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## **EXTERNAL CONDITIONS AND GROWTH PERFORMANCE**

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## **EXTERNAL CONDITIONS AND GROWTH PERFORMANCE**

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### **Resumen**

El presente artículo evalúa la influencia de las condiciones externas y de la integración internacional sobre el crecimiento económico usando métodos de panel para un conjunto amplio de países. Controlando por las condiciones domésticas, se examinan sobre el crecimiento de la integración comercial y financiera así como el de cuatro tipos de choques externos: variaciones en los términos de intercambio, el crecimiento de los principales socios comerciales, fluctuaciones en las tasas de interés internacionales, y los flujos netos de capital regionales. Analizamos la posibilidad de no linealidades al permitir que el efecto de la apertura sobre el crecimiento varíe de acuerdo al nivel de desarrollo económico y que el efecto de los choques externos dependa del grado de integración comercial y financiera. Nuestros resultados confirman la existencia de efectos no-monotónicos de la apertura sobre el crecimiento. Asimismo, hallamos que la apertura comercial tiende a reducir el efecto de choques relacionados al comercio internacional y a amplificar los choques relacionados a mercados financieros. Por otra parte, la apertura financiera tiende a presentar el efecto opuesto

### **Abstract**

This paper provides an empirical evaluation of the influence of external conditions and international integration on growth performance, using panel methods for a large cross-country data set. Controlling for domestic conditions, the paper examines the growth effects of trade and financial integration as well as four types of foreign shocks: terms of trade changes, trading partners' GDP growth, changes in international real interest rates, and net regional capital inflows. We analyze the possibility of non-linearities by allowing the growth 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 non-monotonic effects of openness, in the sense that the growth effects of trade and financial openness increase with the level of development, tapering off for high levels of income. In addition, the paper finds that trade openness tends to dampen the growth effect of trade-related shocks while amplifying the shocks related to financial markets. Interestingly, financial openness tends to have the opposite effect.

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## I. Introduction

A central dimension of globalization is the world trend toward larger trade and financial openness, observed in most industrial and developing economies. Openness leads to higher integration of world goods and capital markets, contributing to potential gains in growth and welfare. However, higher integration may also lead to heightened vulnerability to external shocks. This vulnerability may be particularly important in developing countries, due to their production specialization, non-diversified sources of income, unstable policies, incomplete financial markets, and weak institutions.

A growing empirical literature is addressing the links between trade openness and growth, financial openness and growth, and external shocks and growth.<sup>1</sup> Earlier work on trade openness finds significant, positive, and often very large effects of trade openness on growth, income levels, or income convergence. See, among others, Dollar (1992), Ben-David (1993), Sachs and Warner (1995), Edwards (1998), Frankel and Romer (1999); and Edwards (1993), which reviews earlier work. Much of this research has been subsequently criticized for possible bias stemming from endogeneity of trade to income levels or GDP growth, lack of robustness due to exclusion of relevant controls, and use of inadequate data samples and estimation techniques. Rodrik and Rodriguez (2000) report that the trade openness effects on growth are not robust to the inclusion of the country's geographic latitude, and Rodrik et al. (2003) find that this effect is not robust to inclusion of institutional quality. Rigobon and Rodrik (2004), based on a technique of simultaneous-equation identification through heteroskedasticity, is a recent study reporting negative significant effects of trade openness on per capita income levels, controlling for institutions and geography.

On the other side of the distribution, some recent work reports significant and robust effects of trade openness on growth or income levels, even controlling for the common criticisms of omitted variables and endogeneity. See, for instance, Wacziarg (2001), Irwin and Terviö (2002), Alcalá and Ciccone (2004), Kose, Prasad, and Terrones (2004). Other recent work reports more qualified results: while trade openness effects are not robust in

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<sup>1</sup> Both strands of work are based on either one of 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.

cross-section estimations, they are significant in panel studies and robust to inclusion of institutional variables. This is the case of, for instance, Dollar and Kraay (2003) and 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 trade openness measures and other variables. Kose, Prasad, and Terrones (2004) report robust positive effects of trade openness on growth and find that trade openness turns the negative effect of volatility on growth into a positive one. Alesina, Spolaore, and Wacziarg (2004) study the interaction between trade openness and country size and find that trade openness has large effects in small countries but these effects become zero as country size tends to maximum values in their sample.

The shorter literature on financial openness-growth links also shows mixed results. While Quinn (1997) and Edison, Klein, Ricci, and Slok (2002) report positive significant growth effects of international financial integration for the world at large, others do not find any evidence or reject robust evidence of such effects, including Grilli and Milesi-Ferretti (1995), Kraay (1998), Rodrik (1998), and O'Donnell (2001) (Edison, Klein, Ricci, and Slok 2002 provide a survey). Some studies have tested for the interaction between financial openness and other variables in order to consider non-linearities and non-monotonicities in the relationship between financial openness and growth. Here the general finding is that financial openness and external financial liberalization tend to reduce growth in countries that are 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 financial openness tends to raise growth in countries with the opposite features. Klein (2003) reports quadratic interaction terms of financial openness with government quality and with per capita GDP, concluding that financial openness only raises growth in middle-income countries. Finally Kose, Prasad, and Terrones (2004), complementing their work on trade openness-growth links, do not find any robust growth effects of financial openness separately but, interestingly, show that sufficiently high international financial integration turns the negative effect of volatility on growth into a positive one.

External factors 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 with some monopoly or monopsony power in international markets –reflecting their size and/or their specialization in trading differentiated goods or services– quantities matter for domestic performance too. However, in order to examine the growth impact of external quantity variables, it is necessary to isolate its exogenous component as the relevant predetermined variable. In this vein, the world or regional supply of capital could be an adequate proxy for the supply of capital to the domestic economy, while average growth of all trading partners could be an adequate proxy for the foreign demand of exports from the domestic economy.

Most empirical growth studies use one or two external variables as controls for foreign shocks.<sup>2</sup> The rate of growth of the terms of trade is the most widely used measure of foreign shocks (among representative studies, see Easterly, Loayza, and Montiel 1997, Fernández-Arias and Montiel 2002, Loayza, Fajnzylber, and Calderón 2004, Barro and Sala-i-Martin 2004). In most studies positive terms-of-trade shocks turn out to be significantly positive determinants of growth. Other studies consider the rate of growth of trading partners as the relevant foreign shock. For instance, Arora and Vamvakidis (2004) find that a 1 percentage point increase in economic growth of the country's trading partners leads to an increase in domestic growth of 0.8 percentage points. They argue that this result is consistent with the literature on the impact of cross-country spillovers (Arora and Vamvakidis 2003; Ahmed and Loungani 1999).

Blankenau et al. (2001) finds that foreign real interest rate shocks explain almost one-third of output fluctuations in small open economies as well as more than half of their fluctuations in net exports and net foreign assets. Other studies have included the ratio of

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<sup>2</sup> 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 growth studies choose the first.

private capital inflows to GDP as a growth determinant and have also evaluated the impact of different types of capital flows on growth. Among them, see Bosworth and Collins (1999), Mody and Murshid (2002), and 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.<sup>3</sup>

From our brief review we conclude that the existing literature does not provide a systematic and symmetric empirical analysis of (i) the relationships between economic growth and both financial and trade openness, (ii) the role of external vulnerability reflected by foreign shocks (financial and real, price and exogenous determinants of quantity) and their influence on growth, and (iii) the interaction effects between openness measures and the corresponding foreign shocks on growth performance. This paper addresses some of these issues.

Section II presents the empirical methodology, the data sample, and the panel-data regression results on economic growth. There, we report first the simple growth effects of trade and financial openness, as well as various external shocks; second, the dependence of the growth effect of trade and financial openness on the level of per capita income; and third, the amplification or dampening of the effects of external shocks depending on the degree of trade and financial openness. Section III concludes briefly.

## **II. Empirical Analysis**

Our empirical analysis focuses on the effects that openness and external shocks have on average economic growth. For this purpose, first, we study the simple linear effects of trade and financial openness as well as various external shocks. Second, we assess the dependence of the effect of trade and financial openness on the level of per capita income. And third, we examine the amplification or reduction of the effect of external shocks depending on the degree of trade and financial openness.

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<sup>3</sup> 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.

## A. Methodology

We work with a pooled data set of cross-country and time-series observations (data details are given below). 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.  $X$  is a set of time- and country-varying explanatory variables, proxies of trade and financial openness, measures of various external shocks, interaction terms, and control variables, while  $\beta$  is the vector of coefficients to be estimated. Finally,  $\mu_t$  is an unobserved time-specific effect,  $\eta_i$  is an unobserved country-specific effect, and  $\varepsilon$  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. Then, 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  $\varepsilon$ .

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  $\varepsilon$  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. Sample and Results**

We estimate economic growth regressions on a pooled (cross-country, time-series) data set consisting of 76 countries and, for each of them, at most 6 non-overlapping five-year periods over 1970-2000. 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 Appendix 3 presents basic descriptive statistics for the data used in the 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 effect of actual exposure to international markets on economic growth, 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, its interaction with the measures of trade and financial openness can be considered.

### ***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 Table 1. We find that both trade and financial openness are positively related to economic growth. As mentioned in the introduction, the effect of openness 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 openness 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 openness 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

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

Table 2 presents the estimation results. We consider the interaction between per capita GDP and the 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 1 shows the results when financial openness is interacted with income, and column 2, 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 openness indicator by itself is negative and significant, and the coefficients on the linear and quadratic interaction terms are significantly positive and negative, respectively. The growth effect of openness then depends 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 1 illustrates what the estimated pattern of coefficients implies for the change in growth produced by an increase in each openness measure. Specifically, Figure 1 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 openness, 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 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 openness, 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 financial openness for low-income countries; and we differ from Klein (2003) in that we find that the growth effects of financial openness 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) 0.7 percentage points for countries in the 25% percentile of the world distribution of output per capita for the 1996-00 period (Honduras and Zimbabwe), (b) 0.85 percentage points for countries in the 75% percentile (Spain and Israel, and (c) 0.76 percentage points for countries in the 95% percentile (Japan). Note that the highest growth effect of international financial integration (0.9 percentage points) is achieved by middle-income countries in the 67% percentile—that is, Chile, Mexico, and South Africa. Similarly, an analogous increase in the degree of trade openness will generate an increase in the growth rate of GDP per capita of 0.4 pp for countries in the 25% percentile, 0.57 pp. for median countries (e.g. Paraguay and Tunisia), 0.7 pp for countries in the 75% percentile, and 0.75 pp for countries in the 95% percentile of the world distribution of output per capita.

### ***The Interaction Between Openness and External Shocks***

The previous exercises focus on the potential effect that openness can have on economic growth, controlling for various external shocks. An additional issue is 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 growth effect of shocks depends on the economy's openness.

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 allows us to simulate the effect of each shock independently. The results are presented in Table 3, with each column devoted to the interactions with each of the four external shocks. An interesting pattern emerges. Larger trade openness decreases the growth effect of trade-related shocks --the growth of terms of trade and the GDP growth of trade partners-- while increasing the growth effect of financial market shocks -- international interest rate changes and regional capital inflows. Conversely, larger financial openness increases the 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 growth effect of international interest rate changes. Except for the latter case, the results challenge the conventional wisdom that trade openness increases the vulnerability to trade-related shocks and that financial openness does likewise with financial-related shocks. The channels of transmission seem to be more complex.

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 2 helps to make this assessment by graphing the growth effect of one-standard deviation increase in each shock as a function of, first, trade openness and, then, financial openness (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).<sup>4</sup> For the terms of trade shock, its growth effect is positive for low and medium levels of trade openness, but as this increases further, the growth effect changes signs and becomes negative. The growth effect of the terms of trade shock increases with financial openness and is positive throughout the relevant range. Regarding the trade partners growth shock, as noted above, it decreases with trade openness and increases with financial openness; however, it is always positive in both cases. In the case of the international interest rate shock, its direct impact on 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 this direct impact is negative. Once we take into account the interactions, the total growth effect of interest shocks continues to be negative, but it approaches zero as either type of openness rises. Finally, regarding the capital flow shock, its direct impact is negative; however, once the openness interactions are taken into account, the total effect is positive on growth, with larger trade openness increasing its growth effect while financial openness reducing it.

We can use the numbers to draw several quantitative implications. Consider the following, for instance. First, given an average level of financial openness, a one standard deviation decline in the terms of trade would lead to a fall of growth in real GDP per capita of 0.55 pp for countries in the 25% percentile of the distribution of trade openness across the world in the 1996-00 period (i.e. Greece with exports and imports representing almost 50% of GDP). For median countries —e.g. Venezuela and Portugal— the growth decline due to a deterioration in the terms of trade is smaller (0.13 pp) thanks to their higher trade openness. The growth effect of declining terms of trade would be null for countries in the 90% percentile (like Australia). Second, given an average level of financial openness, 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 0.9 pp for countries in the 25% percentile of the distribution of trade openness. The reduction of the growth rate would be smaller, approximately 0.75 pp, for countries in the 75% percentile (Israel). Third, given an average level of trade openness, a one standard deviation decline in the capital flows to the country's region would generate a reduction in the country's growth rate of 0.23 pp for

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<sup>4</sup> For these simulations, we restrict the range of the financial openness indicator to values where the stock of

countries in the 25% percentile of the distribution of financial openness across the world for the 1996-00 period (Greece), 0.17 pp for median countries in the distribution (South Africa), and 0.12 pp for countries in the 75% percentile (Chile and Spain).

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.<sup>5</sup> To consider this possibility, we add the standard deviation of economic growth as an additional explanatory variable. The results are presented in Table 4, 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.

### III. Conclusions

The goal of this paper is to provide a systematic empirical assessment of the impact of openness and external shocks—as well as their interactions—on economic growth. To accomplish this task, we run linear and non-linear growth regressions on a cross-country, panel data set spanning 76 countries for the 1970-2000 period. We consider outcome (or *de facto*) measures of both trade and financial openness and use four types of external shocks. Trade openness is proxied by the ratio of the volume of imports plus exports to GDP, and financial openness, by the ratio of foreign liabilities to GDP. Under the assumption that no country faces a perfectly elastic demand for its products or has unobstructed access to financial markets, we consider not only price but also quantity proxies of external shocks. Two of them are related to international trade (changes in the terms of trade and the growth rate of country trading partners) and two related to financial markets (changes in international real interest rates and regional capital inflows).

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foreign liabilities is positive.

<sup>5</sup> According to the estimates presented in Table 4, a one-unit reduction in the standard deviation of growth in real GDP would lead to an increase in economic growth between 0.35 and 0.4 pp.

We conduct three types of exercises. The first follows the most common growth regression specification and consists of estimating the linear effects of trade and financial openness as well as external shocks. The second assesses whether the effect of trade and financial openness depends on the country's level of per capita income. Finally, the third exercise examines whether trade and financial openness amplifies or dampens the growth effects of external shocks.

When we consider the simple, linear specification we find that both trade and financial openness are positively related to economic growth. Our panel-data results confirm the finding that when over-time evidence is jointly considered with cross-country comparisons, openness emerges as an engine for growth. Due to our econometric methodology, these 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 or is due to reverse causation. Regarding the growth effects of external shocks, we find that increases in favorable terms of trade, in the growth rate of trade partners, and in capital flows to the region produce a rise in economic growth. These results corroborate the substantial importance of external conditions as growth determinants.

When we expand our regression specification to consider the interaction between openness and the level of income, we find interesting non-linearities. The regression results are *qualitatively* similar for financial or trade openness: In both cases, 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 trade and financial openness appears to be economically significant for middle- and high-income countries.

Finally, on the question of amplification of external shocks through openness, we find an interesting and rather unexpected pattern: Larger trade openness dampens the growth effect of trade-related shocks while amplifying the effect of financial market shocks. Conversely, larger financial openness increases the growth effect of trade-related shocks while attenuating the impact of regional capital inflows, one of the financial market shocks. These results challenge the conventional wisdom that trade openness increases the vulnerability to trade-related shocks and that financial openness does likewise with financial-related shocks.



All in all, our assessment of the growth effects of external conditions is quite positive regarding the beneficial impact of trade and financial openness. However, the fact that these effects change with the level of development present an interesting avenue for future research: finding precisely under what conditions of macroeconomic stability, public infrastructure, market flexibility, and human capital, integration to international markets offers the greatest promise for growth.

## References

- Ahmed, S., and P. Loungani (1999). "Business Cycles in Emerging Market Economies," *Monetaria*, Volume XXII, Number 4, October-December, CEMLA
- Alcala, F. and A. Ciccone (2004). "Trade and Productivity", *Quarterly Journal of Economics*: 119 (2), 613-646
- Alesina, A., E. Spolaore, and R. Wacziarg (2004). "Trade, Growth, and Size of Countries", *manuscript*, Harvard University.
- Arellano M. and S. Bond (1991). "Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations," *Review of Economic Studies* 58, 277-297.
- Arellano M. and O. Bover (1995). "Another Look at the Instrumental-Variable Estimation of Error-Components Models," *Journal of Econometrics* 68, 29-51.
- Arora, V. and A. Vamvakidis (2003). "The Impact of U.S. Economic Growth on the Rest of the World: How much does it matter?," *Journal of Economic Integration*, forthcoming
- Arora, V. and A. Vamvakidis (2004). "How much do trading partners matter for economic growth?," IMF Working Paper WP/04/26, February.
- Arteta, C., B. Eichengreen, and C. Wyplosz (2001). "On the Growth Effects of Capital Account Liberalization", *manuscript*, University of California, Berkeley, CA.
- Barro, R.J., Sala-i-Martin, X., 2004, "Economic Growth," McGraw-Hill, Second Edition.
- Blankenau, W., M.A. Kose and K.-M. Yi (2001). "Can world real interest rates explain business cycles in a small open economy," *Journal of Economic Dynamics and Control* 25, 867-889
- Beck T, A. Demirguc-Kunt, and R. Levine (2000). "A New Database on Financial Development and Structure," *World Bank Economic Review*, 14 (3), pp.597-605.
- Ben-David, D. (1993). "Equalizing Exchange: Trade Liberalization and Income Convergence," *Quarterly Journal of Economics*: 108 (3), 653-679.
- Bosworth, B., Collins, S.M. (1999) "Capital flows to developing economies: implications for saving and investment," *Brookings Papers on Economic Activity* 0(1), 143-169
- Calderón, C., A. Chong and N. Loayza (2002). "Determinants of Current Account Deficits in Developing Countries," *Contributions to Macroeconomics*, Volume 2, Issue 1, Article 2 (<http://www.bepress.com/bejm/contributions/vol2/iss1/art2>)
- Calderón, C., Schmidt-Hebbel, K. (2003). "Macroeconomic Policies and Performance in Latin America," *Journal of International Money and Finance* 22, 895-923
- Chanda, A. (2001). "The Influence of Capital Controls on Ling-Run Growth: Where and How Much?," *manuscript*, Brown University, Providence, RI.
- Dollar, D. (1992). "Outward-Oriented Developing Economies Really Do Grow More Rapidly: Evidence from 95 LDCs, 1976-85," *Economic Development and Cultural Change*, 523-44.
- Dollar, D. and A. Kraay (2003). "Institutions, Trade, and Growth", *Journal of Monetary Economics* 50: 133-62.
- Easterly, W. N. Loayza, and P. Montiel (1997). "Has Latin America's Post-Reform Growth Been Disappointing?," *Journal of International Economics* 43, 287-311
- Edison, H. J., M. Klein, L. Ricci, and T. Slok (2002): "Capital Account Liberalization and Economic Performance: Survey and Synthesis", *IMF Working Paper* WP702/120, July.

- Edison, H. J., R. Levine, L. Ricci, and T. Slok (2002). "International Financial Integration and Economic Growth", *Journal of International Money and Finance* 21: 749-76.
- Edwards, S. (1993). "Openness, Trade Liberalization, and Growth in Developing Countries", *Journal of Economic Literature* 31:1358-93.
- Edwards, S. (1998). "Openness, Productivity and Growth: What Do We Really Know?", *Economic Journal* 108 (447): 383-98.
- Edwards (2001). "Capital Mobility and Economic Performance: Are Emerging Economies Different?", *NBER Working Paper* 8076, Cambridge, MA.
- Elbadawi, I. and K. Schmidt-Hebbel (1998). "Macroeconomic Policies, Instability, and Growth in the World", *Journal of African Economies* 7 (2): 116-68.
- Fatás, A. (2002). "The Effects of Business Cycles on Growth," in: Loayza, N. and R. Soto, eds., *Economic Growth: Sources, Trends, and Cycles*, Santiago, Chile: Central Bank of Chile, pp. 191-220
- Fernández-Arias, E. and P. Montiel (2001). "Reform and Growth: All Pain, No Gain?," *IMF Staff Papers* 48, 522-546.
- Frankel, J. (2004). "What Do We Know and What Should We Know: Perspectives from Academia," *manuscript*. Central Bank of Chile.
- Frankel, J. and D. Romer (1999). "Does Trade Cause Growth?" *American Economic Review* 89 (3): 379-99.
- Grilli, V. and G.M. Milesi-Ferretti (1995). "Economic effects and Structural Determinants of Capital Controls", *IMF Staff Papers* 42: 517-51.
- Hnatkovska, V. and N. Loayza (2004). "Volatility and Growth," World Bank Working Paper 3184, January.
- Irwin, D.A. and M. Terviö (2002). "Does Trade raise Income? Evidence from the Twentieth Century", *Journal of International Economics* 58: 1-18.
- Klein, M.W. (2003). "Capital Account openness and the Varieties of Growth Experience", *NBER Working Paper* 9500, February.
- Klein, M. and G. Olivei (2000). "Capital Account Liberalization, Financial Depth, and Economic Growth", *manuscript*, Tufts University, Medford, MA.
- Kose, M.A., E.S. Prasad, and M. Terrones (2003). "Financial Integration and Macroeconomic Volatility", *IMF Working Paper* WP/03/50, March.
- Kose, M.A., E.S. Prasad, and M. Terrones (2004). "How do Trade and Financial Integration affect the Relationship between Growth and Volatility?", *manuscript*, IMF, Washington, DC, May.
- Kraay, A. (1998). "In Search of the Macroeconomics Effects of Capital Account Liberalization", *manuscript*, The World Bank, Washington, DC.
- Lane, P. and G.M. Milesi-Ferreti (2001). "The external wealth of nations: measures of foreign assets and liabilities for industrial and developing countries," *Journal of International Economics* 55, 263-294
- Lane, P. and G.M. Milesi-Ferreti (2003). "International Financial Integration," *IMF Staff Papers* 50 (*Special Issue*), 82-113
- Loayza, N., Fajnzylber, P., and C. Calderón (2004). "Economic Growth in Latin America: Stylized Facts, Explanations and Forecasts," The World Bank Latin American and Caribbean Studies Viewpoints, forthcoming
- Mody, A., and A.P. Murshid (2002). "Growing up with capital flows." *IMF Working Paper* WP/02/75

- Montiel, P. and C. Reinhart (1999). "Do Capital Controls and Macroeconomic policies influence the Volume and Composition of Capital Flows?," *Journal of International Money and Finance* 18: 619-35.
- O'Donnell, B. (2001). "Financial Openness and Economic Performance", *manuscript*, Trinity College, Dublin, Ireland.
- Prasad, E., K. Rogoff, S.-J. Wei, and M.A. Kose (2003). "Effects of Financial Globalization on Developing Countries: Some Empirical Evidence," *IMF Occasional Paper 220*, August.
- Quinn, D. (1997). "The Correlates of Change in International Financial Regulation", *American Political Science Review* 91 (3): 531-51.
- Ramey, G. and V. Ramey, 1995, "Cross-Country Evidence on the Link Between Volatility and Growth," *American Economic Review* 85(5), 1138-1151
- Rigobon, R. and D. Rodrik (2004). "Rule of Law, Democracy, Openness, and Income: Estimating the Interrelationships", *manuscript*, Sloan School of Management MIT, May.
- Rodrik, D. (1998). "Who needs Capital Account Convertibility?," *manuscript*, Harvard University, Cambridge, Mass., February.
- Rodrik, D. and F. Rodríguez (2000). "Trade Policy and Economic Growth: A Skeptics Guide to the Cross-National Evidence", en B. Bernanke y K. Rogoff (editors) , *NBER Macroeconomics Annual 15*, MIT Press.
- Rodrik, D., A. Subramanian, and F. Trebbi (2002). "Institutions rule: The Primacy of Institutions over Geography and Integration in Economic Development", *NBER Working Paper*, November.
- Sachs, J.D. and A.M. Warner (1995). "Economic reform and the process of global integration," *Brookings Papers on Economic Activity*, 1-118.
- Summers, R. and A. Heston (1991). "The Penn World Table (Mark 5): an expanded set of international comparisons, 1950-1988," *Quarterly Journal of Economics*, 106, 327-68.
- Tytell, I. and S.-J. Wei (2004). "Does Financial Globalization induce better Macroeconomic Policies?," IMF Working Paper WP/04/84, May
- Wacziarg, R. (2001). "Measuring the Dynamic Gains from Trade", *World Bank Economic Review* 15 (3).
- Wacziarg, R. and K.H. Welch (2003). "Trade Liberalization and Growth: New Evidence", *NBER Working Paper* 10152, Cambridge, MA., December.
- World Bank (2002). World Development Indicators, CD-ROM

**Table 1****Economic Growth, Trade Openness, Financial 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*

| Explanatory Variables   | Baseline<br>Regression |
|---|------------------------|
| Constant  | 7.142 **<br>(2.25)     |
| <u>Control Variables</u>  |                        |
| - Initial GDP per capita<br>(in logs)   | -0.177 **<br>(0.09)    |
| - Education<br>(Secondary Enrollment, in logs)                                  | 1.058 **<br>(0.16)     |
| - Financial Depth<br>(Private Domestic Credit to GDP, in logs)                  | 0.631 **<br>(0.10)     |
| - Lack of Price Stability<br>(inflation rate, in log[100+inf.rate])             | -2.275 **<br>(0.37)    |
| - Government Burden<br>(Government Consumption to GDP, in logs)                 | -1.488 **<br>(0.22)    |
| <u>Openness:</u>  |                        |
| - Trade Openness<br>(Real Exports and Imports to GDP, in logs)                  | 0.403 **<br>(0.13)     |
| - Financial Openness<br>(Stock of equity-related foreign liabilities, in logs)  | 0.051 **<br>(0.01)     |
| <u>Foreign Shocks:</u>  |                        |
| - Terms of Trade Shocks<br>(Growth rate of Terms of Trade)                      | 0.038 **<br>(0.01)     |
| - Foreign Growth<br>(Growth rate of the country's trading partners)             | 1.536 **<br>(0.17)     |
| - Regional Capital Inflows<br>(Private capital inflows to the country's region) | 0.098 **<br>(0.02)     |
| <u>Period Shifts</u>  |                        |
| - 76-80 Period:   | -1.119 **              |
| - 81-85 Period:   | -1.284 **              |
| - 86-90 Period:   | -1.865 **              |
| - 91-95 Period:   | -0.517 *               |
| - 96-00 Period:   | -1.843 **              |
| Countries   | 76                     |
| Observations  | 438                    |
| Specification Tests (p-values)  |                        |
| - Sargan Test   | (0.41)                 |
| - 2nd. Order Correlation  | (0.90)                 |

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

**Table 2**  
**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 (Arellano and Bover, 1995; Blundell and Bond, 1998)*

| Variable  | Outcome Measures of Openness |                     |
|---|------------------------------|---------------------|
|   | [1]<br>Financial             | [2]<br>Trade        |
| Constant  | 2.105<br>(2.57)              | 23.419 **<br>(2.37) |
| <u>Control Variables</u>  |                              |                     |
| - Initial GDP per capita (ypc)<br>(in logs)                                     | -0.704 **<br>(0.24)          | -2.883 **<br>(0.27) |
| - Education<br>(Secondary Enrollment, in logs)                                  | 2.443 **<br>(0.24)           | 2.062 **<br>(0.15)  |
| - Financial Depth<br>(Private Domestic Credit to GDP, in logs)                  | 0.354 **<br>(0.15)           | 0.402 **<br>(0.13)  |
| - Lack of Price Stability<br>(inflation rate, in log[100+inf.rate])             | -1.434 **<br>(0.43)          | -1.605 **<br>(0.34) |
| - Government Burden<br>(Government Consumption to GDP, in logs)                 | -1.184 **<br>(0.24)          | -1.460 **<br>(0.32) |
| <u>Openness and Interactions:</u>   |                              |                     |
| - Trade Openness<br>(Real Exports and Imports to GDP, in logs)                  | 0.449 **<br>(0.10)           | -8.214 **<br>(0.77) |
| - Financial Openness<br>(Stock of equity-related foreign liabilities, in logs)  | -2.274 **<br>(0.35)          | -0.050 **<br>(0.01) |
| - Openness * ypc  | 0.562 **<br>(0.10)           | 1.832 **<br>(0.19)  |
| - Openness * ypc squared  | -0.031 **<br>(0.01)          | -0.089 **<br>(0.01) |
| <u>Foreign Shocks:</u>  |                              |                     |
| - Terms of Trade Shocks<br>(Growth rate of Terms of Trade)                      | 0.041 **<br>(0.01)           | 0.055 **<br>(0.01)  |
| - Foreign Growth<br>(Growth rate of the country's trading partners)             | 1.749 **<br>(0.12)           | 1.666 **<br>(0.11)  |
| - Regional Capital Inflows<br>(Private capital inflows to the country's region) | 0.115 **<br>(0.03)           | 0.115 **<br>(0.03)  |
| <u>Period Shifts</u>  |                              |                     |
| - 76-80 Period:   | -1.359 **                    | -1.110 **           |
| - 81-85 Period:   | -1.627 **                    | -1.099 **           |
| - 86-90 Period:   | -2.322 **                    | -1.873 **           |
| - 91-95 Period:   | -0.832 **                    | -0.260              |
| - 96-00 Period:   | -2.610 **                    | -1.609 **           |
| Countries   | 76                           | 76                  |
| Observations  | 438                          | 438                 |
| Specification Tests (p-values)  |                              |                     |
| - Sargan Test   | (0.18)                       | (0.45)              |
| - 2nd. Order Correlation  | (0.94)                       | (0.79)              |

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

**Table 3**

**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]<br>Terms of Trade<br>Changes | [2]<br>Foreign Growth | [3]<br>World Int. Rate<br>Changes | [4]<br>Regional Capital<br>Inflows |
|---|----------------------------------|-----------------------|-----------------------------------|------------------------------------|
| <b>Foreign Shock:</b>   |                                  |                       |                                   |                                    |
| Constant  | 5.242 **<br>(2.41)               | 12.005 **<br>(2.94)   | 9.444 **<br>(2.44)                | 10.804 **<br>(3.06)                |
| <u>Control Variables</u>  |                                  |                       |                                   |                                    |
| - Initial GDP per capita (ypc)<br>(in logs)   | -0.138 *<br>(0.09)               | -0.280 **<br>(0.13)   | -0.176 *<br>(0.11)                | -0.152 *<br>(0.09)                 |
| - Education<br>(Secondary Enrollment, in logs)                                      | 1.284 **<br>(0.19)               | 1.419 **<br>(0.19)    | 1.110 **<br>(0.17)                | 0.977 **<br>(0.16)                 |
| - Financial Depth<br>(Private Domestic Credit to GDP, in logs)                      | 0.592 **<br>(0.07)               | 0.669 **<br>(0.14)    | 0.578 **<br>(0.11)                | 0.628 **<br>(0.10)                 |
| - Lack of Price Stability<br>(inflation rate, in log[100+inf.rate])                 | -1.786 **<br>(0.39)              | -3.936 **<br>(0.33)   | -2.400 **<br>(0.42)               | -2.733 **<br>(0.49)                |
| - Government Burden<br>(Government Consumption to GDP, in logs)                     | -1.597 **<br>(0.24)              | -1.523 **<br>(0.28)   | -1.547 **<br>(0.26)               | -1.384 **<br>(0.23)                |
| <u>Openness:</u>  |                                  |                       |                                   |                                    |
| - Trade Openness (TO)<br>(Real Exports and Imports to GDP, in logs)                 | 0.133 *<br>(0.08)                | 1.227 **<br>(0.46)    | 0.404 **<br>(0.12)                | -0.190<br>(0.15)                   |
| - Financial Openness (FO)<br>(Stock of equity-related foreign liabilities, in logs) | 0.080 **<br>(0.01)               | -0.159 **<br>(0.04)   | 0.071 **<br>(0.01)                | 0.146 **<br>(0.02)                 |
| <u>Foreign Shocks:</u>  |                                  |                       |                                   |                                    |
| - Terms of Trade Shocks<br>(Growth rate of Terms of Trade)                          | 1.175 **<br>(0.12)               | 0.033 **<br>(0.01)    | 0.050 **<br>(0.01)                | 0.039 **<br>(0.01)                 |
| - Foreign Growth<br>(Growth rate of the country's trading partners)                 | 1.703 **<br>(0.17)               | 2.756 **<br>(0.75)    | 1.499 **<br>(0.16)                | 1.618 **<br>(0.19)                 |
| - Regional Capital Inflows<br>(Private capital inflows to the country's region)     | 0.025<br>(0.02)                  | 0.057 **<br>(0.01)    | 0.086 **<br>(0.02)                | -0.374 **<br>(0.12)                |
| <u>Interaction: Openness and Foreign Shock</u>                                      |                                  |                       |                                   |                                    |
| - TO * Foreign Shock  | -0.276 **<br>(0.03)              | -0.361 *<br>(0.19)    | 0.397 **<br>(0.11)                | 0.151 **<br>(0.03)                 |
| - FO * Foreign Shock  | 0.010 **<br>(0.00)               | 0.067 **<br>(0.02)    | 0.118 **<br>(0.02)                | -0.043 **<br>(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   | 76                               | 76                    | 76                                | 76                                 |
| Observations  | 438                              | 438                   | 438                               | 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 4**  
**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]                    | [2]                 | [3]                     | [4]                      |
|---|------------------------|---------------------|-------------------------|--------------------------|
| Foreign Shock:  | Terms of Trade Changes | Foreign Growth      | World Int. Rate Changes | Regional Capital Inflows |
| Constant  | 0.139<br>(1.85)        | 1.107<br>(1.81)     | 2.011<br>(2.08)         | 4.385 **<br>(1.91)       |
| <u>Control Variables</u>  |                        |                     |                         |                          |
| - Initial GDP per capita (ypc)<br>(in logs)   | -0.284 *<br>(0.16)     | -0.226 *<br>(0.13)  | -0.342 *<br>(0.18)      | -0.351 **<br>(0.13)      |
| - Education<br>(Secondary Enrollment, in logs)                                      | 1.233 **<br>(0.20)     | 0.861 **<br>(0.12)  | 0.821 **<br>(0.19)      | 0.836 **<br>(0.12)       |
| - Financial Depth<br>(Private Domestic Credit to GDP, in logs)                      | 0.670 **<br>(0.18)     | 0.826 **<br>(0.15)  | 1.080 **<br>(0.18)      | 0.972 **<br>(0.16)       |
| - Lack of Price Stability<br>(inflation rate, in log[100+inf.rate])                 | -0.390<br>(0.32)       | -1.138 **<br>(0.17) | -0.522 *<br>(0.35)      | -0.999 **<br>(0.23)      |
| - Government Burden<br>(Government Consumption to GDP, in logs)                     | -1.622 **<br>(0.26)    | -1.583 **<br>(0.22) | -1.660 **<br>(0.30)     | -1.345 **<br>(0.22)      |
| <u>Openness:</u>  |                        |                     |                         |                          |
| - Trade Openness (TO)<br>(Real Exports and Imports to GDP, in logs)                 | 0.573 **<br>(0.13)     | 1.380 **<br>(0.33)  | 0.616 **<br>(0.13)      | 0.118<br>(0.15)          |
| - Financial Openness (FO)<br>(Stock of equity-related foreign liabilities, in logs) | 0.029 **<br>(0.01)     | -0.203 **<br>(0.03) | 0.034 **<br>(0.01)      | 0.111 **<br>(0.01)       |
| <u>Foreign Shocks:</u>  |                        |                     |                         |                          |
| - Terms of Trade Shocks<br>(Growth rate of Terms of Trade)                          | 0.917 **<br>(0.15)     | 0.038 **<br>(0.01)  | 0.042 **<br>(0.01)      | 0.036 **<br>(0.01)       |
| - Foreign Growth<br>(Growth rate of the country's trading partners)                 | 1.457 **<br>(0.17)     | 2.573 **<br>(0.50)  | 1.457 **<br>(0.16)      | 1.477 **<br>(0.16)       |
| - Regional Capital Inflows<br>(Private capital inflows to the country's region)     | 0.029<br>(0.03)        | 0.049 **<br>(0.02)  | 0.063 **<br>(0.03)      | -0.233 *<br>(0.14)       |
| <u>Interaction: Openness and Foreign Shock</u>                                      |                        |                     |                         |                          |
| - TO * Foreign Shock  | -0.215 **<br>(0.04)    | -0.346 **<br>(0.12) | 0.311 **<br>(0.13)      | 0.105 **<br>(0.04)       |
| - FO * Foreign Shock  | 0.004 **<br>(0.00)     | 0.089 **<br>(0.01)  | 0.101 **<br>(0.02)      | -0.039 **<br>(0.01)      |
| <u>Macroeconomic Volatility</u>   |                        |                     |                         |                          |
| - Standard Deviation of the Growth Rate of<br>Real GDP per capita                   | -0.380 **<br>(0.02)    | -0.401 **<br>(0.02) | -0.354 **<br>(0.02)     | -0.395 **<br>(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   | 76                     | 76                  | 76                      | 76                       |
| Observations  | 438                    | 438                 | 438                     | 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.



## Appendix 1: Sample of countries

|   |                  |                     |
|---|------------------|---------------------|
| <b>I. Industrial Economies (22 countries)</b>             |                  |                     |
| 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      |                     |
| <b>II. Latin America and the Caribbean (21 countries)</b> |                  |                     |
| 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       |
| <b>III. East Asia and the Pacific (8 countries)</b>       |                  |                     |
| China   | Malaysia         | Singapore           |
| Indonesia   | Papua New Guinea | Thailand            |
| Korea, Rep.   | Philippines      |                     |
| <b>IV. Middle East and North Africa (7 countries)</b>     |                  |                     |
| Algeria   | Israel           | Tunisia             |
| Egypt, Arab Rep.  | Jordan           | Turkey              |
|   | Morocco          |                     |
| <b>V. South Asia (3 countries)</b>                        |                  |                     |
| India   | Pakistan         | Sri Lanka           |
| <b>VI. Sub-Saharan Africa (15 countries)</b>              |                  |                     |
| 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 (2002).  |
| GDP per capita growth       | Log difference of real GDP per capita.   | Authors' construction using Summers and Heston (1991) and The World Bank (2002).  |
| 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 (2002).  |
| Education                   | Ratio of total secondary enrollment, regardless of age, to the population of the age group that officially corresponds to that level of education.   | World Development Network (2002) and The World Bank (2002).   |
| 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\$).  | World Development Network (2002) and The World Bank (2002).   |
| 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 (2002).  |
| CPI                         | Consumer price index (1995 = 100) at the end of the year   | Author's calculations with data from IFS.   |
| Inflation rate              | Annual % change in CPI   | Author's calculations with data from IFS.   |
| Terms of Trade              | Net barter terms of trade index (1995=100)   | World Development Network (2002) and The World Bank (2002).   |
| Terms of Trade Changes      | Log differences of the terms of trade index  | Authors' construction using The World Bank (2002).  |
| Foreign Growth              | Growth in 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 (2002), 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 minus World Inflation.   | Author's calculations with data from IFS.   |
| Regional Capital Inflows    | (Gross) Capital Inflows (FDI, portofolio-equity, loans) to the region of the corresponding country.  | Author's calculations with data from the IMF's Balance of Payments Statistics.  |
| Macroeconomic Volatility    | Standard Deviation of the growth rate of real GDP.   | Authors' construction using Summers and Heston (1991) and The World Bank (2002).  |
| 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

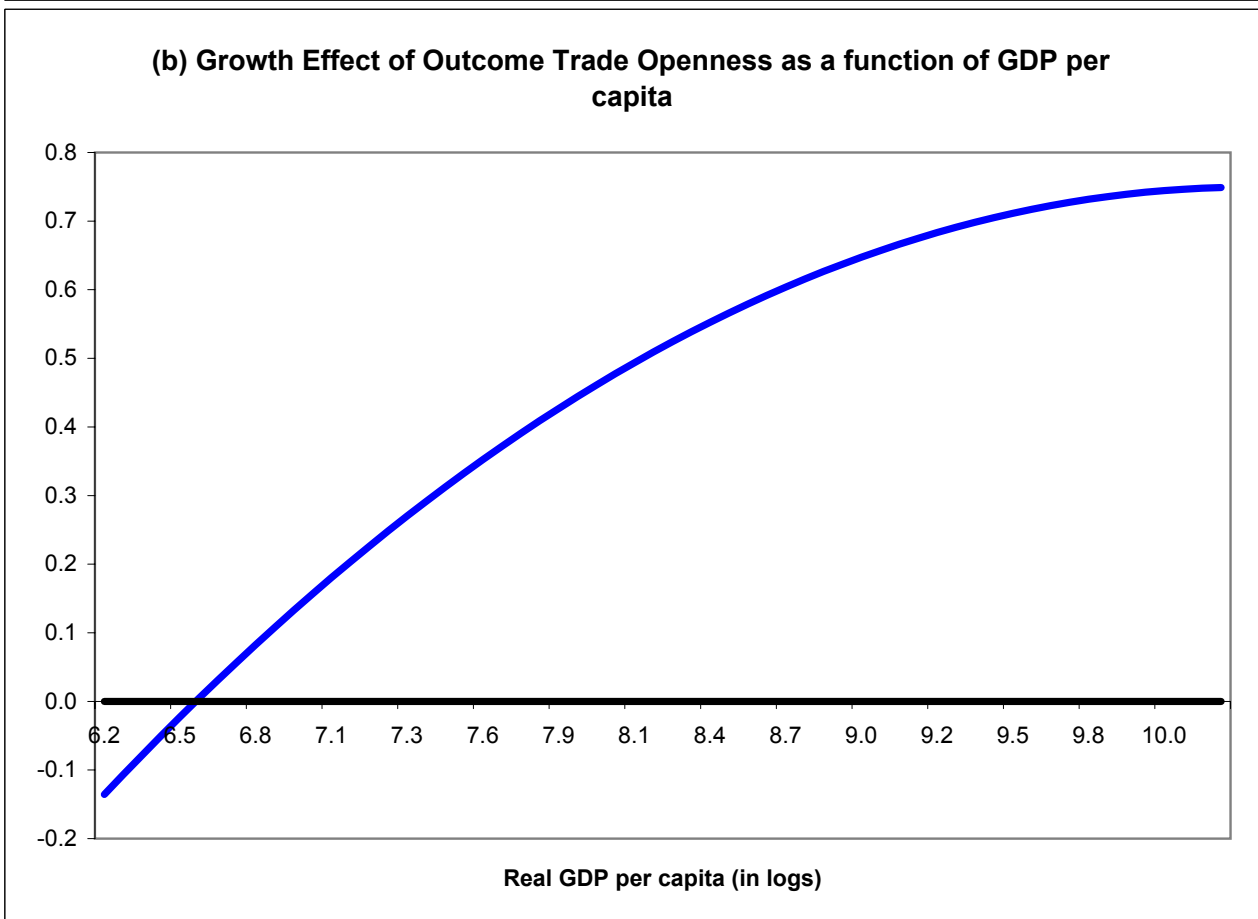
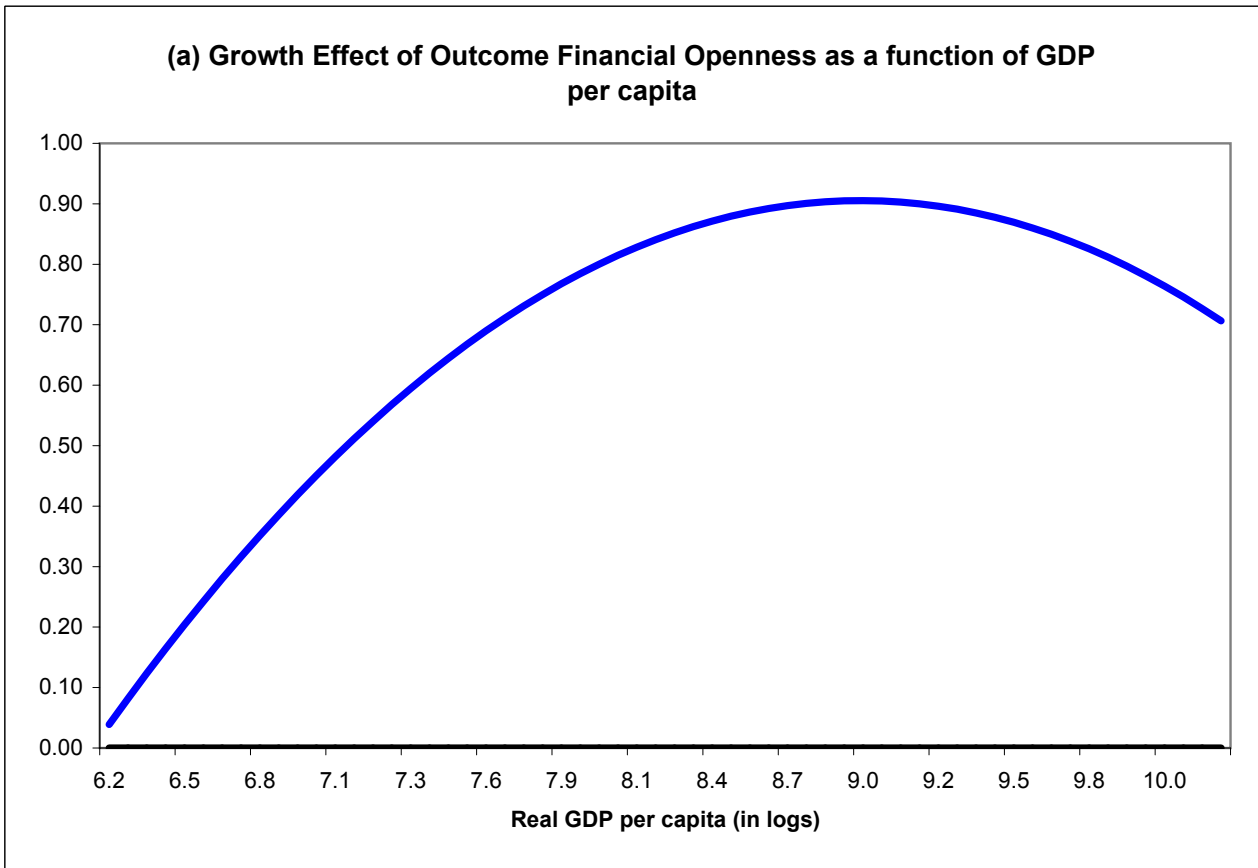
#### (a) Univariate

| 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                | 3.419  | 2.359     | -1.635  | 10.336  |

#### (b) Bivariate Correlations between Growth and Determinants

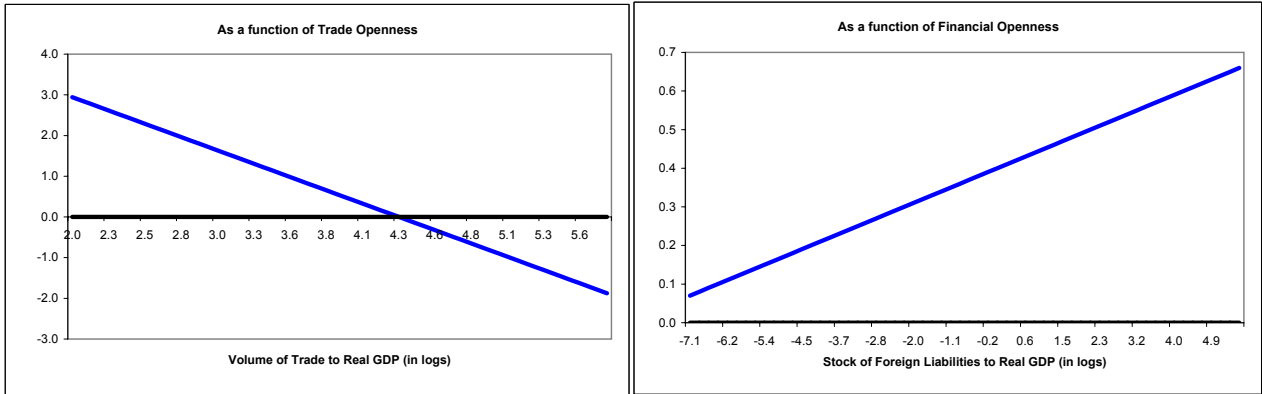
| Variable                              | Growth rate of GDP per capita | Initial GDP per capita (in logs) | Secondary enrollment (in logs) | Private domestic credit/GDP (in logs) | Inflation (in log [100+inf. rate]) | Government consumption /GDP (in logs) | Trade Openness | Financial Openness | Terms of Trade Changes | Foreign Growth | World Int. Rate Changes | Regional Capital Inflows |
|---------------------------------------|-------------------------------|----------------------------------|--------------------------------|---------------------------------------|------------------------------------|---------------------------------------|----------------|--------------------|------------------------|----------------|-------------------------|--------------------------|
| 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              | 0.19                          | 0.44                             | 0.34                           | 0.41                                  | -0.29                              | 0.18                                  | 0.12           | 0.17               | 0.11                   | -0.14          | 0.06                    | 1.00                     |

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

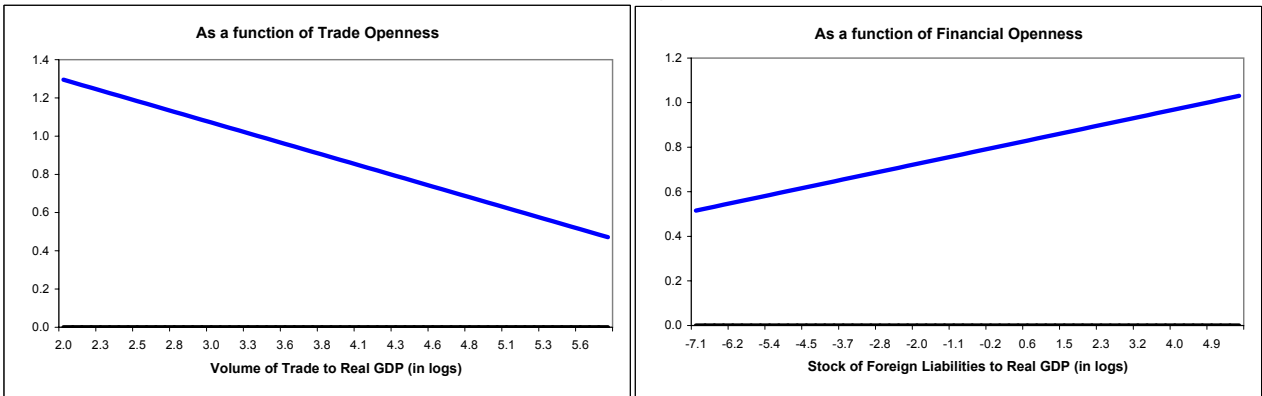


**Figure 2**  
**Growth Effect of External Shocks as a Function of Openness**

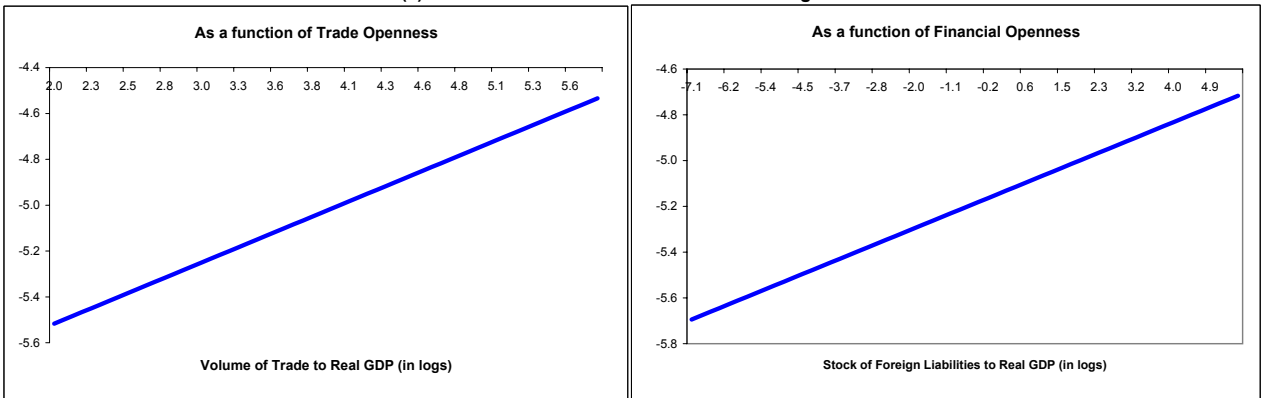
**(a) Growth Effect of Terms of Trade Changes**



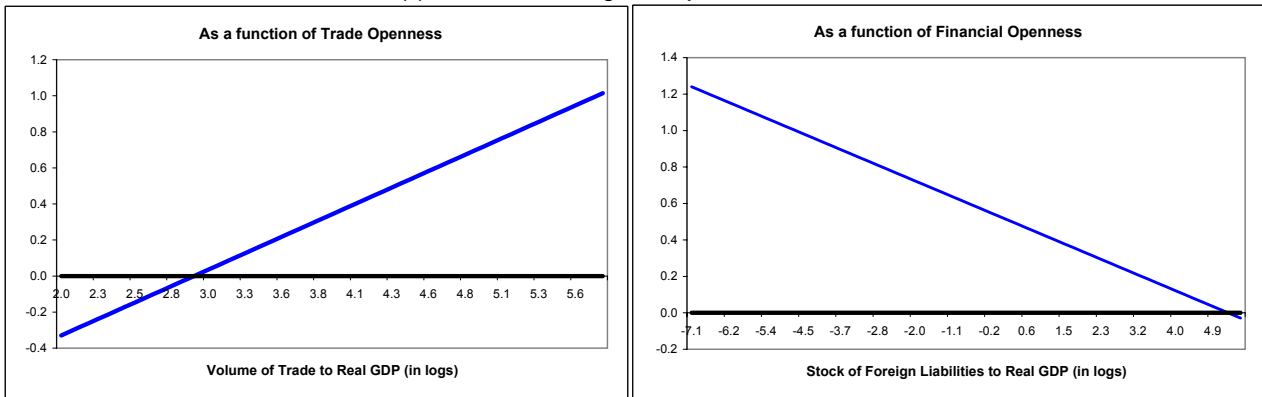
**(b) Growth Effect of Foreign Growth**



**(c) Growth Effect of World Interest Rate Changes**



**(d) Growth Effect of Regional Capital Flows**



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