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Financial Integration, Growth, and Volatility

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Financial Integration, Growth, and Volatility

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Abstract

The aim of this paper is to evaluate the welfare gains from financial integration for developing and emerging market economies. To do so, we build a stochastic endogenous growth model for a small open economy that can (i) borrow from the rest of the world, (ii) invest in foreign assets, and (iii) receive foreign direct investment (FDI). The model is calibrated on 32 emerging market and developing economies for which we evaluate the upper bound for the welfare gain from financial integration. For plausible values of preference parameters and actual levels of financial integration, the mean welfare gain from financial integration is about 10 percent of initial wealth. Compared with financial autarky, actual levels of financial integration translate into slightly higher annual growth rates (around 0.4 percentage point per year.)

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I. INTRODUCTION

What are the benefits of financial integration for developing and emerging market economies?

Economic theory tells us that financial integration brings four types of benefits:

- First, financial integration potentially allows risk sharing. As in the basic portfolio allocation model, global diversification reduces the portfolio risk for a given expected rate of return. In turn, this reduction in risk affects domestic saving.
- Second, financial integration potentially eases the capital scarcity constraint a developing/emerging economy might face.
- Third, financial integration may bring foreign direct investments (FDI) into the country. Part of the income generated with this FDI remains in the country because of taxes or other trickle-down effects.
- Finally, financial integration may boost productivity through a number of channels. For instance, when financial integration increases FDI, foreign investors bring into the country not only capital, but their technology as well.

However, there is mixed empirical evidence on whether capital account liberalization and financial integration have resulted in increased long-run economic growth in developing economies (see the recent survey by Edison, Klein, Ricci, and Sløk, 2002a).

How can we reconcile theoretical prediction with empirical evidence? The absence of clear empirical evidence on the benefits of financial integration may result from the fact that the benefits listed above exist but are small, either because financial integration is not completed yet or because there is not much to gain even under complete financial integration. The gap between theoretical prediction and empirical evidence can also come from the fact that, in addition to the benefits pointed out by economic theory, financial integration brings potential losses (associated, for instance, with sudden stops or reversals of capital flows) that cancel out the benefits.

The aim of this paper is to give a measure of the potential benefits that countries could have seen given the nature of their financial integration and its level. To do so, we build and calibrate a stochastic growth model that encompasses most of the features that are supposed to convert financial integration into economic growth for 32 developing and emerging economies. The aim of this calibration is to derive an upper bound (indeed, we consider only the potential benefits of financial integration and completely neglect potential losses that can arise following sudden stops, reverse capital flows, etc.) for the benefits of financial integration of emerging and developing economies, given their actual degree of financial integration. This upper bound provides a benchmark for econometric studies on the effect of financial integration.

To be more precise, we build a stochastic endogenous growth model for a small open economy that can (i) borrow from the rest of the world so as to relax its capital constraint, (ii) invest in foreign assets so as to benefit from risk sharing, and (iii) receive FDI. In addition, there are two sources of uncertainty in the model – productivity shocks and foreign prices shocks. We derive a closed-form solution for the risk premium that the country is facing, the optimal portfolio choice of the domestic investor, the growth rate of the economy, and the welfare gain from financial integration. The model is then calibrated on 32 emerging and developing economies for which we can evaluate the upper bound for the welfare gain from financial integration.

For plausible values of the preference parameters, we conclude that the gains from financial integration are not huge. These gains are nevertheless significant since they represent about 10 percent of the existing wealth and, in terms of growth differential, actual financial integration brings about an additional 0.4 percentage points compared with growth under financial autarky. Note that our assessment leads to gains that are a lot higher than those computed by Gourinchas and Jeanne (2004). Comparing actual economies with their fully integrated counterpart, they obtain a gain from financial integration that represents only around 1 percent of consumption each year along the growth path of the economy.

The paper is organized as follows. Section II provides measures of financial integration of emerging and developing economies and briefly discusses the empirical evidence on the effects of financial integration on economic growth and volatility. In Section III, we develop and solve a simple stochastic endogenous growth model that encompasses the main theoretical features linking financial integration, growth, and volatility. In Section IV the model is calibrated on 32 emerging and developing economies; we then compute an upper bound for the effect of observed financial integration on economic growth. Finally, in Section V, we check the robustness of our evaluation of the welfare gain from financial integration by calibrating the model under different assumptions. Section VI concludes.

II. Financial Integration: Facts and Empirical Evidence

A. Measuring Financial Integration

There is not yet a measure of the intensity of financial integration that is widely used by economists. Existing measures of financial integration, including that of Quinn (1997) that looks at capital account regulations, focus on potential financial integration rather than on actual financial integration. Using Quinn's measure of financial integration, a country that imposed no restrictions on capital flows, but that received or sent little capital flows, would qualify as financially integrated without actually benefiting from financial integration.

Table 1 presents two measures of actual financial integration for 32 emerging and developing economies. The first one (index 1) is the ratio of the sum of all claims and liabilities of a country to its GDP. Its components are also given for G-3 economies (the United-States, Japan, and Germany) so as to provide a benchmark against which actual financial integration of developing and emerging economies can be compared.

The second measure (index 2) excludes government and monetary authority claims and liabilities; it is the ratio of claims on foreign assets (excluding foreign exchange reserves) and liabilities (excluding public and publicly-guaranteed debt) of a country to its GDP. Index 2 aims to measure the part of financial integration that is not channeled by the government and the monetary authorities of the country.

Within our set of 32 emerging and developing economies, we distinguish two subsets. The first one includes economies that are more financially integrated than the average country of our sample; the second one includes economies that are less financially integrated than the average country of our sample[2]. In what follows, we will refer to these two groups as LIEs (less integrated economies) and MIEs (more integrated economies).

Figures in Table 1 show that the intensity and nature of financial integration differ a lot from one group to another, and across regions. Index 1 varies from 0.42 for LIEs to 0.88 for MIEs. For both LIEs and MIEs, the main component of index 1 is government debt and government-guaranteed debt (31 percent of GDP for LIEs and 35 percent of GDP for MIEs). For MIEs, the second-largest component is claims on foreign assets (excluding foreign exchange reserves), which amount to 33 percent of GDP. For LIEs, it is foreign exchange reserves. As measured by index 1, financial integration is as high in MIEs as it is in G-3 economies. However, the nature of financial integration differs considerably between these emerging economies and G-3 economies. The typical MIE has a foreign debt of more than 50 percent of GDP and receives FDI, whereas G-3 economies exhibit a high index of financial integration thanks to their holdings of foreign assets

Index 2, which excludes government and monetary authorities, ranges from 0.26 for LIEs to 0.75 for MIEs. The main component of index 2 is the stock of FDI for both LIEs (12 percent of GDP) and MIEs (19 percent of GDP). For MIEs, the stock of private debt (18 percent of GDP) is close to that of FDI, and equity liabilities amount to a mere 3 percent of GDP. For LIEs, private foreign debt is only 6 percent of GDP, and equity liabilities amount to only 1 percent of GDP.

Put together, these figures show that for developing and emerging economies, actual financial integration takes place through FDI and debt. Therefore, gains of financial integration should mainly be related to these two components of financial integration. Moreover, with equity liabilities that are only 3 percent of GDP (at most), stock market liberalization, although a potential source of gains, should not be responsible for a large share of the benefit of actual financial integration. Finally, as shown in the bottom line of Table 1, developing and emerging economies in our sample are net borrowers; at the country level, because foreign assets are more than offset by debt, there is no risk sharing.

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[2] See Appendix 4.

B. Empirical Evidence

Research aiming to measure benefits of financial integration usually proceeds by comparing two economies that differ in their level of financial integration. But there are at least three types of comparisons. The comparison can be between an economy with financial autarky and its fully financially integrated counterpart. This is the approach followed by most papers based on the calibration of small theoretical models; it focuses on the potential gain of full financial integration (see, for example, Obtsfeld, 1994, or Athanasoulis and Van Wincoop, 2000). A second approach consists in comparing an actual economy with its fully financially integrated counterpart. This is the approach followed by Gourinchas and Jeanne (2004). Finally, a third approach consists in comparing the economic performance of an actual economy (with its current level of financial integration) with its counterpart under a lower level of financial integration or under financial autarky. This is the approach followed in econometric studies. This paper follows this approach as well.

Evaluating the potential gain of financial integration by calibrating small theoretical models, Obtsfeld (1994) and Athanasoulis and Van Wincoop (2000) found that risk-sharing gains that would come with financial integration are huge. However, in a deterministic growth model in which, by construction, risk sharing does not bring any benefit, Gourinchas and Jeanne (2004) show that the welfare gain from capital account liberalization is rather small (around 1 percent of consumption each year along the growth path of the economy). As far as the effect of capital account liberalization on *volatility* is concerned, Kose, Prasad, and Terrones (2003) conclude by reviewing the literature on international business cycles, that theoretical models (RBC models, NOEM models) do not provide a clear guide to the effects of financial integration on macroeconomic volatility. A recent paper by Tille (2004) confirms this conclusion. In a two-country NOEM model, he shows that the impact of integration is not universally beneficial (it depends on the degree to which exchange rate fluctuations are passed through to consumer prices).

The comparison of economies at different stages of their financial integration process provides mixed empirical evidence that capital account liberalization promotes long-run economic growth in developing economies (see the survey by Edison, Klein, Ricci, and Sløk, 2002). Performing econometric estimations using a new dataset, Edison, Klein, Ricci, and Sløk (2002b) do not find any significant positive effect of financial integration on economic growth. However, Henry (2003) reports empirical evidence that stock market liberalizations (a component of capital account liberalization and financial integration) are followed by lower cost of capital, higher investment, and higher growth. Finally, Bekaert, Harvey, and Lundblad (2001, 2004a) report that, on average, equity market liberalizations lead to a 1 percent increase in economic growth over a five-year period.

Empirical literature is also mixed regarding the effect of financial openness on macroeconomic volatility. For example, Razin and Rose (1994) find no evidence of a link between trade and financial openness and macroeconomic volatility. A recent paper by Easterly, Islam, and Stiglitz (2000) concludes that neither financial openness nor volatility of capital flows has a significant impact on macroeconomic volatility. They show, however, that a higher level of development of the domestic financial sector (as measured by private credit to GDP) reduces growth volatility. Buch, Dopke, and Pierdzioch (2002) do not find any consistent empirical relationship between financial openness and the volatility of output. Nevertheless, Bekaert, Harvey and Lundblad (2004b) find a significant decrease in both GDP and consumption growth variability after equity market liberalizations.

In this paper, we follow the approach that consists in comparing an actual economy to an economy that is less financially integrated. However, we do not rely on econometric estimations, but rather on the calibration of a theoretical model. Therefore, we provide a theoretical framework to understand the mixed empirical results reviewed above. Moreover, our model considers simultaneously the potential effects of FDI, of the openness of financial markets, and of risk sharing on both growth and volatility.

III. The Small Open Economy Stochastic Endogenous Growth Model

To measure the gain from financial integration, we extend a standard macroeconomic model to account for financial integration:

- First, in the financially integrated economy, the representative agent has access to global financial markets. She can hold riskless foreign bonds and contract debt (either to consume or invest in domestic capital). Both foreign bonds and debt are denominated in foreign currency. The agent chooses the amount of debt and bonds that she holds. Depending on her net position, the agent pays or receives interest. Note that, in our model, the representative agent does not have access to foreign risky capital.
- Second, the financially integrated economy receives FDI, the amount of which is not decided by the representative agent. This FDI is converted into productive capital and used for production. The income generated by this FDI goes partly to the foreign owners; the rest stays in the country. An equilibrium condition ensures that for the foreign investors, the certainty equivalent of the return on FDI matches that of international riskless bonds.

The rest of the model is a standard AK model with technological shocks. In addition, the representative agent consumes domestic and imported goods, foreign prices are subject to shocks, and part of the domestic production is exported. The trade balance, and current and capital accounts simultaneously adjust to ensure balance of payment equilibrium. Note that later in the paper the term “autarky economy” refers to an economy that is in financial autarky but trades with the rest of the world. The model is presented below.

A. Technology and the Sharing of GDP Between the Representative Agent and Owners of FDI

Technology

The small open economy produces one good using capital. The technology is *AK,* and temporary technological shocks perturb the production process. Over the period *(t, t+dt)*, the flow of output is:

$$dY = K(\mu_Y dt + \sigma_Y dz_Y) \qquad (1)$$

where dz_Y is the increment of a standard Wiener process $(dz_Y = \eta(t)\sqrt{dt}; \eta(t) \rightarrow N(0,1))$. Equation (1) asserts that the flow of output over the period *(t+dt)* consists of two components: a deterministic component ($K\mu_Y dt$) and a stochastic one ($K\sigma_Y dz_Y$) reflecting the random influences that impact on the production. Thus, as far as productivity is concerned, shocks are neither correlated nor persistent.

In the absence of financial integration, the whole stock of productive capital installed in the country is owned by the domestic representative agent.

With financial integration, additional productive capital (K^*) comes from FDI. This FDI, owned by foreign investors, is used for production. The rest of the stock of capital (Kd) is owned by the representative agent so $K = Kd + K^*$. We define ϕ^* to be the ratio of foreign-owned capital to domestically owned capital ($\phi^* = K^*/Kd$). In the autarky economy, $\phi^* = 0$. In the financially integrated economy, we suppose that ϕ^* is constant over time, an assumption that permits us to derive a closed-form solution for the representative agent's intertemporal allocation problem. Finally, we will later[3] allow the deterministic productivity to depend on the ratio of foreign-owned capital to domestically owned capital, so $\mu_y = \mu_y(\phi^*)$.

Sharing Income from Production

Income generated with capital owned by the domestic agent goes to the domestic agent (who still has to pay interest on his foreign debt). In addition, a fraction τ of the income generated with foreign-owned capital (FDI) goes to the domestic agent to account, for instance, for taxes or any trickle-down effect;[4] the rest of the income generated by FDI goes to the foreign owners.

Thus, before interest payments/revenues on foreign debt/claims, the domestic agent income is given by:

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[3] See Section IV.D of the paper.

[4] It can be wages paid to resident as well.

$$\left[\mu_Y + \sigma_Y dz_y\right]\left[1 + \tau\phi^*\right]K^d .$$

Foreign owners of FDI receive the fraction (1-τ) of the income generated by their capital that is not kept by the domestic agent. Therefore, the revenue from their investment is:

$$(1-\tau)\left(\mu_Y + \sigma_Y dz_y\right)K^* = (1-\tau)\left(\mu_Y + \sigma_Y dz_y\right)\phi^* K^d .$$

This income is stochastic. We impose the condition that for FDI owners, the certainty-equivalent return on risky domestic capital is equal to the riskless rate on foreign bonds (i^*):

$$\left(1-\tau\right)\left(\mu_Y - \gamma\left(1-\tau\right)\sigma_y^2 / 2\right) = i^* + \mu_E , \qquad (2)$$

where γ is the foreign investor's risk aversion, and μ_E is the expected rate of depreciation of the domestic nominal exchange rate against the foreign investor currency.

Note that condition (2) is not sufficient to determine endogenously the amount foreign investors are willing to invest in the country. It just says that foreign investors are indifferent between holding riskless foreign bonds and holding risky domestic productive capital. This condition satisfied, investors can invest any amount in the small open economy. Their participation is measured by ϕ^*, the ratio of foreign-owned capital to domestically owned capital. We take ϕ^* as an exogenous parameter. Moreover, under the assumption that this ratio is constant over time, the flow of foreign investment into the economy is proportional to the investment of domestic agents in domestic capital[5].

B. Other Features of the Model

The representative household consumes a domestically produced good (C_D) and an imported one (C_M). Total consumption in terms of domestic currency then depends on both the price of the imported good denominated in foreign currency and the exchange rate.

[5] We do not model the behavior of the foreign investor but make sure he is indifferent between investing in riskless bonds in his country and risky FDI in the developing country. The assumption that his participation to the economy is constant over time implies that the stock of FDI he owns grows at the developing economy growth rate. In order to model the behavior of the foreign investor one would have to consider a multicountry model. This is not done in this paper.

The Utility Function

We consider a recursive utility function that disentangles risk aversion and intertemporal substitution:

$$(1-\gamma)U(t)=\left[\left[\frac{C_{Dt}^{\theta}C_{Mt}^{1-\theta}}{L_0e^{nt}}\right]^{\frac{\varepsilon-1}{\varepsilon}}dt+e^{(n-\delta)dt}\left((1-\gamma)E_tU_{t+dt}\right)^{\frac{1}{1-\gamma}\frac{\varepsilon-1}{\varepsilon}}\right]^{\frac{(1-\gamma)\varepsilon}{\varepsilon-1}} \tag{3}$$

with $\varepsilon>0,\varepsilon\neq 1$, and $\gamma\neq 1$,

Where γ is the relative risk aversion coefficient of the domestic agent (and we suppose it is equal to that of the foreign investor), ε is the inter-temporal elasticity of substitution, L_0 is the population size at the initial date which is assumed to be unitary ($L_0=1$), and n is the population growth rate. Domestically produced and imported consumptions are aggregated according to a Cobb-Douglas function, so $C_{Dt}^{\theta}C_{Mt}^{1-\theta}$ gives the aggregate consumption.

Trade, Real and Nominal Exchange Rates

Let *P* be the price of the imported good denominated in foreign currency. We assume that *P* follows a geometric Brownian motion:

$$\frac{dP}{P}=\mu_P dt+\sigma_P dz_P \ ,$$

where dz_P is the increment of a standard Wiener process. Therefore, the price of the imported goods grows at a constant rate μ_P continuously perturbed by shocks. The instantaneous standard deviation of the growth rate is denoted by σ_P. We assume that productivity shocks and shocks on *P* are uncorrelated ($dz_P dz_Y=0$).

Total consumption in terms of domestic currency or domestic goods (the price of the domestically produced good is taken as numeraire) is C_D+EPC_M, where *E* is the nominal exchange rate defined as the number of domestic currency units per unit of foreign currency. *EP* is therefore the price of the imported good in terms of domestic currency. The nominal exchange rate *E* evolves at a constant and deterministic rate μ_E consistent with condition (2):

$$\frac{dE}{E}=\mu_E dt \ ,$$

with:

$$\mu_E=(1-\tau)\left(\mu_Y-\gamma(1-\tau)\sigma_Y^2/2\right)-i^*,$$

The evolution of *EP,* the real exchange rate, is then given by:

$$\frac{d(EP)}{(EP)}=\left(\mu_P+\mu_E\right)dt+\sigma_P dz_P \ ,$$

Wealth Accumulation, Capital Mobility, and the Flow of FDI

- In the autarky economy, the representative agent has no access to foreign financial market, and the only way of saving is investment in risky domestic capital. Wealth evolution is then given by:

$$dW = dK = \left[\mu_Y K - \left(C_D + EPC_M\right)\right] dt + K\sigma_Y dz_Y$$

- When the economy is financially integrated, the representative agent can hold equity claims on domestic capital and riskless foreign bonds (B>0). She can also contract debt denominated in foreign currency ($B<0$). Therefore, domestic wealth is split into two components: capital owned by domestic agents (K^d) and foreign debt/assets (EB):

$$W = K^d + EB \ ,$$

  Wealth evolution is as follows:

$$dW = \left[(1+\tau\phi^*)\mu_Y K^d + EB(i^* + \mu_E) - (C_D + EPC_M)\right] dt + (1+\tau\phi^*)K^d \sigma_Y dz_Y$$

Balance of Payments

The balance of payments equilibrium is always satisfied:

$$\underbrace{\underbrace{\underbrace{(\mu_Y dt + \sigma_Y dz)K - dK - AWdt}_{\text{Trade Balance}} - (1-\tau)\phi^* K^d(\mu_Y dt + \sigma_Y dz) + EB(i^* + \mu_E)}_{\text{Current Account}} + \phi^* dK^d - d(EB)}_{\text{Balance of Payments}}$$

$$= \underbrace{(\mu_Y dt + \sigma_Y dz)K - AWdt - (1-\tau)\phi^* K^d(\mu_Y dt + \sigma_Y dz) + EB(i^* + \mu_E)}_{dW} - \underbrace{\left[dK^{d=} d(EB)\right]}_{dW} = 0$$

IV. Solving the Model

The resolution of the model is given in Appendix 1. In this section, we present the main findings on portfolio allocation, growth, volatility, and, finally, the welfare gain from financial integration.

A. Portfolio Allocation

In the autarky economy, there is no portfolio choice since the only asset available to the representative agent is domestic capital.

Under financial integration, maximizing the utility function subject to the wealth accumulation equation provides expressions for the share of the two assets (as well as for consumption of the imported good and domestically produced good) in the composition of the wealth of the representative agent. These shares are (see Appendix 1):

$$n_K = \frac{K^d}{W} = \frac{1}{2} + \frac{\left[(1+\tau\phi^*)\mu_Y - \gamma(1+\tau\phi^*)^2\sigma_Y^2/2)\right] - \left[i^* + \mu_E\right]}{\gamma(1+\tau\phi^*)^2\sigma_Y^2} \qquad (3)$$

$$n_B = \frac{EB}{W} = 1 - n_k\ ,$$

As in any other portfolio choice, the optimal portfolio composition depends on expected returns and risk. The share of domestic capital in the domestic agent's portfolio can be larger than 1, meaning that the domestic investor borrows abroad to invest in domestic capital. The fact that the economy benefits from FDI ($\tau > 0$) increases the determinist part of the return on domestic capital for the domestic agent and thus his incentive to borrow abroad to invest at home. It increases as well the volatility of this return, thus limiting the incentive to borrow.

In the case where the economy does not benefit from foreign investment ($\tau = 0$), condition (2) implies that the expected return on domestic capital adjusted for risk is the same as the one on claims on foreign assets. Therefore, the domestic agent holds half of her wealth as domestic capital, the other half being invested abroad for diversification purposes.

B. Growth

In the autarky economy, the deterministic part of the GDP growth rate is:

$$g^A = \mu_Y - A^A\ ,$$

where A^A is the propensity to consume wealth, equal to: $A^A = \varepsilon\delta - n + (1-\varepsilon)CEq^A$, where Ceq^A is the certainty equivalent of the return on wealth. This expression for the marginal propensity to consume is standard. Note that, thanks to the recursive utility specification, it is clear that the effect on A^A of the certainty equivalent Ceq^A depends on the intertemporal elasticity of substitution. When the intertemporal elasticity of substitution is less than 1, a higher Ceq^A increases the propensity to consume, and hence reduces the growth rate of the economy. In turn, risk aversion does affect the relationship between risk and Ceq^A:

$$CEq^A = \left(\mu_y - \gamma\frac{\sigma_Y^2}{2}\right) - (1-\theta)\left(\left(\mu_P + \mu_E\right) - \left((1-\theta)(1-\gamma)+1\right)\frac{\sigma_P^2}{2}\right).$$

When the economy is financially integrated, the deterministic part of the economy growth rate is:

$$g^L = (1+\tau\phi^*)n_K\mu_Y + (1-n_K)(i^* + \mu_E) - A^L \quad ; \qquad (4.a)$$

A^L, the constant propensity to consume wealth, is equal to:

$$A^L = \varepsilon\delta - n + (1-\varepsilon)CEq^L \quad , \tag{4.b}$$

where Ceq^L is the certainty equivalent of the return on wealth, which depends on the portfolio allocation. It is equal to:

$$CE_q^L = n_k(1+\tau\phi^*)\left(\mu_y - \gamma n_k(1+\tau\phi^*)\frac{\sigma_Y^2}{2}\right) + (1-n_k)(i^*+\mu_E) - (1-\theta)\left((\mu_P+\mu_E) - [(1-\theta)(1-\gamma)+1]\frac{\sigma_P^2}{2}\right) \tag{4.c}$$

In the financially integrated economy, part of the certainty equivalent of the return on wealth comes from foreign debt/assets, and part of it comes from domestic capital income (net of the income that goes to foreign investors).

- In a net borrowing country ($n_K > 1$), the stock of physical capital is higher both because domestic agents borrow abroad to invest at home and because there are FDI flows. The component of the certainty equivalent of the return on domestic activity due to deterministic productivity increases, but the component linked to the stochastic part (which reduces Ceq^L) rises as well.
- In the case of net lenders ($n_K < 1$), it is even more ambiguous since more wealth comes from foreign investors, but domestic agents now devote part of their wealth to invest abroad.

The condition for international financial integration to spur growth is that $g^L > g^A$. This condition is not met for any set of parameters.

In the simplest case where the intertemporal elasticity of substitution is equal to 1, and the country is neither a lender nor a borrower, financial integration spurs growth (one can show that $g^L - g^A = \tau\phi^*\mu_y > 0$) through FDI. Moreover, when the intertemporal elasticity of substitution is equal to 1, one can show that the derivatives of $g^L - g^A$ to n_k are always positive, which means that the more debt the country holds, the higher its growth rate. Let us recall, though, that the optimal amount of debt is not a parameter but is endogenously determined within the model.

When the intertemporal elasticity of substitution is different from 1, the effect of financial integration on growth is ambiguous and cannot be analyzed analytically. Therefore, we rely on calibration experiments in the next section.

C. Volatility

Volatility in the Growth Rate of Wealth

Wealth volatility in a financially integrated economy (denoted vol^L) is:

$$vol^L = (1+\tau\phi^*)^2 n_K^2 \sigma_Y^2 .$$

Comparing this volatility with that of wealth in the autarky economy (denoted vol^A) gives:

$$\frac{vol^L}{vol^A} = (1+\tau\phi^*)^2 n_K^2 \ . \qquad (5)$$

In the case of a net borrower country ($n_K > 1$), financial integration increases total wealth volatility. Moreover, the larger the stock of FDI, the higher the volatility. For countries that are net lenders ($n_K < 1$), current account liberalization may either increase or decrease wealth volatility.

Volatility in the Growth Rate of Consumption

Solving the maximization problem provides expressions for the consumption of imported and domestic goods (see Appendix 1):

$$C_D^i = A^i \theta W$$
$$EPC_M^i = A^i (1-\theta) W \quad \text{with} \quad i = A, L$$

The volatility of the growth rate of total nominal consumption ($C_D + EPC_M$) and that of domestic consumption are the same as that of wealth since they both are a constant part of wealth. This is not the case for the volatility of imported consumption, which is (see Appendix 1):

$$vol(C_M^i) = vol^i + \sigma_P^2 \quad \text{with} \quad i = A, L .$$

Volatility of the growth rate of aggregate consumption is then (see Appendix 1):

$$vol\left(C_D^\theta C_M^{1-\theta}\right)^i = vol^i + (1-\theta)^2 \sigma_P^2 \quad \text{with } i=A,L.$$

Consumption volatility is higher than that of output owing to foreign price volatility. Moreover, consumption volatility is higher in the financially integrated economy than in the autarky economy as soon as wealth volatility is higher in the financially integrated economy.

D. Welfare Gain from Financial Integration

Total Welfare Gain from Financial Integration

The welfare gain from financial integration is computed as the percentage of current wealth that the domestic representative agent should receive to be as well off in the autarky economy as she is in the financially integrated one[6]. We denote this percentage by *k*. Note that at the time *t=s* of the switch, the wealth of the agent is $W(s) = K^d(s) + EB(s) = K(s)$, which means that the wealth is at the same level before and after the switch, but that its composition differs. After the switch, it is only made up of domestic capital.

The value functions for the optimal program or the indirect utilities of the two economies are as follows (see the appendix 1).

$$V^A = \left(A^{A}\right)^{\frac{1-\gamma}{1-\varepsilon}} \left(\frac{\theta EP}{1-\theta}\right)^{-(1-\gamma)(1-\theta)} \frac{(\theta K)^{1-\gamma}}{(1-\gamma)} e^{-(1-\gamma)nt}$$

$$V^L = \left(A^{L}\right)^{\frac{1-\gamma}{1-\varepsilon}} \left(\frac{\theta EP}{1-\theta}\right)^{-(1-\gamma)(1-\theta)} \frac{\left[\theta\left(K^d + EB\right)\right]^{1-\gamma}}{(1-\gamma)} e^{-(1-\gamma)nt}$$

One can show that:

$$k = \left[\frac{A^L}{A^A}\right]^{\frac{1}{1-\varepsilon}} - 1 \quad . \qquad (6)$$

Splitting-Up the Welfare Gain From Financial Integration

To appraise whether the welfare gain from financial integration comes from FDI or from the openness to foreign debt/assets, we break down the total welfare gain computed previously.

To split the total welfare gain from financial integration, we consider three different economies. Two of them have already been considered above – the autarky economy and the actual economy. We consider a third economy that receives FDI but is closed to other capital flows. We then proceed in two stages as illustrated in Figure 1. First, we consider the switch from the actual economy to an economy with FDI but no access to global financial markets; this allows us to compute the welfare gain from access to global financial markets. Next, we consider the switch from the latter economy to autarky, and this gives us the welfare gain of FDI.

Let us note V^{PL}, the optimal value of the program of an economy with FDI but no other capital flows. One can show that it is:

$$V^{PL} = (A^{PL})^{\frac{1-\gamma}{1-\sigma}} \left(\frac{\theta EP}{1-\theta}\right)^{-(1-\gamma)(1-\theta)} \frac{\left[\theta K^d\right]^{1-\gamma}}{1-\gamma} e^{-(1-\gamma)nt}$$

$$A^{PL} = \varepsilon\delta - n + (1-\varepsilon)CEq^{PL}$$

$$CEq^{PL} = (1+\tau\phi^*)\left[\mu_Y - \gamma(1+\tau\phi^*)\sigma_Y^2/2\right] - (1-\theta)\left[\mu_P + \mu_E - \left((1-\theta)(1-\gamma)+1\right)\sigma_P^2/2\right].$$

---

[6] The definition we use is the compensating variation.

The welfare gain from access to financial markets is then computed as the percentage of wealth that the domestic representative agent should receive to be as well off in the economy where there is FDI but no access to global financial markets as she is in the actual economy. It is:

$$k^{AFM} = \left[\frac{A^L}{A^{PL}}\right]^{\frac{1}{1-\varepsilon}} - 1. \qquad (7)$$

Finally, the welfare gain from FDI is the percentage of wealth that the domestic representative agent should receive to be as well off in the autarky economy as she is in the economy with FDI but no other capital flows. It is then:

$$k^{FDI} = \left[\frac{A^{PL}}{A^A}\right]^{\frac{1}{1-\varepsilon}} - 1 \qquad (8)$$

The three welfare gains are such that:

$$(1+k) = \left[1+k^{FDI}\right]\left[1+k^{AFM}\right]$$

V. Measuring the Welfare Gain From Financial Integration

A. The Data

To measure the upper bound for the welfare effect of financial integration, we calibrate our model on 32 developing and emerging economies over the period 1990-98. Our aim is to measure the welfare gain of a country representative agent that would result from the observed level of financial integration of that country in the specific (and optimistic) case where no costly side effects of financial integration hurt the country.

Tables 2 and 3 contain common and country-specific parameters used in the calibration. Common parameters (Table 2) are set to standard values with a discount rate of 2 percent; an international interest rate of 4 percent, an intertemporal elasticity of substitution set at 0.5, and a risk aversion of 5. Robustness of our results to preference parameters and the international interest rate is checked for additional values indicated in Table 2.

Country-specific parameters (see Table 3) have been computed using the Penn World table (HS 6.1) and the database on stock of international wealth put together by Lane and Milesi-Ferreti (2001). For our evaluation, the two most important parameters are ϕ^*, the ratio of foreign-owned capital to domestically owned capital, and n_K, the share of domestic capital in the representative agent's wealth. The mean value of n_K is 1.09, just above unity and ranges from 0.73 (Botswana) to 1.42 (Pakistan). Among the 32 countries we consider, only 7 of them are net lenders (Botswana, China, Egypt, Malaysia, Panama, South Africa, and Venezuela). The ratio of foreign-owned capital to domestically owned capital varies from 0 (Syria), which means that there is no FDI in this country, to 0.22 (Malaysia), which means that 18 percent of the physical capital installed in Malaysia is owned and managed by foreigners.

B. Calibration Issues

Our theoretical model has been solved under the hypothesis that the representative agent maximizes her intertemporal utility. In doing so, she allocates her wealth between domestic capital and debt/assets abroad according to her tastes, returns, and risk. She also determines her savings and consumption according to her tastes. We had no difficulties calibrating the inter-temporal choice of the domestic agents of the countries we studied. The portfolio choices were trickier to reproduce.

Actual data show that the volatility of emerging and developing economies, although higher than that of industrial economies, is low compared with the excess return of domestic investment for the representative agent. This should lead emerging and developing economies to borrow a lot abroad to invest at home, or, in our setting, a high n_k. This is not what we observe in the data. Numbers reported in Table 3 for actual n_k show that it is above but close to unity, much lower than what one would expect.

Our calibration strategy is then to stick to the n_k observed in the data and consider that this low level of indebtedness results from borrowing constraints that prevent emerging countries from holding their optimal portfolio. Consequences of this strategy will be discussed later in the paper. Note, however, that since portfolio choices and consumption-saving decisions are independent, the value function of the programs still holds under portfolio constraint. Thus, the value function of the program can be used to evaluate the welfare gain from financial integration.

Calibration runs as follows. We used equation (2) and the system composed of equations (4.a)-(4.c) to find the parameter τ, which measures the share of production using FDI that goes to domestic agent, the parameter μ_E, the expected change in the nominal exchange rate, and the productivity parameter μ_Y. Note that condition (2) still holds when the domestic agent is constrained in her borrowings. Indeed, this condition is derived from the perspective of foreign agents owning FDI in the country who are not affected by the borrowing constraint. It is the expression of the optimal share n_K (equation (3)) that is no longer valid under the borrowing constraint.

The growth rate of the economy (g^L), the volatility (σ_Y), and the portfolio allocation n_k are taken from the data (see Table 3). We calibrated the model for each country as well as for the average country, which we define as a country with country-specific parameters set to the mean of the sample.

Table 4 contains the outcome of this calibration process. Recall that the parameter τ measures the extent to which a country benefits from FDI. Our calibration indicates that for the average country of our sample, 37 percent of the production on foreign-owned plants goes to the domestic agent; in our sample, it ranges from a mere 2 percent to 51 percent, with a mean of 25 percent. The expected annual depreciation of emerging market currency against the dollar ranges from 0 percent to 8 percent, lower than actual between 1990 and 1998.

C. Evaluating the Welfare Gain From Financial Integration

We now use the calibrated model to compute the welfare gain from financial integration. Recall that we compare actual economies with economies under financial autarky. And the question we answer is the following: by how much should the total wealth of the representative agent be increased for her to accept to switch back to financial autarky? This is what we call the welfare gain from financial integration. It is computed using equation (6).This gain is then split into two components: the gain from FDI (equation (8)) and the gain from access to global financial markets (the ability to borrow and/or to invest abroad, equation (7)). Finally, we compute the difference in the growth rates of the two economies (the actual one and the one in financial autarky) and their relative volatility (equation (5)). Results are shown in Table 5.

For the average country of our sample, the gain from financial integration is around 11 percent of the representative agent's wealth, and the gain comes equally from FDI (4.9 percent of wealth) and from access to global financial markets (5.6 percent). Compared with autarky economies, we calculate that, on average, actual economies enjoy an additional 0.31 percentage points of annual growth. This comes at the cost of more volatility, which is 25 percent higher in actual economies compared with the autarky situation.

Figure 2 illustrates the dynamics of production, consumption, and capital accumulation in the two economies. The solid line refers to actual economies as described in our model, and the dotted line refers to the autarky economy. Let us consider what happens to the economy at the time the representative agent agrees to switch back to autarky and is compensated so as to keep intertemporal utility the same. At the beginning, the representative agent is richer (her wealth increases by the compensating amount she receives), but there is less productive capital available in the autarky economy since it is closed to FDI. As a result, GDP is lower in the autarky economy, while gross national income (GDP less interest and dividend payments), is almost the same in the two economies (note that in the autarky economy, GNI is equal to GDP). Propensity to consume wealth is higher in the actual economy than in the autarky one, but because wealth is initially higher in the autarky economy, it turns out that initial consumption is higher too in the autarky economy. From this initial situation, all macroeconomic aggregates in each economy grow at the same rate, which is lower in the autarky economy, and eventually the two economies diverge. The divergence process is slow. In our calibration, because the difference in the annual growth rates is small (around 0.3 percent per year), it takes around twenty years for consumption in the integrated economy to catch up with that in the autarky economy. The dashed line in Figure 2 illustrates the dynamics of the autarky economy in which no compensation is provided to the representative agent at the time she leaves the financially integrated economy. This economy exhibits the same growth rate as the autarky economy with compensation paid, but starts at a lower level. The comparison of these two economies gives us a measure of the compensation in terms of permanent consumption. It is straightforward to show that it is equal to the percentage compensation in terms of initial wealth. Thus, the welfare gain of financial integration can also be evaluated at around 11 percent of permanent consumption.

It is of interest to distinguish the welfare gain from financial integration by level of financial integration and by region. It is no surprise that the gain from financial integration is higher for countries that are more financially integrated, since we measure the gain from complete financial autarky to the actual level of financial integration. However, one can notice that the gain from financial integration in terms of annual growth rates is not that high. Our calibration says that more financially integrated economies would grow by an additional 0.42 percentage point compared with autarky, while less financially integrated economies grow by an additional 0.16 percentages point. The difference between these two figures is only 0.26 percentage point per year. This rather small number may explain why econometric studies so far have not provided clear evidence on the effect of financial integration on economic growth.

Turning to the gain from financial integration by region reported in Table 5, we see that the average Asian country benefits more from financial integration than countries in any other region. Financial integration indexes reported in Table 1 indicate that Latin America was the most financially integrated region, yet our results show that it benefits less from financial integration than Asia; the welfare gain from financial integration is equal to 11.6 percent for Asia compared with 9.7 percent for Latin America. This underscores that the degree of financial integration is not the only component of the welfare gain from financial integration; the nature of financial integration (FDI, debt) and the capacity of the country to benefit from FDI (parameter τ) also matter.

D. Checking for Robustness

Sensitivity to Preference Parameters and Interest Rate

To check for the robustness of the above evaluation of the welfare gain from financial integration, we start by modifying preference parameters (risk aversion and intertemporal elasticity of substitution) and international interest rates. Table 6 contains the results. The welfare gain from financial integration is a decreasing function of all these parameters. An international interest rate 1 percent higher reduces the overall evaluation of the welfare gain from financial integration by 1 percent (from 10.9 percent to 9.8 percent). A higher risk aversion translates into a smaller welfare gain. This comes from the fact that financial integration, and the foreign borrowing that accompanies it in most emerging economies, increases the volatility of gross national income. As a consequence, the more risk averse the representative agent, the smaller the gain from financial integration. In our calibration, changing the risk aversion parameter from 2 to 5 reduces the welfare gain from 10.9 percent to 8.7 percent. Finally, a higher intertemporal elasticity of substitution reduces the sensitivity of the marginal propensity to consume with respect to financial integration. Therefore, the larger the intertemporal elasticity of substitution, the smaller the gains from financial integration.

Alternative Calibration Strategy

So far our calibration strategy has been to consider that, because of borrowing constraints, countries were unable to hold their optimal portfolio. As said before, given the model parameters and the relatively low volatility in most emerging countries, our model predicted that emerging countries would want to borrow a lot abroad to invest at home. This is not what is observed in the data, which show that emerging countries are indebted in reasonable proportions (with *nk* slightly above 1). This discrepancy between observed and predicted portfolios could also come from the existence of a risk premium on foreign borrowing. Indeed, we have assumed so far that investors required a risk premium only on risky FDI, but not on lending that was considered as risk-free for the foreign investor. We now relax this hypothesis and calibrate a risk premium (*RP*) on emerging country borrowing such that the observed n_K is optimal. Under this risk premium assumption, equation (5) becomes:

$$dW = \left[(1+\tau\phi^*)\mu_Y K^d + EB(i^* + \mu_E + RP) - (C_D + EPC_M)\right]dt + (1+\tau\phi^*)\sigma_Y K^d dz_Y,$$

and the optimal portfolio share is now given by:

$$n_K = \frac{1}{2} + \frac{\left[(1+\tau\phi^*)\mu_Y - \gamma(1+\tau\phi^*)^2\sigma_Y^2/2\right] - \left[i^* + \mu_E + RP\right]}{\gamma(1+\tau\phi^*)^2\sigma_Y^2}. \qquad (9)$$

The growth rate of the financially integrated economy is:

$$g^L = (1+\tau\phi^*)n_K\mu_Y + (1-n_K)(i^* + \mu_E + RP) - A^L,$$

with

$$A^L = \varepsilon\delta - n + (1-\varepsilon)CEq^L,$$

and

$$CEq^L = n_K(1+\tau\phi^*)\left(\mu_Y - \gamma(1+\tau\phi^*)\frac{\sigma_Y^2}{2}\right) + (1-n_K)(i^* + \mu_E + RP)$$
$$-(1-\theta)\left((\mu_P + \mu_E) - ((1-\theta)(1-\gamma)+1)\frac{\sigma_P^2}{2}\right).$$

Note that equation (2), which expresses the required return on FDI, remains the same.

To calibrate this new version of our model, we keep all the other parameters equal to their value in the previous calibration and calculate the *RP* that exactly solves equation (9). The risk premium that we obtain on foreign borrowing is given in Table 7. For the average country, it is around 3 percent and varies from 8 percent to –1 percent. It is higher for more financially integrated economies than for less integrated ones. Finally, it is relatively stable across regions.

Table 8 shows that the welfare gain from financial integration is much lower (around 5 percent of initial wealth) when we introduce a risk premium, although small, on foreign borrowing. The decomposition of the welfare gain shows that the gain from FDI is unchanged compared to with previous calibration. On the contrary, the gain from access to global financial markets becomes a lot smaller – almost negligible. This is not surprising. The risk premium emerging countries have to pay on their debt reduces the benefit they get from borrowing. This was not the case in the previous calibration in which they only bear the riskless international interest rate augmented for currency depreciation.

Allowing for a Higher Productivity of FDI

In the introduction of this paper, we mentioned that financial integration may provide additional benefits to the country when FDI brings in new technology that raises the overall productivity of the economy. So far, our model and our calibration strategy do not allow for such an effect. The calibration can be easily modified to take it into account and compute its impact on the welfare gain from financial integration.

To do so, let us assume that FDI makes capital used in the country (FDI itself + domestic capital) more productive. The larger the FDI, the more important this productivity gain. Therefore, we assume that the gain in productivity is proportional to the size of the FDI: $\mu_Y = (1 + X\phi^*)\mu_Y^D$, where μ_Y^d is the productivity in the autarky economy. It is less than μ_Y as soon as X is positive. In terms of computing the welfare cost of financial integration, we use the same calibration for the financially integrated economy, but reduce to μ_Y^d the productivity parameter in the autarky economy. In the calibration below we set $X=0.5$, which corresponds, for the average country in our sample, to a 9 percent increase in the overall productivity in the financially-integrated economy.

Results of that experiment are shown in Table 9. Of course, the fact that FDI affects the overall productivity does not change the welfare gain from access to global financial markets. The welfare gain from FDI is significantly higher.

VI. CONCLUSION

In this paper, we have calibrated a theoretical model in order to appraise the welfare gains from actual financial integration in developing and emerging economies. We provide an upper bound to the gains from financial integration since we focus on the potential benefits and neglect potential losses. Gains we have computed are not huge, but significant, since they represent about 10 percent of existing wealth. In particular, the gains in terms of growth differential cannot be ignored; actual financial integration brings about 0.3 percentage point of growth per year. Moreover, we show that the welfare gains from financial integration are nearly equally split between the gains from access to global financial markets and those due to FDI. Finally, when we allow for FDI to raise domestic productivity we obtain a large welfare gain, with financial integration translating into 0.5 percentage point of growth per year.

On average, the gains we derived are higher than those computed by Gourinchas and Jeanne (2004). Indeed, they obtain a gain from financial integration that represents only around 1 percent of consumption each year along the growth path of the economy. Such a discrepancy with our measure may come from their different modeling: they consider a deterministic model of exogenous growth while we consider an exogenous growth model under uncertainty. It also comes from the fact that they measure the potential gain from full financial integration compared with the actual level of financial integration, while we measure the gain from the actual level of financial integration compared with financial autarky[7]. The approach we follow provides a better benchmark for econometric studies, which are based on actual economies.

Even though we derive larger gains from financial integration than Gourinchas and Jeanne (2004), the benefits from financial integration we report are not huge. Our calibration shows, therefore, that it is not surprising that econometric studies struggle to exhibit large effects of financial integration on growth.

[7] Note that in our endogenous growth model it is impossible to define what would be full financial integration. Therefore, we cannot derive a measure of the effect of financial integration that would directly compare with that of Gourinchas and Jeanne.

Table 1. Measuring Financial Integration for 32 Developing and Emerging Economies in 1996

(Ratio to GDP)

	Whole sample	Level of financial integration		Region				For memo
		Low	High	Africa	Asia	Latin America	Middle East	G-3 economies
# of countries	32	12	20	3	8	15	6	3
- Claim on foreign assets (excluding FX reserves) (1)	0.23	0.06	0.33	0.17	0.11	0.32	0.11	0.45
- Foreign Exchange reserves (2)	0.14	0.17	0.13	0.38	0.12	0.11	0.15	0.03
- Foreign Debt (3)	0.47	0.37	0.53	0.25	0.38	0.48	0.67	0.26
Of which:								
- Private foreign debt (3 a)	*0.14*	*0.06*	*0.18*	*0.09*	*0.18*	*0.13*	*0.09*	
- Government foreign debt (3 b)	*0.33*	*0.31*	*0.35*	*0.15*	*0.20*	*0.35*	*0.58*	
- Stock of FDI (4)	0.17	0.12	0.19	0.07	0.14	0.23	0.11	0.04
- Stock of equities liabilities (5)	0.02	0.01	0.03	0.02	0.03	0.02	0.01	0.06
- Financial Integration								
- Index 1 (1)+(2)+(3)+(4)+(5)	0.71	0.42	0.88	0.74	0.58	0.82	0.47	0.86
- Index 2 (1)+(3 a)+(4)+(5)	0.56	0.26	0.75	0.36	0.47	0.71	0.32	
Net Credit Position (1)+(2)-(3)	-0.10	-0.14	-0.07	0.30	-0.05	-0.05	-0.41	0.22

Unless indicated, data come from Lane and Milesi-Ferreti (2001).

(1) is the ratio to GDP of the sum of the estimate of stock of direct investment assets (cumulative flow adjusted for relative price variations), the estimate of stock of portfolio equity assets (cumulative flow adjusted for stock market price variations), and the sum of cumulative flows of portfolio debt assets, other assets and net errors and omissions.

(2) is the ratio to GDP of total reserves minus gold.

(3) is the ratio to GDP of gross external debt for developing countries, and the ratio to GDP of stock of other investment liabilities for G3 economies, (3b) is the ratio to GDP of public and publicly guaranteed long term debt (World Bank, Global Development Finance), and (3a) = (3) – (3b).

(4) is the ratio to GDP of the estimate of stock of direct investment liabilities (cumulative flow adjusted for relative price variations).

(5) is the ratio to GDP of the estimate of stock of portfolio equity liabilities (cumulative flow adjusted for stock market price variations).

Table 2. Common Parameters

Annual discount rate	δ	0.02
Intertemporal elasticity of substitution	ε	**0.5** ; 0.9 ;
Risk aversion	γ	**2** ; 5
International nominal interest rate	i^*	**0.04** ; 0.05

Table 3. Country-Specific Parameters

		Source (see also Appendix 2)	mean	max	min
Population growth rate (in percent)	n	HS 6.1 mean over period 1990-1998	1.9	3.1	0.9
Ratio of imported goods to absorption	$1-\theta$	HS 6.1 mean over the period 1990-1998	0.31	0.81	0.08
Variance of productivity shocks (in percent)	σ_y^2	HS 6.1 variance of the growth rate of the economy over the period 1990-1998	0.08	0.27	0.00
Trend in price of imported goods (foreign currency)	μ_P	HS 6.1 annual mean over the period 1990-1998	-0.12	0.06	-0.56
Price of imported good volatility (in percent)	σ_P^2	HS 6.1 variance of the annual growth rate in the price of imported goods over the period 1990-1998	1.67	14.46	0.04
Share of domestic capital in the agent's wealth	n_K	HS 6.1 + Lane and Milesi-Ferreti (year 1996) See Appendix 3.	1.09	1.42	0.73
Ratio of foreign owned capital to domestically owned capital	ϕ^*	HS 6.1 + LM-F (year 1996) See Appendix 3.	0.08	0.22	0.00
GDP growth rate	g^L	HS 6.1 mean over period 1990-1998	0.04	0.09	0.01

Table 4. Calibrated Parameters Under the Borrowing Constraint Hypothesis

			Mean	max	min	Average country
Share of production from foreign owned capital that goes to the domestic agent	τ	Equations (2), (4.a) - (4.c)	0.25	0.51	0.02	0.37
Expected annual change in the nominal exchange rate	μ_E		0.02	0.08	0.00	0.02
Productivity parameter	μ_Y		0.09	0.18	0.03	0.10

Note that parameters reported in this table are those derived with common parameters (Table 2) set at the following values: $i^*= 0.04$, $\gamma=2$, $\varepsilon =0.5$

Table 5. Welfare Gain from Financial Integration (average country)

	Whole sample	Level of financial integration		Region		
		Low	High	Asia	Latin America	Middle East
# of countries	32	12	20	8	15	6
K	10.9%	6.0%	14%	11.6%	9.7%	5.2%
k^{AFM}	5.6%	3.9%	6.0%	7.0%	4.8%	4.6%
k^{FDI}	4.9%	1.9%	7.5%	4.2%	4.6%	1.8%
$g^L - g^A$	0.31%	0.42%	0.16%	0.31%	0.29%	0.13%
Vol^L / Vol^A	1.25	1.26	1.25	1.28	1.29	1.18

Table 6. Sensitivity to Preference Parameters and Interest Rate

	i*=4% γ=2 ε= 0.5	**i*=5%** γ=2 ε= 0.5	i*=4% **γ=5** ε= 0.5	i*=4% γ=2 **ε= 0.9**
# of countries	32	32	32	32
k	10.9%	9.8%	8.7%	4.5%
k^{AFM}	5.6%	5.1%	4.5%	2.3%
k^{FDI}	4.9%	4.5%	4.0%	2.1%
$g^L - g^A$	0.31%	0.28%	0.24%	0.10%
Vol^L / Vol^A	1.25	1.24	1.23	1.21

Table 7. Calibrated Risk Premium on Foreign Debt

Whole sample				Level of financial integration		Region		
Mean	max	min	Average country	Low	High	Asia	Latin America	Middle East
0.03	0.08	-0.01	0.03	0.02	0.05	0.03	0.03	0.02

Note that parameters reported in this table are those derived with common parameters (Table 2) set at the following values: $i^*= 0.04$, $\gamma=5$, $\varepsilon=0.5$

Table 8. Welfare Gain from Financial Integration – Risk Premium Hypothesis

(average country)

	Whole sample	Level of financial integration		Region		
		Low	High	Asia	Latin America	Middle East
# of countries	32	12	20	8	15	6
k	4.98%	1.96%	7.52%	4.24%	4.63%	1.85%
k^{AFM}	0.01%	0.01%	0.00%	0.03%	0.02%	0.01%
k^{FDI}	4.97%	1.96%	7.51%	4.21%	4.61%	1.84%
$g^L - g^A$	0.15%	0.16%	0.24%	0.13%	0.15%	0.13%
Vol^L / Vol^A	1.25	1.26	1.25	1.28	1.29	1.18

Table 9. Welfare Gain from Financial Integration when FDI boosts overall productivity

(average country)

	Whole sample	Level of financial integration		Region		
		Low	High	Asia	Latin America	Middle East
# of countries	32	12	20	8	15	6
k	18.4%	11.4%	22.9%	18.9%	19.6%	9.3%
k^{AFM}	5.6%	3.9%	6.0%	7.1%	4.8%	3.3%
k^{FDI}	12.1%	7.2%	15.9%	11.1%	14.1%	5.9%
$g^L - g^A$	0.49%	0.29%	0.63%	0.47%	0.53%	0.22%
Vol^L / Vol^A	1.25	1.26	1.25	1.28	1.29	1.18

Figure 1. Splitting Up the Welfare Gain from Financial Integration

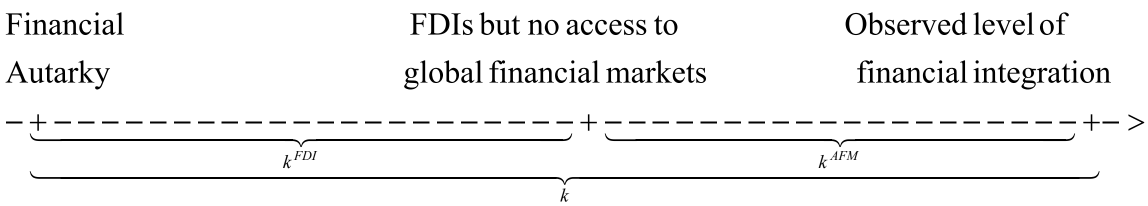
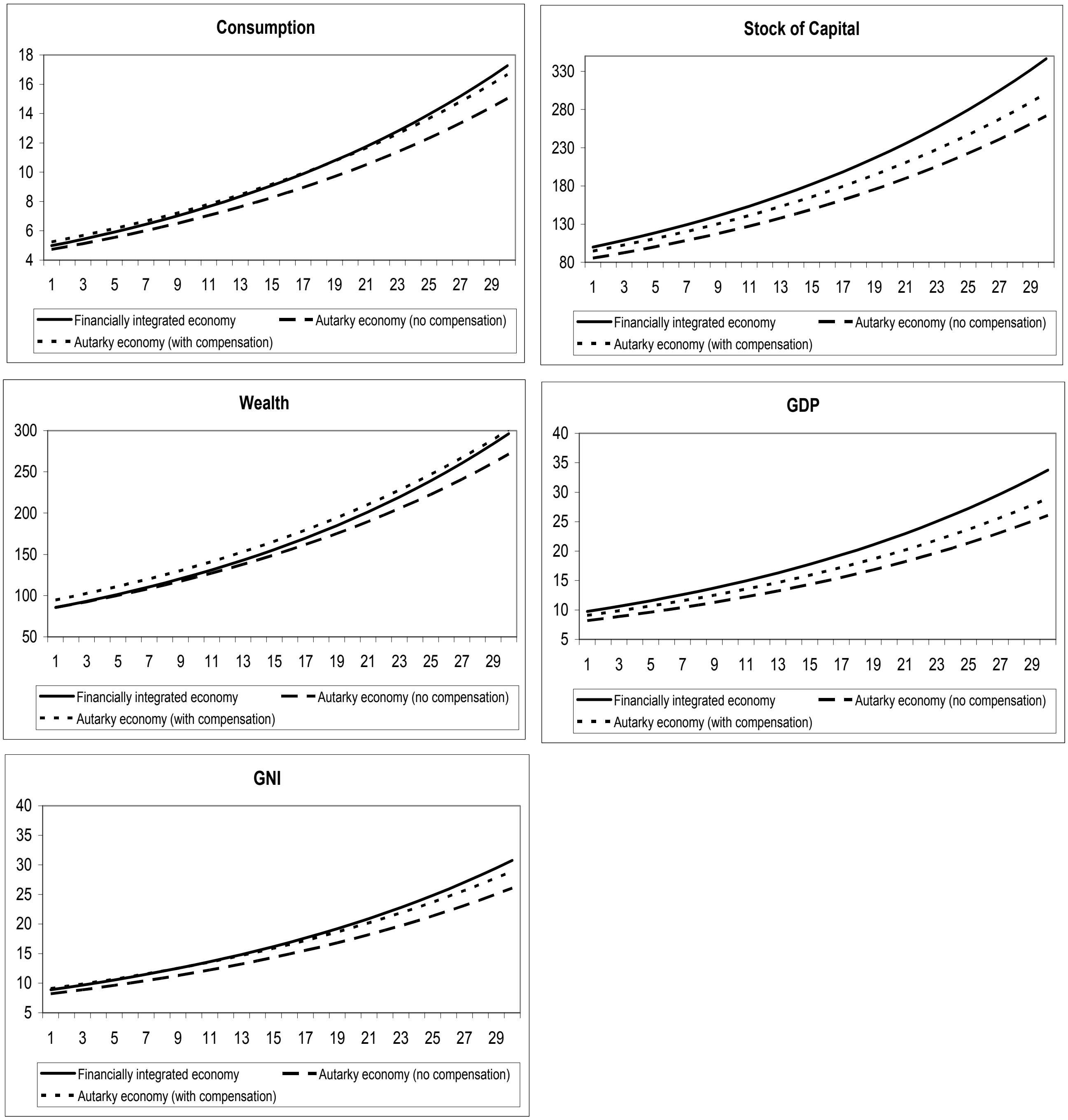


Figure 2. Dynamics of Financially Integrated and Financial Autarky Economies



APPENDIX

Appendix 1. Solving the Model

The program to be solved is:

$$\max(1-\gamma)U(t)=\left[\left[\frac{C_{Dt}^{\theta}C_{Mt}^{1-\theta}}{L_0e^{nt}}\right]^{\frac{\varepsilon-1}{\varepsilon}}dt+e^{(n-\delta)dt}\left((1-\gamma)E_tU_{t+dt}\right)^{\frac{1}{1-\gamma}\frac{\varepsilon-1}{\varepsilon}}\right]^{\frac{(1-\gamma)\varepsilon}{\varepsilon-1}}$$

$$s.t.\ \ dW=\left[(1+\tau\phi^*)K^d\mu_Y+EB(i^*+\mu_E)-\left(C_D+EPC_M\right)\right]dt+(1+\tau\phi^*)K^d\sigma_Y dz_Y.$$

The Bellman function associated with the program is:

$$(1-\gamma)V(t)=\underset{\{K_t,B_t,C_{Dt},C_{Mt}\}}{Max}\left[(C_{Dt}^{\theta}C_{Mt}^{1-\theta})^{\frac{\varepsilon-1}{\varepsilon}}e^{-\frac{\varepsilon-1}{\varepsilon}nt}dt+e^{(n-\delta)dt}\left((1-\gamma)E_tV_{t+dt}\right)^{\frac{1}{1-\gamma}\frac{\varepsilon-1}{\varepsilon}}\right]^{\frac{(1-\gamma)\varepsilon}{\varepsilon-1}},$$

where *V(t)* is the value function of the program.
We guess a value function of the form:

$$V=A^{\frac{1-\gamma}{1-\varepsilon}}\left(\frac{\theta EP}{1-\theta}\right)^{-(1-\gamma)(1-\theta)}\frac{(\theta W)^{1-\gamma}}{(1-\gamma)}e^{-(1-\gamma)nt},$$

where A is a constant to be calculated.
$E_t\left[V(W_{t+dt})\right]$ can be calculated using Itô's lemma:

$$E_t\left[V(W_{t+dt})\right]=A^{\frac{1-\gamma}{1-\varepsilon}}\left(\frac{\theta EP}{1-\theta}\right)^{-(1-\gamma)(1-\theta)}\frac{(\theta W)^{1-\gamma}}{(1-\gamma)}e^{-(1-\gamma)n(t+dt)}\left[1+(1-\gamma)\left(\mu_Y(1+\tau\phi^*)\frac{K^d}{W}+\frac{EB}{W}(i^*+\mu_P)-\frac{C_D+EPC_M}{W}\right)dt\right.$$
$$\left.-\gamma(1-\gamma)(1+\tau\phi^*)^2\left(\frac{K^d}{W}\right)^2\frac{\sigma_Y^2}{2}dt-(1-\gamma)(1-\theta)(\mu_P+\mu_E)dt+(1-\gamma)(1-\theta)\left((1-\theta)(1-\gamma)+1\right)\frac{\sigma_P^2}{2}dt\right]$$

Replacing it into the Bellman equation and using the fact that $\lim_{x\to 0}(1+x)^y=1+xy$ and $\lim_{x\to 0}e^x=(1+x)$ leads to:

$$V(t)=\underset{\{K_t,B_t,C_{Dt},C_{Mt}\}}{Max}\left[(C_{Dt}^{\theta}C_{Mt}^{1-\theta})^{\frac{\varepsilon-1}{\varepsilon}}e^{-\frac{\varepsilon-1}{\varepsilon}nt}dt+e^{-\frac{\varepsilon-1}{\varepsilon}nt}A^{\frac{-1}{\varepsilon}}\left(\frac{\theta P}{1-\theta}\right)^{\frac{-(\varepsilon-1)(1-\theta)}{\varepsilon}}(\theta W)^{\frac{\varepsilon-1}{\varepsilon}}\left[1+\frac{\varepsilon-1}{\varepsilon}\left(\mu_Y(1+\tau\phi^*)\frac{K^d}{W}+\frac{EB}{W}(i^*+\mu_P)-\frac{C_D+EPC_M}{W}\right)dt\right.\right.$$
$$\left.\left.-\frac{\gamma(\varepsilon-1)}{\varepsilon}(1+\tau\phi^*)\left(\frac{K^d}{W}\right)^2\frac{\sigma_Y^2}{2}dt-\frac{(1-\theta)(\varepsilon-1)}{\varepsilon}\left((\mu_P+\mu_E)-\left((1-\theta)(1-\gamma)+1\right)\frac{\sigma_P^2}{2}\right)dt+\left(\frac{n}{\varepsilon}-\delta\right)dt\right]\right]^{\frac{(1-\gamma)\varepsilon}{\varepsilon-1}}$$

Maximizing with respect to C_D and C_M leads to:

$$C_{Dt} = \theta AW$$
$$EPC_{Mt} = (1-\theta)AW$$

Maximizing with respect to (K^d/W) and (EB/W) subject to the constraint that $K^d + EB = W$ leads to equations (7).

Replacing the optimal consumptions, capital stock, and debt stock in the Bellman equation allows getting the expression of the constant A:

$$A = \varepsilon\delta - n + (1-\varepsilon)CEq$$

$$CEq = (1+\tau\phi^*)n_k\left(\mu_y - \gamma(1+\tau\phi^*)n_n\frac{\sigma_Y^2}{2}\right) + (1-n_k)\left(i^* + \mu_E\right) - (1-\theta)\left(\left(\mu_P + \mu_E\right) - \left((1-\theta)(1-\gamma)+1\right)\frac{\sigma_P^2}{2}\right)$$

It then provides equations (8) in the text.

The solution of the program is then:

$$C_{Dt} = \theta AW$$
$$EPC_{Mt} = (1-\theta)AW$$
$$n_K = \frac{1}{2} + \frac{\left[(1+\tau\phi^*)\mu_Y - \gamma(1+\tau\phi^*)^2\sigma_Y^2/2\right] - \left[i^* + \mu_E\right]}{\gamma(1+\tau\phi^*)^2\sigma_Y^2}$$
$$dW = \left[(1+\tau\phi^*)K^d\mu_Y + EB(i^* + \mu_E) - \left(C_D + EPC_M\right)\right]dt + (1+\tau\phi^*)K^d\sigma_Y dz$$

Computation of the consumption volatility is made as follows:

Since $EPC_M^i = (1-\theta)A^iW$,

$$\frac{dC_M^i}{C_M^i} = \left(\frac{dW}{W}\right)^i - \frac{dP}{P} - \frac{dE}{E} \Rightarrow E\left(\frac{dC_M^i}{C_M^i}\right)^2 = vol^i + \sigma_P^2.$$

Moreover,

$$\frac{d\left(C_D^\theta C_M^{1-\theta}\right)^i}{\left(C_D^\theta C_M^{1-\theta}\right)^i} = \theta\left(\frac{dW}{W}\right)^i - (1-\theta)\frac{dP}{P} - (1-\theta)\frac{dE}{E} = vol^i + (1-\theta)^2\sigma_P^2.$$

Appendix 2. Data

Table 10. Data Sources and Definitions

Variable	Source	Definition
Y	Heston, Summer and Aten 6.1.	Real GDP, constant local currency
I	Heston, Summer, and Aten 6.1.	Investment, constant local currency
C	Heston, Summer, and Aten 6.1.	Consumption, constant local currency
G	Heston, Summer, and Aten 6.1.	General government consumption, local currency
IM	Heston, Summer, and Aten 6.1.	Importations, constant local currency
X	Heston, Summer, and Aten 6.1.	Exportations, constant local currency
IV	Heston, Summer, and Aten 6.1.	Investment, nominal local currency
E	Heston, Summer, and Aten 6.1.	Nominal Exchange rate, US $ 1 = E local currency units
NEW	Lane and Milesi-Ferreti	Estimate of net external asset position based on adjusted cumulative current account, current US$.
SIL	Lane and Milesi-Ferreti	Estimate of stock of investment liabilities, (cumulative flow adjusted for relative price variations)current US$
SPL	Lane and Milesi-Ferreti	Estimate of stock portfolio liabilities (cumulative flow adjusted for stock market variation)

Appendix 3. Constructing Capital and Debt Stocks

- *K*, the total stock of capital available is computed with the perpetual inventory method, starting in 1960, and with annual discount factor set at 6%.

$$K_{1960} = I_{1960}$$
$$K_t = (1-0.06)K_{t-1} + I_t, \quad t > 1960$$

- K^*, the stock of capital owned by foreign investors is taken from Lane and Milesi-Ferreti dataset and converted into constant local currency , and two cases are considered. In the first case, it is equal to the stock of investment liabilities: $K_t^* = SIL_t \left[E_t \times \frac{I_t}{IV_t} \right]$ In the second case, it is equal to the stock of investment and portfolio liabilities: $K_t^* = \left[SIL_t + SPL_t \right] \left[E_t \times \frac{I_t}{IV_t} \right]$

- K^d, the stock of capital owned by domestic agents is computed the difference between *K* and *K**.

- ϕ^*, the ratio of capital owned by foreign investors to capital owned by domestic agents is then $\phi^* = K^* / K^d$

- *B*, the net debt of the country in current US dollars is computed as its net external position as computed by Lane and Milesi-Ferreti minus the value of stock of capital owned by foreign investors. Again two cases (excluding and including portfolio liabilities) are considered: $\begin{cases} B_t = NEW_t + SIL_t \\ B_t = NEW_t + SIL_t + SPL_t \end{cases}$

- n_K, the part of domestic capital in representative domestic wealth is then:

$$n_{k,t} = \frac{K^d \left[\frac{IV_t}{I_t} \right]}{K^d \left[\frac{IV_t}{I_t} \right] + E_t B_t}$$

Appendix 4. Less Integrated and More Integrated Economies

Table 11. Constructing Indices of Financial Integration

	Foreign assets (1)	Reserves (2)	K* (4)	Ceqlr (5)	Debt (3)	Private debt(3a)	Pubic debt (3b)	class1 (6)	class2 (7)	class3 (8)	class4 (9)	Conclusion
Algeria	0.10	0.09	0.03	0.00	0.73	0.05	0.67	LI	LI	LI	LI	**LI**
Argentina	0.19	0.06	0.15	0.04	0.37	0.17	0.21	LI	HI	HI	HI	**HI**
Bolivia	0.25	0.13	0.23	0.00	0.69	0.13	0.57	HI	LI	HI	HI	**HI**
Botswana	0.15	0.93	0.12	0.01	0.11	0.00	0.11	LI	LI	LI	HI	**LI**
Brazil	0.06	0.08	0.10	0.05	0.23	0.11	0.12	LI	HI	LI	LI	**LI**
Chile	0.10	0.22	0.30	0.07	0.40	0.33	0.07	HI	HI	HI	LI	**HI**
China	0.16	0.13	0.22	0.00	0.16	0.03	0.13	HI	LI	LI	HI	**HI**
Colombia	0.12	0.11	0.20	0.01	0.34	0.16	0.17	HI	LI	HI	LI	**HI**
Costa Rica	0.01	0.11	0.33	0.00	0.39	0.06	0.32	HI	LI	LI	LI	**LI**
Dominican Republic	0.04	0.03	0.19	0.00	0.33	0.06	0.26	HI	LI	LI	LI	**LI**
Ecuador	0.18	0.10	0.20	0.00	0.76	0.11	0.65	HI	LI	LI	HI	**HI**
Egypt	0.09	0.26	0.19	0.00	0.46	0.04	0.43	HI	LI	LI	LI	**LI**
El Salvador	0.07	0.09	0.07	0.00	0.28	0.06	0.22	LI	LI	LI	LI	**LI**
Guatemala	0.03	0.06	0.16	0.00	0.24	0.07	0.18	HI	LI	LI	LI	**LI**
India	0.02	0.05	0.02	0.02	0.24	0.04	0.20	LI	HI	LI	LI	**LI**
Indonesia	0.08	0.08	0.10	0.04	0.57	0.30	0.26	LI	HI	HI	LI	**HI**
Jamaica	0.13	0.22	0.64	0.00	0.98	0.21	0.77	HI	LI	HI	HI	**HI**
Korea	0.20	0.07	0.03	0.03	0.24	0.19	0.05	LI	HI	HI	HI	**HI**
Malaysia	0.15	0.27	0.45	0.00	0.40	0.24	0.16	HI	LI	HI	HI	**HI**
Mauritius	0.05	0.21	0.07	0.01	0.42	0.15	0.27	LI	LI	HI	LI	**LI**
Mexico	0.27	0.06	0.25	0.09	0.48	0.19	0.29	HI	HI	HI	HI	**HI**
Morocco	0.09	0.10	0.10	0.02	0.60	0.02	0.58	LI	HI	LI	LI	**LI**
Pakistan	0.06	0.01	0.06	0.02	0.46	0.09	0.37	LI	HI	LI	LI	**LI**
Panama	2.70	0.11	0.28	0.00	0.74	0.11	0.62	HI	LI	LI	HI	**HI**
Peru	0.00	0.17	0.22	0.02	0.48	0.15	0.33	HI	HI	HI	LI	**HI**
Philippines	0.18	0.12	0.14	0.03	0.48	0.16	0.32	LI	HI	HI	HI	**HI**
South Africa	0.32	0.01	0.03	0.05	0.21	0.12	0.08	LI	HI	LI	HI	**HI**
Syria	0.74	0.16	0.03	0.00	1.28	0.28	1.00	LI	LI	HI	HI	**HI**
Thailand	0.06	0.21	0.12	0.07	0.50	0.41	0.09	LI	HI	HI	LI	**HI**
Tunisia	0.15	0.10	0.23	0.03	0.59	0.11	0.48	HI	HI	LI	HI	**HI**
Turkey	0.08	0.09	0.04	0.02	0.45	0.19	0.27	LI	HI	HI	LI	**HI**
Venezuela	0.65	0.17	0.15	0.05	0.50	0.11	0.40	HI	HI	LI	HI	**HI**
Sample median	**0.12**	**0.11**	**0.15**	**0.01**	**0.46**	**0.12**	**0.27**					

(1)-(5): Table 1. (6): According to the classification 1, countries have a low integration if their stock of direct investment is less than that of the median country. (7): According to the classification 2, countries have a low integration if their stock of portfolio equity liabilities is less than that of the median country. (8): According to the classification 3, countries have a low integration if their private debt is less than that of the median country. (9): According to the classification 4, countries have a low integration if their Claim on foreign assets excluding reserves is less than that of the median country. We conclude that an economy has a low integration if it is not integrated with respect to at least 2 of the previous classifications.

Table 12. Distinguishing Between LIEs (Less Integrated Economies) and MIEs (More Integrated Economies)

12 Less Integrated Economies		20 More Integrated Economies	
Algeria	Morocco	Argentina	Mexico
Botswana	Pakistan	Bolivia	Panama
Brazil		Chile	Peru
Costa Rica		China	Philippines
Dominican Republic		Colombia	South Africa
Egypt		Ecuador	Syria
El Salvador		Indonesia	Thailand
Guatemala		Jamaica	Tunisia
India		Korea	Turkey
Mauritius		Malaysia	Venezuela

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