1.138 ** (0.17)	-0.522 * (0.35)	-0.999 ** (0.23)
Government Burden (Government Consumption to GDP, in logs)	-1.622 ** (0.26)	-1.583 ** (0.22)	-1.660 ** (0.30)	-1.345 ** (0.22)
<u>Openness:</u>				
Trade Openness (TO) (Real Exports and Imports to GDP, in logs)	0.573 ** (0.13)	1.380 ** (0.33)	0.616 ** (0.13)	0.118 (0.15)
Financial Openness (FO) (Stock Equity-related Foreign liabilities to GDP, logs)	0.029 ** (0.01)	-0.203 ** (0.03)	0.034 ** (0.01)	0.111 ** (0.01)
<u>Foreign Shocks:</u>				
Terms of Trade Shocks (Growth rate of Terms of Trade)	0.917 ** (0.15)	0.038 ** (0.01)	0.042 ** (0.01)	0.036 ** (0.01)
Foreign Growth (Growth rate of the country's trading partners)	1.457 ** (0.17)	2.573 ** (0.50)	1.457 ** (0.16)	1.477 ** (0.16)
Regional Capital Inflows (Private capital inflows to the country's region)	0.029 (0.03)	0.049 ** (0.02)	0.063 ** (0.03)	-0.233 * (0.14)
<u>Interaction: Openness and Foreign Shock</u>				
TO * Foreign Shock	-0.215 ** (0.04)	-0.346 ** (0.12)	0.311 ** (0.13)	0.105 ** (0.04)
FO * Foreign Shock	0.004 ** (0.00)	0.089 ** (0.01)	0.101 ** (0.02)	-0.039 ** (0.01)
<u>Macroeconomic Volatility</u>				
Std. Dev. Growth	-0.380 ** (0.02)	-0.401 ** (0.02)	-0.354 ** (0.02)	-0.395 ** (0.02)
<u>Period Shifts</u>				
- 76-80 Period:	-1.324 **	-1.187 **	-4.458 **	-1.252 **
- 81-85 Period:	-1.704 **	-1.491 **	-2.587 **	-1.486 **
- 86-90 Period:	-2.624 **	-2.099 **	-3.512 **	-2.043 **
- 91-95 Period:	-0.974 **	-0.629 *	-1.306 **	-0.497
- 96-00 Period:	-2.457 **	-2.173 **	-3.200 **	-2.093 **
Countries / Observations	76 / 438	76 / 438	76 / 438	76 / 438
Specification Tests (p-values)				
- Sargan Test	(0.22)	(0.27)	(0.24)	(0.46)
- 2nd. Order Correlation	(0.94)	(0.62)	(0.78)	(0.74)

Numbers in parenthesis are robust standard errors. * (**) denotes statistical significance at the 10 (5) percent level.

Table 6
Growth Volatility, Trade Openness, Financial Openness and Foreign Shocks

Sample of 76 Countries, 1970-2000 (5-year period observations)

Dependent Variable: Standard Deviation of Growth in Real GDP per capita

Estimation Method: GMM-IV System Estimator (Arellano and Bover, 1995; Blundell and Bond, 1998)

Measures of Trade and Financial Openness:	Baseline Regression	Non-Linear Effects	
		Financial	Trade
Constant	-0.682 ** (0.30)	-1.254 ** (0.37)	0.773 * (0.44)
<i>Control Variables</i>			
Inflation Volatility (S.D. annual log differences of CPI)	0.006 ** (0.00)	0.007 ** (0.00)	0.005 ** (0.00)
RER Overvaluation (Proportional index, overvaluation if >100)	0.004 ** (0.00)	0.003 ** (0.00)	0.003 ** (0.00)
Systemic Banking Crises (Frequency of years under crises: 0-1)	1.303 ** (0.13)	1.341 ** (0.14)	0.973 ** (0.14)
<i>Openness:</i>			
Trade Openness (TO) (Real Exports and Imports to GDP, in logs)	0.543 ** (0.07)	0.664 ** (0.08)	-0.658 * (0.39)
Financial Openness (FO) (Stock Equity-related Foreign liabilities to GDP, logs)	-0.088 ** (0.01)	-4.206 ** (0.32)	-0.097 ** (0.01)
Openness * Inc	...	0.977 ** (0.09)	0.277 ** (0.11)
Openness * Inc squared	...	-0.057 ** (0.01)	-0.020 ** (0.01)
<i>Volatility of Foreign Shocks</i>			
Volatility of Terms of Trade Changes (S.D. annual log differences of ToT)	0.075 ** (0.00)	0.075 ** (0.00)	0.072 ** (0.00)
Volatility of Foreign Growth Volatility (S.D. annual log differences of Foreign Growth)	0.246 ** (0.07)	0.312 ** (0.07)	0.109 (0.12)
Volatility of Regional Capital Inflows (S.D. ratio of Regional Capital Flows to GDP)	0.350 ** (0.04)	0.332 ** (0.04)	0.322 ** (0.04)
<i>Period Shifts</i>			
- 81-85 Period:	-0.286	-0.093	-0.081
- 86-90 Period:	-0.533	-0.339 **	-0.436 **
- 91-95 Period:	-0.223	-0.053	-0.096
- 96-00 Period:	-1.101 **	-0.869 **	-0.977 **
Countries / Observations	76 / 371	76 / 371	76 / 371
Specification Tests (p-values)			
- Sargan Test	(0.21)	(0.728)	(0.518)
- 2nd. Order Correlation	(0.92)	(0.855)	(0.990)

Numbers in parenthesis are robust standard errors. * (**) denotes statistical significance at the 10 (5) percent level.

Table 7
Growth Volatility and the Interaction between Openness and the Volatility of Foreign Shocks

Sample of 76 Countries, 1970-2000 (5-year period observations)

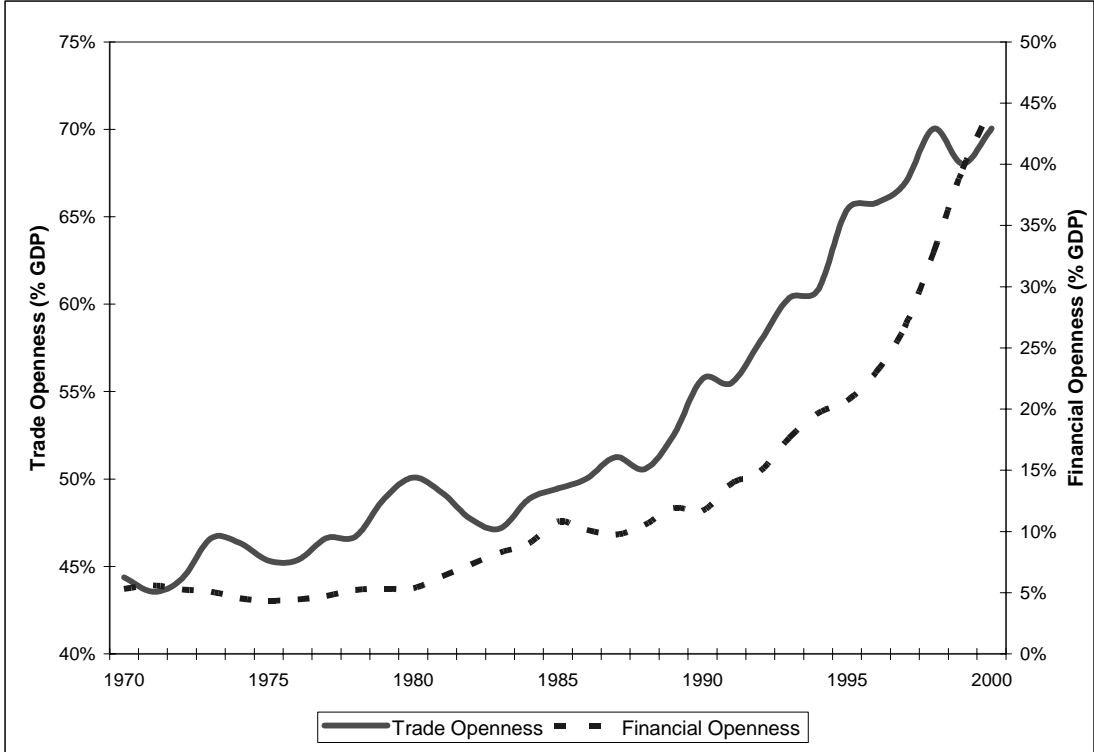
Dependent Variable: Standard Deviation of Growth in Real GDP per capita

Estimation Method: GMM-IV System Estimator (Arellano and Bover, 1995; Blundell and Bond, 1998)

	[1]	[2]	[3]	[4]
Foreign Shock:	Terms of Trade Changes	Foreign Growth	World Int. Rate Changes	Regional Capital Inflows
Constant	-2.005 ** (0.32)	1.995 ** (0.67)	-0.142 (0.41)	-1.917 ** (0.44)
<u>Control Variables</u>				
Inflation Volatility (S.D. annual log differences of CPI)	0.007 ** (0.00)	0.006 ** (0.00)	0.004 ** (0.00)	0.008 ** (0.00)
RER Overvaluation (Proportional index, overvaluation if >100)	0.002 ** (0.00)	0.003 ** (0.00)	0.004 ** (0.00)	0.002 ** (0.00)
Systemic Banking Crises (Frequency of years under crises: 0-1)	1.346 ** (0.10)	1.360 ** (0.12)	1.228 ** (0.14)	1.391 ** (0.10)
<u>Openness:</u>				
Trade Openness (TO) (Real Exports and Imports to GDP, in logs)	0.941 ** (0.08)	-0.266 * (0.16)	0.438 ** (0.13)	0.919 ** (0.11)
Financial Openness (FO) (Stock Equity-related Foreign liabilities to GDP, logs)	-0.092 ** (0.01)	-0.018 (0.02)	-0.018 (0.01)	-0.138 ** (0.01)
<u>Volatility of Foreign Shocks</u>				
Volatility of Terms of Trade Changes (S.D. annual log differences of ToT)	0.079 ** (0.00)	0.077 ** (0.00)	0.074 ** (0.00)	0.072 ** (0.00)
Volatility of Foreign Growth Volatility (S.D. annual log differences of Foreign Growth)	0.237 ** (0.07)	-2.147 ** (0.50)	0.432 ** (0.10)	0.315 ** (0.07)
Volatility of Regional Capital Inflows (S.D. ratio of Regional Capital Flows to GDP)	0.325 ** (0.03)	0.413 ** (0.05)	0.331 ** (0.04)	0.366 * (0.23)
<u>Interaction: Openness and Vol. Foreign Shock</u>				
TO * Vol(Foreign Shock)	-0.010 ** (0.00)	0.727 ** (0.12)	-0.128 (0.15)	0.005 (0.06)
FO * Vol(Foreign Shock)	-0.006 ** (0.00)	-0.146 ** (0.02)	-0.152 ** (0.01)	-0.019 ** (0.00)
<u>Period Shifts</u>				
- 81-85 Period:	-0.361 **	-0.181 **	0.217	-0.315 **
- 86-90 Period:	-0.587 **	-0.461 **	-0.372 **	-0.523 **
- 91-95 Period:	-0.366 **	-0.187 **	0.162	-0.221 **
- 96-00 Period:	-1.289 **	-0.904 **	-1.250 **	-1.111 **
Countries / Observations	76 / 371	76 / 371	76 / 371	76 / 371
Specification Tests (p-values)				
- Sargan Test	(0.22)	(0.37)	(0.48)	(0.19)
- 2nd. Order Correlation	(0.85)	(0.86)	(0.84)	(0.88)

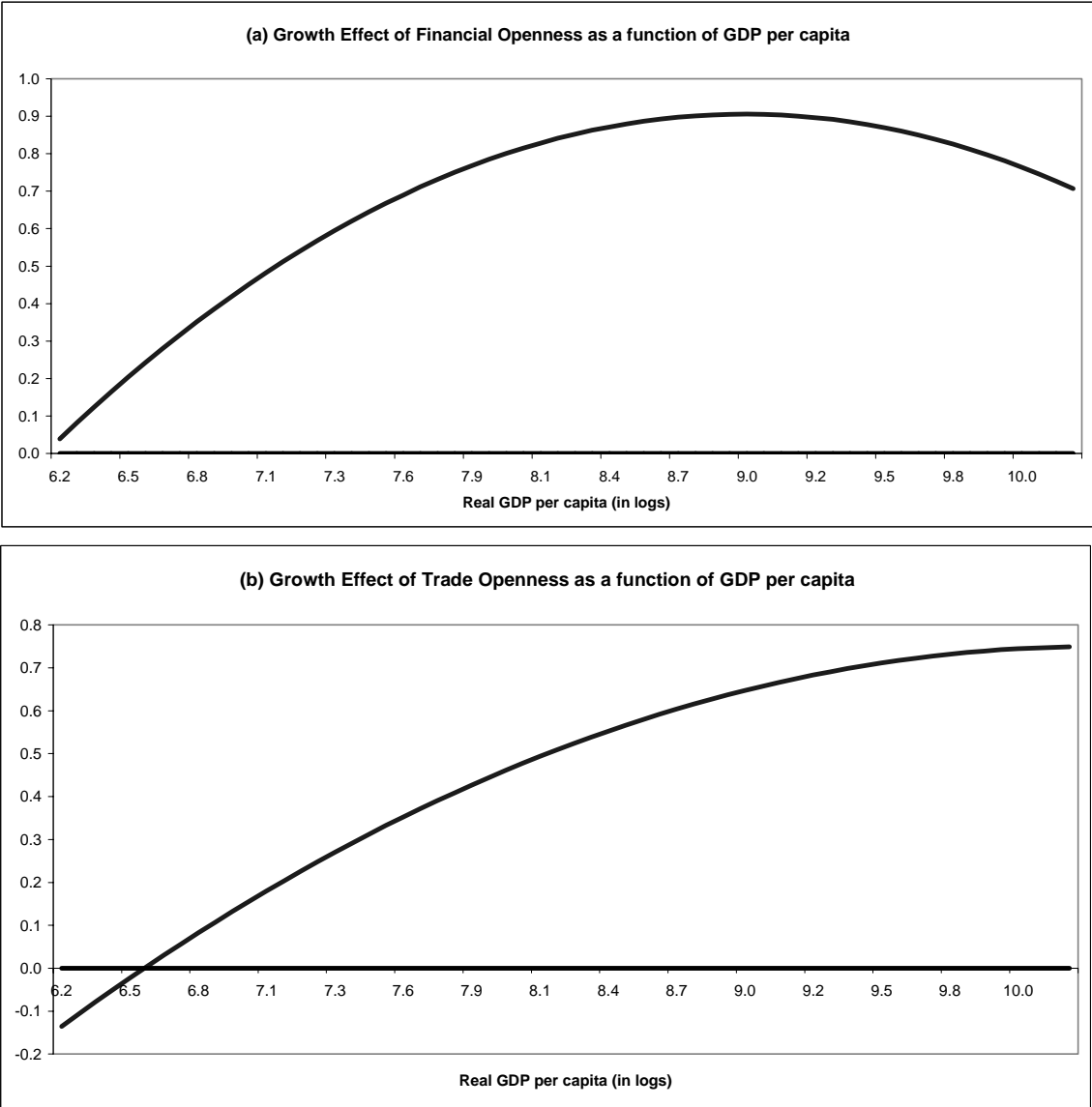
Numbers in parenthesis are robust standard errors. * (**) denotes statistical significance at the 10 (5) percent level.

Figure 1
Trends in Openness, 1970-2000



Note: Openness measures are defined as the ratio of real exports and imports to GDP (trade) and equity-based foreign liabilities to GDP (financial). World medians are calculated from data for 76 countries.

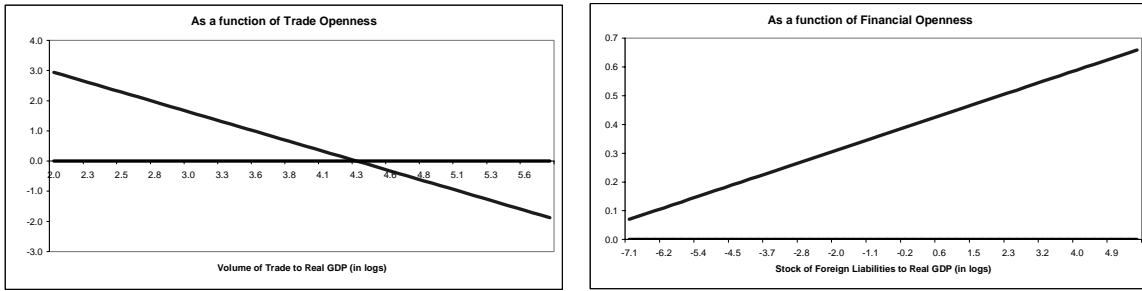
Figure 2
Growth Effect of Openness as a function to GDP per capita 1/



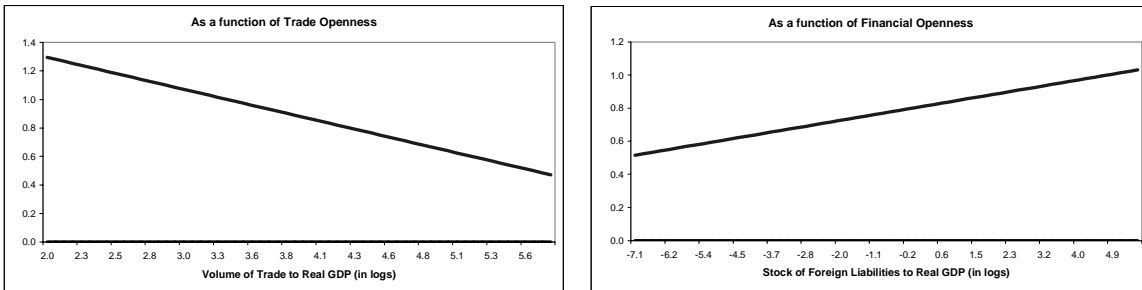
1/ Growth effect of a one standard deviation increase in financial and trade openness. See Table A.3 for the computed standard deviations.

Figure 3
Growth Effect of External Shocks as a Function of Openness 1/

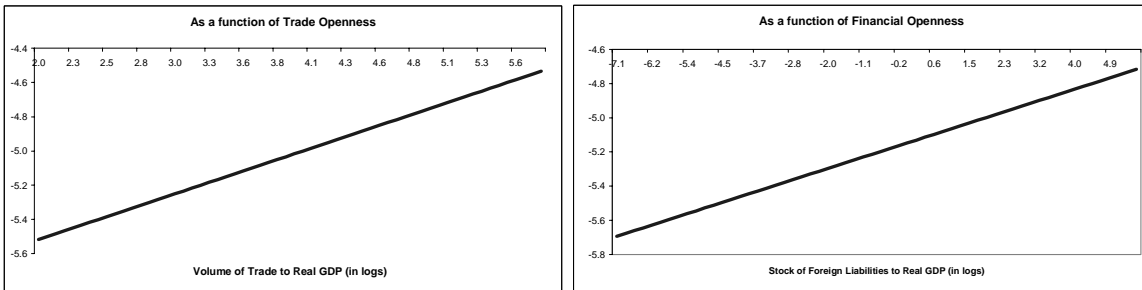
(a) Growth Effect of Terms of Trade Changes



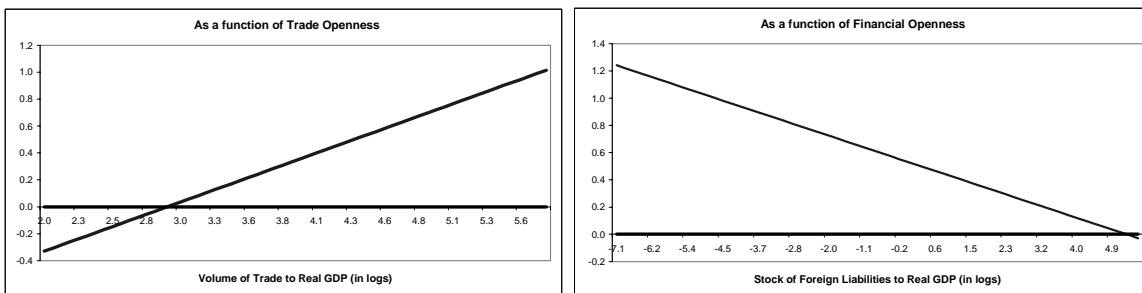
(b) Growth Effect of Foreign Growth



(c) Growth Effect of World Interest Rate Changes

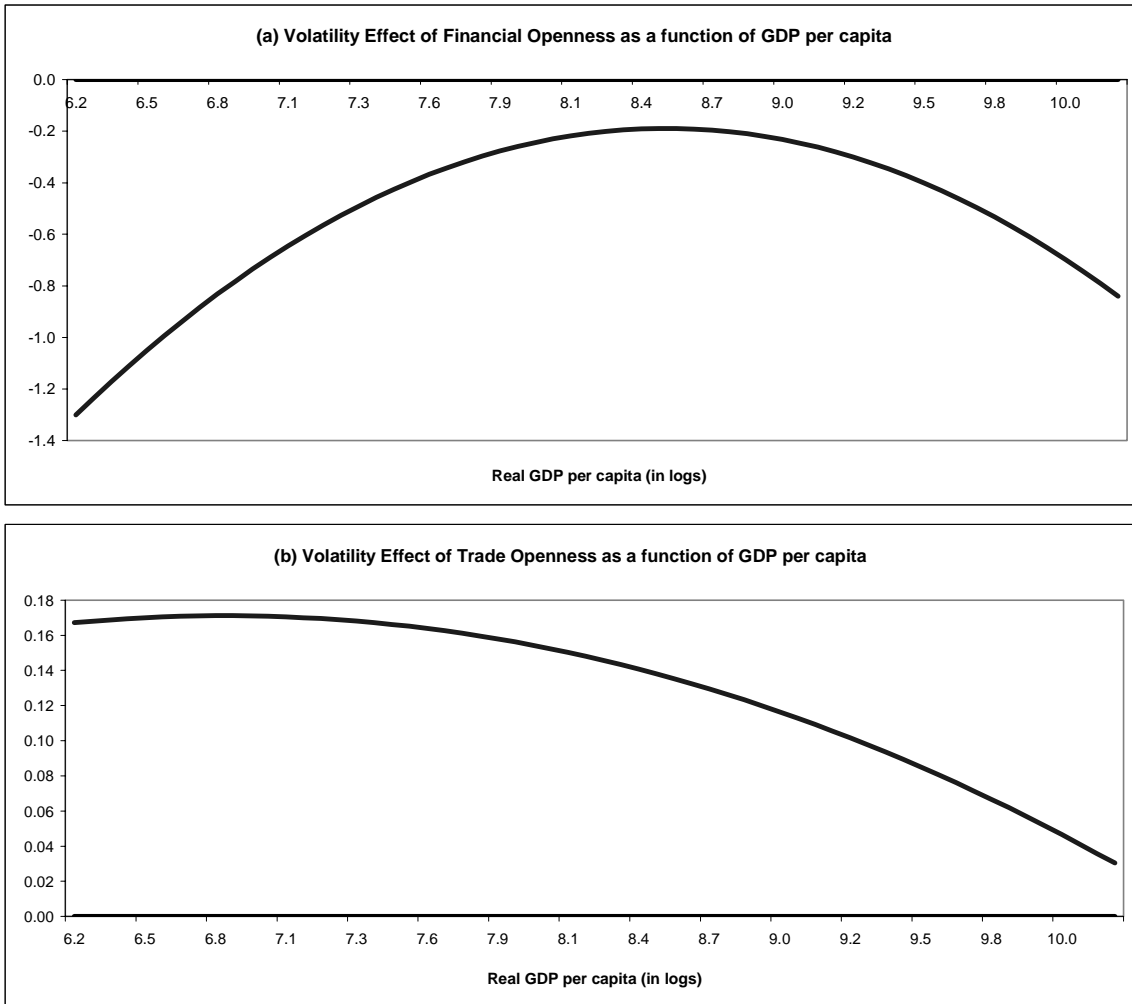


(d) Growth Effect of Regional Capital Flows



1/ Growth effect of a one standard deviation increase in the corresponding external shock. See Table A.3 for the computed standard deviations of these shocks.

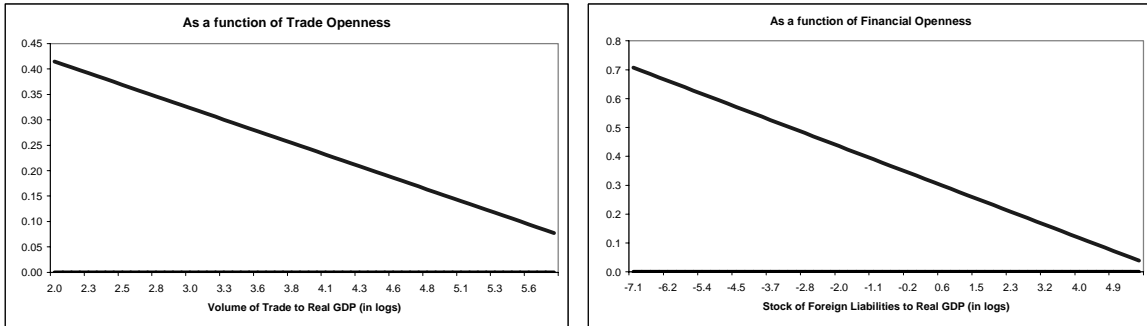
Figure 4
Volatility Effect of Openness as a function to GDP per capita 1/



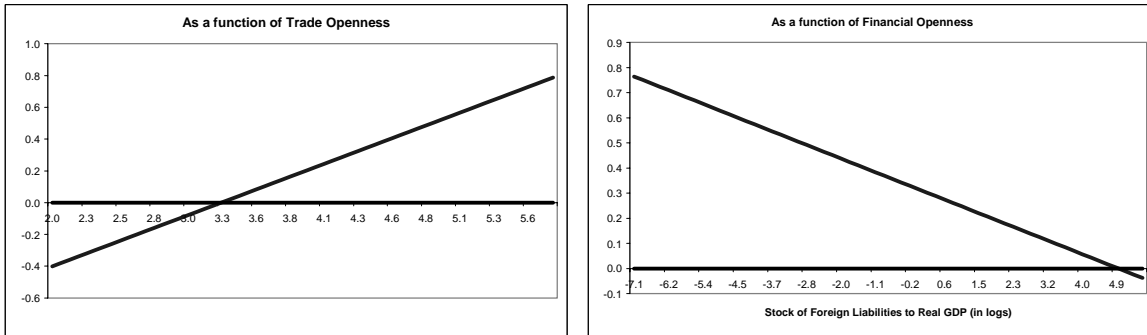
1/ Volatility effect of a one standard deviation increase in financial and trade openness. See Table A.4 for the computed standard deviations.

Figure 5
Volatility Effect of External Shocks as a Function of Openness 1/

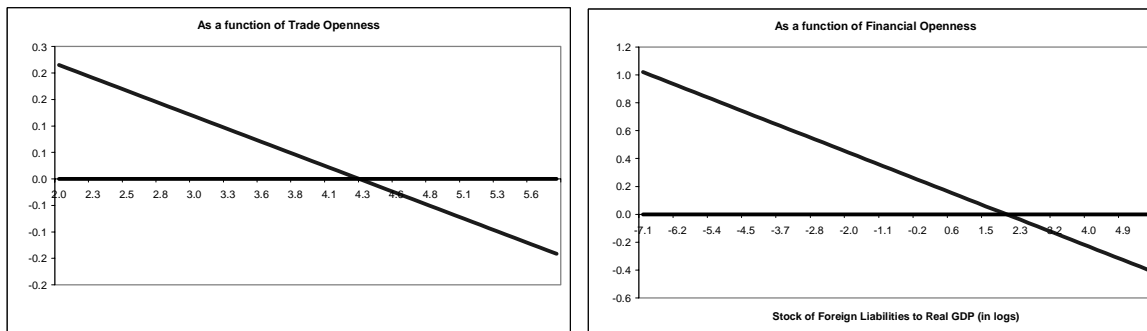
(a) Volatility Effect of Volatility in Terms of Trade Changes



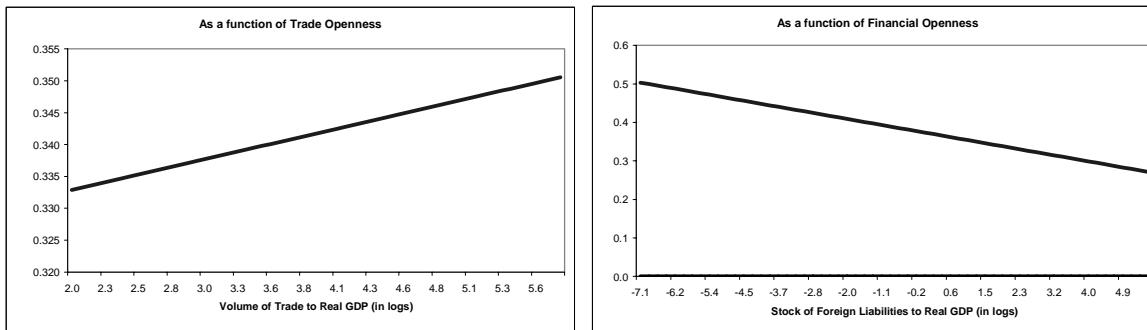
(b) Volatility Effect of Volatility of Foreign Growth



(c) Volatility Effect of Volatility of World Interest Rate Changes



(d) Volatility Effect of Volatility of Regional Capital Flows



1/ Volatility effect of a one standard deviation increase in the volatility of the external shock. See Table A.4 for the computed standard deviations of these shocks.

Appendix 1: Sample of countries

I. Industrial Economies (22 countries)		
Australia	Germany	Norway
Austria	Greece	Portugal
Belgium	Iceland	Spain
Canada	Ireland	Sweden
Denmark	Italy	Switzerland
Finland	Japan	United Kingdom
France	Netherlands	United States
	New Zealand	
II. Latin America and the Caribbean (21 countries)		
Argentina	Ecuador	Nicaragua
Bolivia	El Salvador	Panama
Brazil	Guatemala	Paraguay
Chile	Haiti	Peru
Colombia	Honduras	Trinidad and Tobago
Costa Rica	Jamaica	Uruguay
Dominican Republic	Mexico	Venezuela, RB
III. East Asia and the Pacific (8 countries)		
China	Malaysia	Singapore
Indonesia	Papua New Guinea	Thailand
Korea, Rep.	Philippines	
IV. Middle East and North Africa (7 countries)		
Algeria	Israel	Tunisia
Egypt, Arab Rep.	Jordan	Turkey
	Morocco	
V. South Asia (3 countries)		
India	Pakistan	Sri Lanka
VI. Sub-Saharan Africa (15 countries)		
Botswana	Madagascar	Sierra Leone
Cote d'Ivoire	Malawi	South Africa
Gambia, The	Niger	Togo
Ghana	Nigeria	Zambia
Kenya	Senegal	Zimbabwe

Appendix 2: Definitions and Sources of Variables Used in Regression Analysis

Variable	Definition and Construction	Source
GDP per capita	Ratio of total GDP to total population. GDP is in 1985 PPP-adjusted US\$.	Authors' construction using Summers and Heston (1991) and The World Bank (2003).
GDP per capita growth	Log difference of real GDP per capita.	Authors' construction using Summers and Heston (1991) and The World Bank (2003).
Initial GDP per capita	Initial value of ratio of total GDP to total population. GDP is in 1985 PPP-adjusted US\$.	Authors' construction using Summers and Heston (1991) and The World Bank (2003).
Education	Ratio of total secondary enrollment, regardless of age, to the population of the age group that officially corresponds to that level of education.	Easterly and Sewadeh (2002) and The World Bank (2003).
Financial Depth	Ratio of domestic credit claims on private sector to GDP	Author's calculations using data from IFS, the publications of the Central Bank and PWD. The method of calculations is based on Beck, Demiguc-Kunt and Levine (1999).
Trade Openness	Log of the ratio of exports and imports (in 1995 US\$) to GDP (in 1995 US\$).	Easterly and Sewadeh (2002) and The World Bank (2003).
Financial Openness	Log of the Stock of Equity-based Foreign Liabilities to GDP (both expressed in 1995 US\$). Following Eichengreen and Irwin (1998), we add the value of 1 to the stock in order to include the cases where the stock of foreign liabilities is 0.	Lane and Milesi-Ferreti (2001, 2003), IMF's Balance of Payments Statistics
Government Burden	Log of the Ratio of government consumption to GDP.	The World Bank (2003).
CPI	Consumer price index (1995 = 100) at the end of the year	Author's calculations with data from IFS.
Inflation rate	Log differences of CPI	Author's calculations with data from IFS.
Real Exchange Rate	Real Effective Exchange Rate, with the level adjusted such that the average for 1976-85 equals Dollar's (1992) index of overvaluation (based on the ratio of actual to income-adjusted Summers-Heston purchasing power parity comparisons).	Easterly (2001)
Overvaluation		
Terms of Trade	Net barter terms of trade index (1995=100)	The World Bank (2003).
Terms of Trade Changes	Log differences of the terms of trade index	Authors' construction using The World Bank (2003).
Foreign Growth	Growth of main trading partners calculated as the trade-weighted growth for the main trading partners of the corresponding country.	Authors' construction using Summers and Heston (1991), The World Bank (2003), and the IMF's Direction of Trade Statistics.
World Nominal Interest Rate	G-3 (U.S., Germany and Japan) Money Market Rate (period average)	Author's calculations with data from IFS.
World Inflation	G-3 (U.S., Germany and Japan) Consumer Price Index (CPI) Inflation rate	Author's calculations with data from IFS.
World Real Interest Rate	World Nominal Interest Rate adjusted by World Inflation.	Author's calculations with data from IFS.
Regional Capital Inflows	(Gross) Capital Inflows (FDI, portfolio-equity, loans) to the region of the corresponding country, as a percentage to the corresponding GDP.	Author's calculations with data from the IMF's Balance of Payments Statistics.
Inflation Volatility	Standard deviation of the annual log differences of CPI	Authors' construction using The World Bank (2003).
Systemic Banking Crises	Number of years in which a country underwent systemic banking crisis, as a fraction of years in the corresponding period.	Author's calculations using data from Caprio and Klingebiel (1999), and Kaminsky and Reinhart (1998).
Volatility of Terms of Trade Changes	Standard deviation of the annual log differences of the terms of trade.	Authors' construction using The World Bank (2003).
Volatility of Foreign Growth	Standard deviation of the trade-weighted annual growth of the main trading partners of the corresponding country.	Authors' construction using Summers and Heston (1991), The World Bank (2003), and the IMF's Direction of Trade Statistics.
Volatility of World Real Interest Rates	Standard deviation of the world real interest rate annual changes.	Author's calculations with data from the IMF's Balance of Payments Statistics.
Volatility of Regional Capital Inflows	Standard deviation of the capital inflows to region of the corresponding country relative to its regional GDP.	Author's calculations with data from the IMF's Balance of Payments Statistics.
Period-specific Shifts	Time dummy variables.	Authors' construction.

Appendix 3: Descriptive Statistics for Growth Regressions

Data in 5-year period averages, 76 countries, 438 observations

(a) Univariate

Variable	Mean	Std. Dev.	Minimum	Maximum
Growth rate of GDP per capita	1.422	2.642	-7.944	10.128
Initial GDP per capita (in logs)	8.522	0.989	6.243	10.240
Secondary enrollment (in logs)	3.739	0.788	0.113	4.923
Private domestic credit/GDP (in logs)	3.485	0.844	0.568	5.435
Inflation (in log [100+inf. rate])	4.743	0.175	4.585	6.135
Government consumption /GDP (in logs)	2.680	0.371	1.475	3.637
Trade Openness	3.948	0.594	2.024	5.787
Financial Openness	1.689	3.779	-21.044	5.536
Terms of Trade Changes	-0.424	4.644	-18.859	21.415
Foreign Growth	2.244	0.606	0.834	3.833
World Int. Rate Changes	-0.017	0.658	-0.975	1.505
Regional Capital Flows / GDP	3.419	2.359	-1.635	10.336

(b) Bivariate Correlations between Growth and Determinants

Variable	Growth rate of GDP per capita	Initial GDP per capita (in logs)	Secondary enrollment (in logs)	Private domestic credit/GDP (in logs)	Inflation (in log [100+inf. rate])	Government consumption /GDP (in logs)	Trade Openness	Financial Openness	Terms of Trade Changes	Foreign Growth	World Int. Rate Changes	Regional Capital Inflows/GDP
Growth rate of GDP per capita	1.00											
Initial GDP per capita (in logs)	0.19	1.00										
Secondary enrollment (in logs)	0.22	0.80	1.00									
Private domestic credit/GDP (in logs)	0.25	0.71	0.61	1.00								
Inflation (in log [100+inf. rate])	-0.29	-0.10	0.00	-0.35	1.00							
Government consumption /GDP (in logs)	-0.03	0.36	0.29	0.35	-0.10	1.00						
Trade Openness	-0.04	-0.14	-0.13	0.01	-0.30	0.27	1.00					
Financial Openness	0.15	0.34	0.44	0.28	0.04	0.03	-0.11	1.00				
Terms of Trade Changes	0.10	0.07	0.03	0.04	-0.12	-0.04	0.08	0.06	1.00			
Foreign Growth	0.28	-0.14	-0.24	-0.12	-0.17	-0.15	-0.12	-0.23	0.08	1.00		
World Int. Rate Changes	0.04	-0.01	-0.02	0.00	0.03	0.05	-0.01	0.03	0.20	0.29	1.00	
Regional Capital Inflows / GDP	0.19	0.44	0.34	0.41	-0.29	0.18	0.12	0.17	0.11	-0.14	0.06	1.00

Appendix 4: Descriptive Statistics for Growth Volatility Regressions

Data in 5-year period averages, 76 countries, 371 observations

(a) Univariate

Variable	Mean	Std. Dev.	Minimum	Maximum
Growth Volatility	2.887	2.190	0.314	16.053
Inflation Volatility	8.681	19.193	0.198	168.127
RER Overvaluation	107.417	44.123	47.192	555.027
Systemic Banking Crises	0.138	0.286	0.000	1.000
Trade Openness	3.968	0.569	2.249	5.781
Financial Openness	2.085	3.027	-21.044	5.536
Volatility of Terms of Trade Changes	8.476	8.628	0.000	56.323
Volatility of Foreign Growth	1.000	0.434	0.214	2.438
Volatility of World Int. Rate Changes	1.056	0.737	0.303	2.849
Volatility of Regional Capital Inflows/GDP	1.424	0.969	0.139	4.444

(b) Bivariate Correlations between Growth Volatility and Determinants

Variable	Growth Volatility	Inflation Volatility	RER Overvaluation	Systemic Banking Crises	Trade Openness	Financial Openness	Volatility of Terms of Trade Changes	Volatility of Foreign Growth	Volatility of World Int. Rate Changes	Volatility of Regional Capital Inflows/GDP
Growth Volatility	1.00									
Inflation Volatility	0.24	1.00								
RER Overvaluation	0.08	0.13	1.00							
Systemic Banking Crises	0.11	0.24	0.04	1.00						
Trade Openness	0.05	-0.24	0.09	-0.09	1.00					
Financial Openness	-0.30	-0.03	-0.09	0.07	-0.05	1.00				
Volatility of Terms of Trade Changes	0.36	0.27	0.16	0.03	0.01	-0.30	1.00			
Volatility of Foreign Growth	0.18	0.02	-0.05	-0.14	-0.15	-0.18	0.12	1.00		
Volatility of World Int. Rate Changes	0.15	0.02	-0.05	-0.16	-0.13	-0.24	0.15	0.87	1.00	
Volatility of Regional Capital Inflows/GDP	0.12	0.16	0.10	0.19	0.04	0.10	-0.08	-0.07	-0.23	1.00