Financial Globalization and Emerging Markets: With or Without Crash?

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Abstract

We analyze the impact of financial globalization on asset prices, investment and the possibility of crashes driven by self-fulfilling expectations in emerging markets. In a two-country model with one emerging market (intermediate income level) and one industrialized country (high income level), we show that transaction costs on international financial flows magnify the income effect of productivity differences through their impact on asset prices and investment incentives. Symmetric liberalization of capital outflows and inflows increases asset prices, investment and income in the emerging market. However, for intermediate levels of international financial transaction costs, we find that a financial crash driven by self-fulfilling expectations is possible. The crash is accompanied by capital flight and a drop in income and investment below the financial autarky level. We show that emerging markets are more prone to such a financial crash simply because they have a lower income level and not because of the existence of market failures such as moral hazard or credit constraints.

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1 Introduction

This paper investigates the impact of financial liberalization on equity prices, investment behavior and income in emerging markets. When capital flows more easily into and out of emerging markets, do these markets reap the benefits of increased investment and a better ability to diversity their risk? Or do they simply face an increased likelihood of financial crash? The empirical literature seems to point towards the relevance of both these outcomes. Bekaert and Harvey (2001), Bekaert, Harvey and Lundblad, (2001), Henry (2000) and de Jong and de Roon (2001) show that increased financial liberalization in emerging markets leads to a decrease in the cost of equity capital and has a positive effect on domestic investment and growth. On the other hand, a voluminous literature on financial crisis emphasizes the risks of liberalization and the fragility of emerging markets financial systems in a world of free capital mobility. Edwards (2001) finds that opening the capital account positively affects growth only after the country has achieved a certain degree of economic development. McKenzie (2001) concludes that restrictions on current account payments, but not on capital transactions, affect growth negatively. Arteta, Eichengreen and Wyplosz (2001) show that capital account liberalization has a significant positive growth effect contingent on the absence of macroeconomic imbalances. Wyplosz (2001) finds that external financial liberalization is considerably more destabilizing in developing countries than in developed countries: liberalization generates a boom-bust cycle. Another strand of literature[1] has also found that liberalization of capital flows has contributed to both banking and currency crises in emerging markets. Kaminski and Schmukler (2001) find that stock markets become more volatile in the three years following financial liberalization. They tend however to be more stable in the longer run.

The paper presents a general framework in which these contradictory aspects of financial globalization can be reconciled and discussed. In our model, reducing asset market segmentation between emerging markets and developed countries increases asset prices, investment and income in the emerging market. Thus financial liberalization does perform its positive role of expanding diversification opportunities and lowering the cost of investment in emerging markets. In certain circumstances, however, financial liberalization can lead to financial crashes. We show that emerging markets may be more prone to financial crashes due to the mere fact that their income is lower than developed countries and not necessarily because of fundamental macro-economic imbalances, a bad choice of exchange rate regime or because of the existence of market failures such as "moral hazard", credit constraints or an 'over-borrowing syndrome'. The point we are making here is therefore very general and independent of any specific form of credit market imperfection. In our model, the decision to

[1] See for example, Eichengreen, Rose and Wyplosz (1995), Rossi (1999), Demigüc-Kunt and Detragiache (1998) and Kaminsky and Reinhart (1999)

invest by one agent influences the cost of capital of other investors through the impact of that decision on income and the price of assets. The type of market failure our model is based on can therefore best be described as a pecuniary externality.

We present a two-country model of the world economy (one generic emerging market and one generic developed market). The emerging market and the developed economy differ only by the productivity levels of their labor. In both countries, domestic entrepreneurs decide to invest or not in risky projects, sell shares of their projects on the stock exchange and acquire shares in other risky ventures developed at home or abroad. Financial markets however are not perfectly integrated as transaction costs hamper the international trade in assets.

What is the main mechanism at work in our model? When entrepreneurs expect that aggregate investment in their economy will be large, they expect aggregate income and demand for equity investment to be high as well. Because assets are imperfect substitutes and transaction costs give rise to a home bias in asset holding, this in turn means that the expected price of their shares on the stock exchange will be high and gives them an incentive to invest in a large number of risky projects. In such a case, facilitating capital flows helps the emerging market to reduce the disadvantage of having a low productivity level that translates into low saving and high cost of capital. Therefore, in this situation, liberalizing the capital account enhances international risk sharing and increases domestic investment. The same logic may however go in the other direction: if entrepreneurs expect low levels of aggregate investment, they also contemplate a low level of aggregate income and they do not expect to be able to raise capital at a good price. This deters them from developing risky projects. In such a case, domestic investors turn to the developed country stock exchange to buy equity shares and there are big capital outflows from the emerging market to developed countries. This circular chain of causation may lead to multiple equilibria as long as investing in risky projects requires a fixed cost and there is an intermediate degree of financial segmentation. The reason why instability and crashes occur only for intermediate degrees of capital account liberalizations in our model can be understood as follows. If financial markets are perfectly integrated, international arbitrage ensures that asset prices are the same in the developed country and the emerging market. This rules out the possibility of multiple equilibria since the price of equity shares in the emerging market is pinned down by the price of capital worldwide and independent of domestic expectations. Symmetrically, if financial asset markets are very segmented internationally, emerging markets agents have no choice but to invest at home since capital outflows are heavily restricted. This rules out capital flight and multiple equilibria but leads to a suboptimal world allocation of resources with lower equity prices (and therefore higher cost of capital) in the emerging market compared to the developed country. The reason why the emerging market is more prone to a financial crash than the industrialized country is that when agents are pessimistic on investment in the industrialized country , the expected income and asset price in that country are always higher than in the emerging market when that country is

hit by pessimistic expectations. Another way to say it is that pessimistic expectations have always worse consequences in the emerging market.

The most closely related paper is Matsuyama (2001) which studies the impact of financial globalization on inequality across countries when there is a borrowing constraint on domestic capital markets. Like Matsuyama (2001), we find that in some cases, financial globalization leads to increased inequality across nations. One advantage of our model compared to Matsuyama (2001) is that we are able to analyze all the intermediate cases of financial globalization (he contrasts autarky with free capital mobility). Also, we do not rely on any specific assumption regarding credit constraints on the domestic capital market. Instead we make the simple and realistic assumption that labor is more productive in one country than in the other.

More generally, our work is related both to the literature on financial integration (see Stulz 2001 for a survey) and to the literature on self fulfilling financial crises in emerging markets. Aghion, Bachetta and Banerjee (2000) find that countries with intermediate levels of domestic financial development and free capital movements are more prone to macroeconomic volatility. In contrast to this paper and most of the existing literature however the vulnerability of emerging markets to financial crises in our model does not come from strong assumptions distinguishing emerging markets from developed countries. In particular we do not assume the existence of credit constraints on capital markets and their implied balance sheets effects (as in Diaz-Alejandro, 1985, Chang and Velasco, 1998, Meng and Velasco, 1999, Krugman, 1999, Aghion et al., 2000, Caballero and Krishnarmurthy, 2000, Schneider and Tornell, 2000, Mendoza, 2001, Mendoza and Smith, 2001) or of moral hazard (as in Corsetti, Pesenti and Roubini, 1999 and Burnside, Eichenbaum and Rebello, 2000). The only structural difference between the emerging market and the developed economy in our model is that labour is more productive in the high income country. Note finally that our model is a real one: a financial crash can occur irrespective of the exchange rate regime and the issue of currency mismatch on which the literature of currency and banking crises has also focused is absent.

Section 2 presents the model. Section 3 describes the properties of the interior equilibrium when no crash occurs. Section 4 investigates the condition for a financial crash to occur. Section 5 and 6 analyze the impact of asymmetric external financial liberalization and domestic financial liberalization respectively. Some welfare implications are analyzed in section 7 and Section 8 concludes.

2 The model

There are two countries E (emerging) and I (industrialized). The model has two periods. In the beginning of the first period, L identical agents in each country (immobile across countries) work (they are each endowed with one unit of labour), and decide whether and how much to invest in risky projects which give dividends in the second period. The good produced in the first period in a perfectly competitive sector, has labour as the only input and is freely tradable. It serves as the

numeraire. The industrialized country has a higher marginal productivity of labor than the emerging country, so that its wage rate w_I, equal to marginal productivity, is higher than w_E in the emerging country.

The cost for an individual of doing projects is $F + f(z_E)$, where z_E is the number of projects undertaken by an individual agent in the emerging market. We assume that these projects are of fixed unit size. The cost function for projects is convex and the functional form that we choose is quadratic[2]: $f(z_E) = \frac{1}{2}z_E^2$ and a symmetric one for the industrialized country: the marginal cost of undertaking projects rises as an agent decides to invest in more projects. In addition, a fixed cost F has to be paid to start investing in projects. We assume that this fixed cost is paid individually by each investor to all other agents in the economy so that aggregate income is not affected by the fixed cost[3]. This can be interpreted for example as a fixed cost to become an entrepreneur and this could be a flat fee paid to the government and redistributed at the end of the period.

The first period is without uncertainty. In the second period, there are N exogenous and equally likely states of nature, and the realized state of nature is revealed at the beginning of that period. Similarly to Acemoglu and Zilliboti (1998) and Martin and Rey (2001), the risky investment projects are such that each project gives dividends in only one state of nature. The payoff structure is such that project i gives d in state i and 0 otherwise. Note that investment projects in the two countries have the exact same ex-ante expected dividend, d/N. All projects are floated on the stock market at the end of period one, so that to each project corresponds an asset. This implies that buying a share in a specific project is equivalent to investing in a Arrow-Debreu asset that pays in only one state of nature and that the different assets are imperfect substitutes. No duplication occurs in equilibrium so that only each project/asset in the world is unique[4]. This could obviously lead to some sort of monopolistic power. We however assume that asset markets are perfectly competitive so that project developers do not exploit this potential power. The issue of monopolistic competition in this type of framework is dealt in Martin and Rey (2001) and its introduction would not fundamentally alter our results here.

If $Z = L(z_E + z_I)$ is the total number of investment projects/assets issued in the world, then $(N - Z)$ is the degree of incompleteness of financial markets and will be endogenous in equilibrium as the number of investment projects/assets is itself endogenous . We assume that the number of states of nature N is large enough so that $N > Z$. Hence, the matrix of payoffs of projects has the following form:

[2] We discuss in appendix V how our results would be affected by a more general convex cost function.

[3] If the fixed cost has an impact on aggregate income, the main results of the model are unaffected. However, the results are analytically less tractable.

[4] It can be checked that no investor has an incentive to duplicate an existing project as long as the total number of projects/assets is less than the number of states of nature. We assume that N is large enough so that this is always the case. The intuition is that as long as a new non existing project can be started, the price of the associated asset and therefore the profit of doing such projects will always be higher than if the agent was to replicate an existing project/asset.

$$\overset{\longleftarrow Z \longrightarrow}{\begin{bmatrix} d & 0 & 0 & ... & 0 & 0 \\ 0 & d & 0 & ... & 0 & 0 \\ 0 & 0 & d & ... & 0 & 0 \\ ... & ... & ... & ... & ... & ... \\ 0 & 0 & 0 & ... & 0 & 0 \\ 0 & 0 & 0 & ... & 0 & 0 \end{bmatrix}} \overset{\longleftarrow N \longrightarrow}{}$$

At the end of the first period, consumption takes place. Shares of the projects are sold on each of the stock markets. These shares can be traded internationally. International trade in assets between the industrialized country and the emerging market entails transaction costs. An agent in the industrialized country who wants to buy assets in the emerging market must pay these transaction costs which capture different types of costs such as government regulations on capital flows, difference in regulations in accounting, banking and commission fees, exchange rate transaction costs and information costs. We will interpret financial globalization as a process through which these transaction costs are reduced but not eliminated. The situation of zero transaction costs will be interesting theoretically but we do not see it as relevant empirically. The presence of these transaction costs will translate into a home bias in asset holdingWe note these transaction costs on inflows τ_{in}, and assume that they take the form of an iceberg cost[5]. This implies that part of the share "melts" during the transaction or that the transaction cost is paid in shares. Agents have to buy $1 + \tau_{in} > 1$, units of shares to receive one share. This modelling implies that the transaction involved by international trade in assets consumes real resources. Similarly, an agent in the emerging market who buys shares from the industrialized country must pay a transaction cost $1 + \tau_{out} > 1$ on these outflows. We will analyze both the case of symmetric liberalization where these transaction costs are lowered simultaneously and the case of asymmetric liberalization where these transaction costs are not lowered symmetrically.

We assume that utility of an agent in each country is given by the non-expected utility function introduced by Epstein and Zin (1989) and Weil (1989, 1990):

$$U_i = \ln c_{i1} + \beta \ln \left[\sum_{n=1}^{N} \frac{1}{N} c_{i2}(n)^{1-\rho} \right]^{\frac{1}{1-\rho}} \qquad i = E, I \tag{1}$$

where ρ is the coefficient of relative risk aversion. We assume for simplicity that the intertemporal elasticity of substitution is 1.

The first period budget constraint of an agent in E who undertakes projects is:

$$Y_E = c_{E1} + \sum_{i=1}^{Lz_E} p_{E\ i} s_{Ei} + \sum_{j=1}^{Lz_I} (1 + \tau_{out}) p_{Ij} s_{Ej} = w_E + \sum_{h=1}^{z_E} p_{Eh} - F - f(z_E) + T \tag{2}$$

[5] These iceberg transaction costs are borrowed from the trade literature. See Martin and Rey (2001) for a more precise description. This modelization allows the elasticity of substitution between assets to be the same for all agents and also does not require the formal introduction of a sector that performs the transaction.

where Y_E is per-capita income in first period of the emerging country, T is the transfer (which in equilibrium is equal to F) and s_{Ei} and s_{Ej} are demands of shares of risky projects developed in the emerging market and in the industrialized country respectively. $p_{E\,i}$ and p_{Ij} are the prices of the different assets. The budget constraint in the industrialized country is symmetric. In the last period, income and consumption come only from dividends of shares bought in the first period. Hence, the budget constraint for an agent in E is given by:

$$c_{2E}(n) = ds_{En},\ n \in [1, Z] \tag{3}$$

where we already made use of the fact that only a subset $Z = L(z_E + z_I)$ of the N states of nature are covered by traded assets. Hence, we can rewrite the utility of an agent in the emerging market as:

$$U_i = \ln c_{i1} + \beta \frac{d}{N} + \beta \ln \left[\sum_{i=1}^{Lz_E} {s_E}_i^{1-\rho} + \sum_{j=1}^{Lz_I} {s_I}_j{}^{1-\rho} \right]^{\frac{1}{1-\rho}} \tag{4}$$

Note that in second period, this utility is identical to a Dixit-Stiglitz type of utility function used in the new-trade literature.

3 Solving the model in the interior equilibrium: when things go well

3.1 Investment and portfolio decisions

Agents in both countries choose consumption and investment (the number of projects) in the beginning of the first period. For this, they need to form expectations on the number of projects that other agents are going to engage into, because it will have an impact on the price of the assets that they will sell at the end of the first period and therefore on their wealth. We will see in the next section that a coordination problem can arise for which in some equilibria no investment is performed. We first solve the model in the case of an interior equilibrium where both countries invest in risky projects ($z_E, z_I > 0$) so that no "crash" occurs. Agents also choose optimally their portfolio of assets (domestic and foreign). For notational simplicity, we note that as projects/assets are ex-ante symmetric, the demand for each asset in a given country will be identical. Hence, we call s_{EE} the demand of shares for a "typical" asset in the E market by an agent in that market. s_{EI} is the demand for an asset of the I market by an agent in the E market. Also, because of the symmetry of projects and agents inside each country, all assets in a given country have the same price which we call p_E and p_I respectively. The first order conditions for an agent in the emerging market imply the following (where expectations are denoted by superscript e):

$$z_E = p_E^e \tag{5}$$

$$c_{E1} = \frac{Y_E}{1+\beta} \tag{6}$$

$$s_{EE} = \left(\frac{\beta Y_E}{1+\beta}\right)^{1/\rho} p_E^{-1/\rho} \left[\sum_{i=1}^{Lz_E} s_{E\,i}^{1-\rho} + \sum_{j=1}^{Lz_I} s_{I\,j}^{1-\rho}\right]^{-1/\rho} \tag{7}$$

The equality of marginal cost to the expected price of the asset implies that the number of projects depends positively on the expected share price. Note also that the elasticity of substitution between assets is constant and equal to the inverse of the relative risk aversion, ρ.

For the number of projects in the emerging market to be positive, it must be that the expected profitability of such projects is positive or $p_E^e z_E - \frac{1}{2} z_E^2 - F \geq 0$. This profitability constraint must hold for the interior equilibrium with all agents investing to exist, and can be rewritten as $\frac{1}{2} p_E^{2\,e} \geq F$. We will concentrate on the case for which, when agents expect that investment in the emerging market is positive ($z_E^e > 0$), then this constraint is met for all values of the transaction costs. This will impose an upper bound on the fixed cost F[6].

Using the budget constraint and the first order conditions above, the typical demand by agents in the emerging economy for a share of a domestic project (s_{EE}) and for a share of a industrialized country project (s_{EI}) can be derived:

$$\begin{aligned} s_{EE} &= \frac{\beta Y_E}{1+\beta} \frac{1}{L p_E} \left[z_E + \phi_{out} z_I (p_E/p_I)^{1/\rho - 1}\right]^{-1} \\ s_{EI} &= \frac{\beta Y_E}{1+\beta} \frac{(1+\tau_{out})^{-1/\rho}}{L p_I} (p_E/p_I)^{1/\rho - 1} \left[z_E + \phi_{out} z_I (p_E/p_I)^{1/\rho - 1}\right]^{-1} \end{aligned} \tag{8}$$

where $\phi_{out} = (1+\tau_{out})^{1-1/\rho}$ is a transformation of transaction costs on the purchase of the assets of the industrialized country (usual in the trade literature). As in the trade literature, we restrict ρ to be less than 1, so that the demand for foreign shares, for a given price and inclusive of transaction costs, is less than the demand for domestic shares. This implies that we interpret an increase in ϕ_{out} as lower transaction costs on outflows. It also implies that $0 \leq \phi_{out} \leq 1$. From a theoretical point of view, it is interesting to note that non-expected utility combined with assets with linearly independent payoffs generates a demand for shares that has exactly the same form than those derived in trade models with transaction costs and Dixit-Stiglitz type preferences. Note also that the demand for a specific share increases with income, and decreases with the total number of projects/assets. Finally, demand for foreign shares decreases with transaction costs on international trade in assets. Even for identical asset prices, a home bias will emerge so that the demand for domestic shares will be lower than for foreign shares.

[6] If the fixed cost is higher than this upper bound, we need to anlyse asymmetric equilibria in which a fraction only of agents invest. We do this in appendix III.

Projects have a fixed unit size and population is equal in each country[7] so that the equilibrium on each stock market (inclusive of those shares that serve to pay the transaction costs) implies for a specific asset/project:

$$\begin{aligned} 1 &= \frac{1}{p_E}\frac{\beta}{1+\beta}\left(\frac{Y_E}{z_E + z_I\phi_{out}q^{1/\rho-1}} + \frac{Y_I\phi_{in}q^{1-1/\rho}}{z_I + z_E\phi_{in}q^{1-1/\rho}}\right) \\ 1 &= \frac{1}{p_I}\frac{\beta}{1+\beta}\left(\frac{Y_I}{z_I + z_E\phi_{in}q^{1-1/\rho}} + \frac{Y_E\phi_{out}q^{1/\rho-1}}{z_E + z_I\phi_{out}q^{1/\rho-1}}\right) \end{aligned} \tag{9}$$

where $\phi_{in} = (1+\tau_{in})^{1-1/\rho} < 1$ and $q = p_E/p_I$ is the relative price of assets between emerging and industrialized markets. These two equations give the supply = demand condition on the stock market for a typical asset in the emerging market and a typical asset in the industrialized market. There are $L(z_E + z_I)$ such equilibrium conditions. In the parenthesis, the first term represents the demand coming from domestic agents and the second term the demand coming from foreigners (inclusive of the transaction costs). Note that these equations imply a financial home market effect similar to the "new trade literature", in the sense that local income will have a more important impact on the equilibrium of asset markets than foreign income, as long as ϕ_{out} and ϕ_{in} are less than 1, i.e. as long as some transaction costs exist.

The stock market equilibrium implies that total world income in first period is fixed. To see this, note from the stock market equilibrium that: $p_E z_E + p_I z_I = \frac{\beta}{1+\beta}(Y_E + Y_I)$. Using the optimal investment rule and the definition of world income, we get that: $L(Y_E + Y_I) = \frac{2L(1+\beta)}{2+\beta}(w_E + w_I)$. Total consumption in the world is given by the world resource constraint: $L(c_E + c_I) = \frac{2L(w_E+w_I)}{2+\beta}$.

Using the constraint on world income and the asset markets equilibrium, it is useful to rewrite the price of assets in terms of the relative price. These become:

$$\begin{aligned} p_E^2 &= \frac{2\beta(w_E + w_I)}{(2+\beta)(1+q^{-2})} \\ p_I^2 &= \frac{2\beta(w_E + w_I)}{(2+\beta)(1+q^2)} \end{aligned} \tag{10}$$

This also implies that an increase in the relative price of assets entails an increase in investment in the emerging market and a decrease of investment in the industrialized one. The impact on per-capita income follows:

$$\begin{aligned} Y_E &= w_E + \frac{\beta(w_E + w_I)}{(2+\beta)\left[1+q^{-2}\right]} \\ Y_I &= w_I + \frac{\beta(w_E + w_I)}{(2+\beta)\left[1+q^2\right]} \end{aligned} \tag{11}$$

An increase in the relative price of assets in the emerging market implies an increase in income in this country.

[7] We discuss the consequences of different population size in appendix VI.

3.2 Equilibrium relations between the relative asset price and the income share

We first look at the case of symmetric transaction costs ($\phi_{in} = \phi_{out} = \phi$). We believe that both cases of symmetric and non symmetric financial liberalization are relevant. In the real world, emerging economies which liberalized capital movements, with the objective for example to attract foreign capital, liberalized both outflows and inflows. The reason (not modelled here) is that to attract inflows, the authorities have to insure investors that transaction costs on outflows will not be too high. Another way to say this is that transaction costs on outflows and inflows are actually intimately linked. We will analyze in section 5 the case where this liberalization is not symmetric. However, in this section, we interpret the process of financial globalization as a process of lowering transaction costs on both inflows and outflows of capital.

As world income is fixed, it proves convenient to define $s_Y = Y_E/(Y_E + Y_I)$ as the share of income in the emerging market. Equation (9) of the stock market equilibrium can be rewritten as:

$$q = \frac{s_Y z_I(1-\phi^2) + z_E \phi q^{1-1/\rho} + z_I \phi^2}{z_I \phi q^{1/\rho - 1} + z_E - s_Y z_E(1-\phi^2)} \tag{12}$$

Note that if $\phi = 1$ (zero transaction costs) then $q = 1$, which implies that without any financial segmentation, the price of assets is identical in the two countries.

There are three equilibrium relations which help define the solution of the model in the interior case, that is in the case with positive investment: the income equation (2), the optimal investment equation (5), and the equilibrium on the stock markets (9). By eliminating the optimal investment equation, we can reduce the model to two equilibrium relations between s_Y and q, the share of income and the relative asset price in the emerging market. From (11), we get immediately the equilibrium income relation, which we call the YY schedule:

$$s_Y = \frac{s_w\,(2+\beta)}{2\,(1+\beta)} + \frac{\beta}{2(1+\beta)(1+q^{-2})} \tag{13}$$

where $s_w = w_E/(w_E + w_I) < 1/2$, is the share of wage income in the emerging market. This equation says that, through higher investment and a wealth effect an increase in the relative price of assets in the emerging market increases the income share of that country.

Combining the optimal investment equation with the equilibrium on the stock markets (12) which pins down the equilibrium relative asset price, we get a second relation between s_Y and q, which we call the qq schedule:

$$s_Y = \frac{\left(q^2 + \phi q^{1/\rho}\right)\left(1 - \phi q^{-1/\rho}\right)}{(1+q^2)\left(1-\phi^2\right)} \tag{14}$$

This equilibrium relation implies that a higher share of income in the emerging market, increases demand for assets on that market and increases the relative price of assets in that market as $\partial q/\partial s_Y$

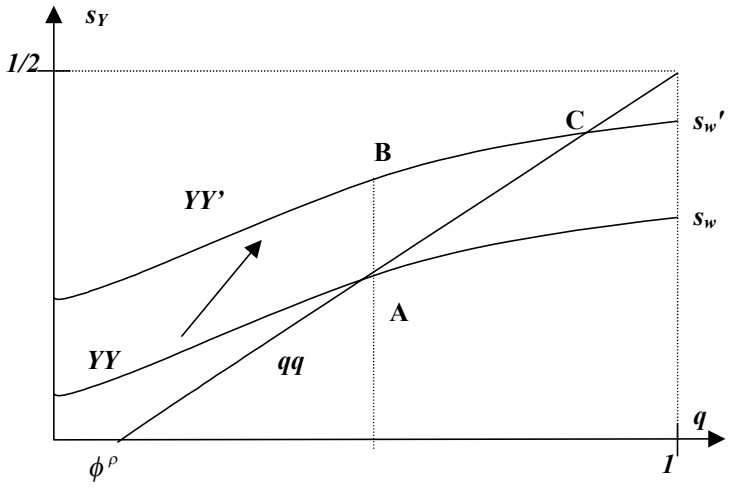

Figure 1: An increase in productivity in the emerging market

can be shown to be positive for the stock market equilibrium (see appendix I). Note also that if countries were symmetric in terms of per-capita income ($s_Y = 1/2$) then the interior equilibrium implies that $q = 1$ for any level of transaction costs. In financial autarky, ($\phi = 0$), the relative price of assets is given by $q^2 = w_E/w_I$ which implies that the price of assets in the emerging market with lower productivity and wages is smaller than in the industrialized country. In the case of symmetric transaction costs, the relative price of assets in the emerging market is always less than 1 as long as the two markets are not perfectly integrated ($\phi \neq 1$). This can be seen for figure 1 where we illustrate the two equilibrium relations YY and qq. Note that for any positive q, s_Y on the YY curve is less than 1/2, as long as $s_w < 1/2$ and that for any $q > 1$, $s_Y > 1/2$ on the qq curve. Also, in appendix II, we show that the two curves only cross once, so that only one interior equilibrium exists.

The asset price in the emerging market is less than in the industrialized country, the more so, the larger the differential in productivities. Note that this implies that investment in the emerging market will be less than in the industrialized market even though projects have, ex-ante, the same payoffs. This also implies that as long as international financial markets are segmented, the differential in productivity will be magnified in terms of income differential through investment. To see this graphically, suppose w_E increases. This shifts up the YY curve. The increase in income in the emerging market comes in two parts. The direct effect increases the income share from A to B. The increase in the asset price of the emerging market further increases the income share from B to C. The magnification effect comes from the increased investment and wealth effect induced by the increase in asset price. The intuition comes from a size effect on financial markets that we have identified in a previous paper (Martin and Rey, 2001) with a somewhat similar model. With segmented markets, a

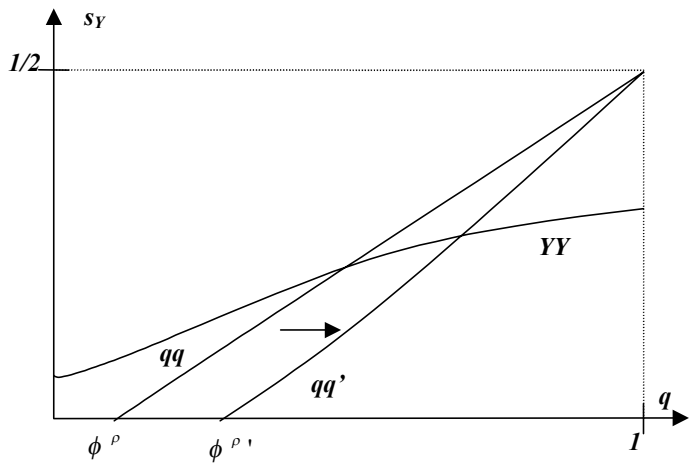

Figure 2: A symmetric decrease in transaction costs

high income translates into a high demand for assets which are imperfect substitutes. This imperfect substitution coupled with financial market segmentation generates a home bias which itself brings the size effect. The amplification effect here is all the more important because of a specific mechanism that will play a crucial role when we analyze the possibility of self-fulfilling expectations driven crash: higher income increases the demand for domestic assets when asset markets are segmented. Because assets are imperfect substitutes in our framework this increased demand translates into a higher asset price and investment.

Note that with perfectly integrated financial markets ($\phi = 1$), the qq curve is vertical at $q = 1$. In this case, an increase in the wage level of the emerging market, a shift of the YY curve has no effect on the relative asset prices and therefore no amplification process on income sets in.

3.3 Financial globalization and asset prices

We now analyze the impact of a decrease in transaction costs on international trade in assets (higher ϕ). The effect of an increase in ϕ on the qq curve (the YY curve is not affected) can be analyzed by looking at how s_Y is affected by an increase in ϕ for a given q:

$$\frac{\partial s_Y}{\partial \phi} = \frac{\left(1+\phi^2\right)\left(q^{1/\rho} - q^{2-1/\rho}\right) - 2\phi(1-q^2)}{\left(1+q^2\right)\left(1-\phi^2\right)^2} \tag{15}$$

This expression is negative as long as $q < 1$ that is as long as $s_w < 1/2$. The symmetric decrease in transaction costs is illustrated in figure 2 and implies a rightward shift of the qq curve.

Hence, both the income share in the emerging market and the relative price of assets increases. The intuition is that lower transaction costs on international trade in assets attracts foreign investors

as the price of ex-ante identical assets in the emerging market is lower than on the industrialized market. As the asset price in the emerging market becomes higher, the incentive to invest in that country is strengthened, so that income increases further as well as the domestic demand for assets in the emerging market.

3.4 Financial globalization and the current account

It is interesting to analyze the impact of financial globalization on the first period current account of the emerging market in our setting. Using the demands for foreign shares in both countries and the optimal investment rules, we get that the current account in the emerging market is:

$$CA_E = L^2(1+\tau)p_I z_I s_{EI} - L^2(1+\tau)p_E z_E s_{IE} = \frac{L\beta\phi}{1+\beta}\left[\frac{Y_E}{q^{2-1/\rho}+\phi} - \frac{Y_I}{q^{-2+1/\rho}+\phi}\right] \tag{16}$$

Obviously when $\phi = 0$, the current account is balanced. In the case of perfect capital mobility ($\phi = q = 1$), the current account of the emerging market is in deficit as we know that $Y_E < Y_I$. This is simply because with lower income, the agents in the emerging market will want to save less and consume more in the first period than the agents in the industrialized country. Hence, the lower the transaction costs between the financial markets (the higher ϕ) and the more the industrialized country will invest its saving on the stock market of the emerging market. Moreover, using the fact that $q < 1$ when capital movements are not entirely free ($0 \leq \phi < 1$), we can prove that the current account is always in deficit. This is consistent with the previous section where we showed that liberalizing capital movements would generate higher relative asset prices in the emerging market. The capital inflows generated by such liberalization are just the mirror image of the adjustment in prices. Capital inflows are larger than capital outflows as agents in the industrialized economy take advantage of the lower asset prices in the emerging market and substitute industrialized market assets for emerging market assets. This is made easier as transaction costs between the two markets decrease.

3.5 Financial globalization and market incompleteness

In the interior equilibrium financial globalization lessens market incompleteness and therefore last period consumption volatility. The reason is that the total number of assets increases as transaction costs decrease. The total number of assets is $Z = L(z_E + z_I) = L(p_E + p_I)$. It can be shown easily that the total number of assets is increasing in $q : \partial Z/\partial q > 0$ so $\partial Z/\partial \phi > 0$. This just comes from the convexity of the investment cost function: as the price of assets increases in the emerging market with lower transaction costs, the number of assets in the emerging market increases more than it decreases in the industrialized country. Hence, market incompleteness, measured by $(N - Lz_E - Lz_I)$ and therefore the volatility of consumption in the last period, decrease with the level of international transaction cost. From that point of view, financial globalization is stabilizing. However, this is when

"things go well" that is when agents are optimistic about investment prospects in the emerging market. In the next section, we analyze a case when "things go wrong". In this case, financial globalization can become destabilizing.

4 Self-fulfilling expectations driven crash and financial globalization: when things go wrong

Until now, we have focused on equilibria where both countries invest in a positive number of projects. However, the decision to invest at the beginning of the period depends crucially on the expected price of assets at the end of the period when the stock markets open and that projects are floated. The expected asset price (which can be interpreted as the inverse of the cost of capital) determines whether investment is profitable. We now investigate under which condition a self-fulfilling expectations driven crash can occur. In particular, we are interested by the impact of transaction costs on international asset flows on this possibility. We ask the following question: under which conditions, if the agents in the emerging market expect that other agents in that market do not invest, is this a rational expectations equilibrium or put it another way when is it that the expected price of the assets in this case is low enough that a single agent will find it unprofitable to invest? The condition for this to happen is that $\pi_E^e = p_E^e \widetilde{z}_E - \frac{1}{2}\widetilde{z}_E^2 - F \leq 0$ which implies that the profitability condition is not fulfilled. $\widetilde{z}_E$ in this condition is the investment that would be done by a single "pessimistic" agent if she anticipates that no other single agent will invest (so $Lz_E^e = 0$) and $\widetilde{z}_E = p_E^e$ by the optimal investment rule which still applies here. This agent is small (L is large) so that her decision does not affect aggregate income or investment.

Suppose that $z_E^e = 0$, what is then the rationally expected asset price in second period? Aggregate incomes in the two markets are: $LY_E^e = Lw_E$ and $LY_I^e = Lw_I + \frac{1}{2}Lp_I^{e\,2}$. The stock market condition in the industrialized market then reduces to:

$$p_I^{e\,2} = \frac{\beta}{1+\beta}\left(Y_E^e + Y_I^e\right) \tag{17}$$

so that per-capita income in the industrialized country is in this case:

$$Y_I^e = \frac{2(1+\beta)}{2+\beta} w_I + \frac{\beta w_E}{2+\beta} \tag{18}$$

Note that this implies an increase in income in the industrialized market and a fall of income in the emerging market. The previous equation implies that the expected price of assets in the industrialized country is:

$$p_I^{e\,2} = \frac{2\beta}{2+\beta}\left(w_I + w_E\right) \tag{19}$$

Using the asset market equilibrium for a single asset that would be floated in the emerging market, we find that the expected relative asset price is then:

$$q^e = \left\{ \frac{s_w \left(2+\beta\right)\left(\frac{1}{\phi}-\phi\right) + 2(1+\beta)\phi}{2(1+\beta)} \right\}^{\rho} \tag{20}$$

Note that the expected relative price in this case decreases with financial globalization (higher ϕ) at low levels of ϕ and then increases at high levels of financial globalization. A single investor will not invest if the profitability condition, rewritten here in terms of relative price, is not fulfilled, that is, if:

$$\pi_E^e = \frac{\beta}{2+\beta}(w_E + w_I)\frac{q^{e\ 2}}{1+q^{e\ 2}} - F < 0 \tag{21}$$

The condition for the zero-investment equilibrium to exist can be rewritten using equation (22):

$$\pi_E^e = \frac{\beta(w_E+w_I)}{2+\beta}\left\{1+\left[\frac{2(1+\beta)}{s_w\left(2+\beta\right)\left(\frac{1}{\phi}-\phi\right)+2(1+\beta)\phi}\right]^{2\rho}\right\}^{-1} - F < 0 \tag{22}$$

This profit function is U-shaped as a function of ϕ and the negativity condition can hold for intermediate levels of transaction costs.

For multiple equilibria to exist, it must be that for the same set of parameters, an interior equilibrium exists when $z_E^e > 0$ and does not exist when $(z_E^e = 0)$. We know that the profit level increases in the relative price q, and that q itself in the interior equilibrium increases with ϕ. Hence, a sufficient condition for the interior equilibrium to exist for any level of transaction cost is that the profitability condition for the emerging market is fulfilled in the case of financial autarky ($\phi = 0$). The fixed cost such that all agents are indifferent between investing and not investing in autarky which we take as a natural upper bound for F is: $F_1 = \frac{\beta w_E}{2+\beta}$. If for this value of the fixed cost or a lower value, the profit function when agents are pessimistic can be negative for certain values of ϕ, then this is sufficient condition for multiple equilibria to exist. It proves convenient to rewrite the fixed cost as $F = \alpha F_1$. We concentrate on the case of $\alpha \leq 1$ so that all agents in the emerging market invest when they are optimistic. The sign of equation (22) is the same as the sign of this quadratic function in ϕ:

$$(1-\alpha s_w)^{1/2\rho}\left[2(1+\beta)-(2+\beta)s_w\right]\phi^2 - 2\left(\alpha s_w\right)^{1/2\rho}(1+\beta)\phi + (1-\alpha s_w)^{1/2\rho}s_w(2+\beta) < 0 \tag{23}$$

This inequality is fulfilled for values of ϕ between the two roots ϕ_1 and ϕ_2 of the above equation. If the two roots exist, it can be checked that they lie strictly between 0 and 1, that is that the zero-investment equilibrium cannot occur without capital flows or with perfect capital mobility. This is intuitive. In a situation of financial autarky, agents can only save by buying domestic assets. This puts a floor on the demand for domestic assets and hence on their expected price as capital flight is impossible. In a situation of perfect capital mobility, arbitrage implies that all projects/assets

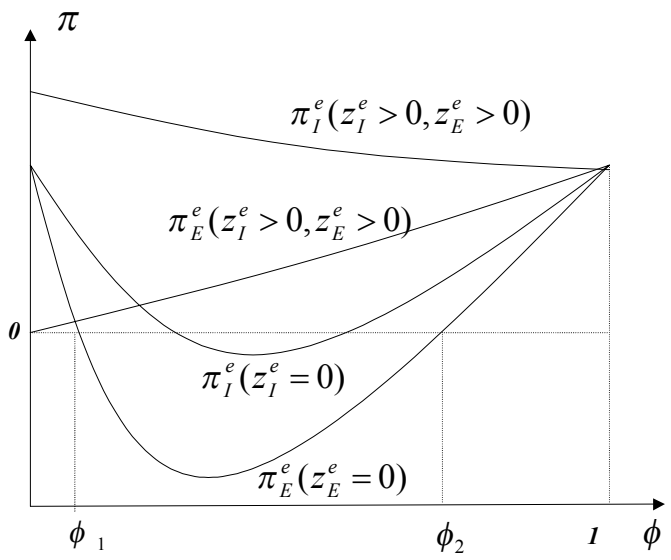

Figure 3: Multiple equilibria and transaction costs

must have the same price on both markets ($q = 1$) as they are perfectly integrated. In this case, if it is profitable to invest in the industrialized country it must be so also in the emerging market as intrinsically these projects have the same payoff. As we assume the fixed cost to be the same in both countries, indeed projects must be profitable in the industrialized country. Another way to say this is that a global financial crash is not possible. This is the same reasoning as for the impossibility of a crash in autarky.

It can be checked that the determinant of equation (23) is positive for high values of α, β and ρ. A high α simply means that the fixed cost cannot be too low for the crash to be possible. β must be high enough (but less than 1) for our story to work because otherwise the saving mechanism behind investment on stock markets would be weak. Finally, it is easy to check that with risk neutral agents ($\rho = 0$), multiple equilibria would not exist. The reason is simply that then the assets become perfectly substitutable so that asset prices in the emerging market can not be below those of the industrialized country.

The possibility of multiple equilibria and its dependence on transaction costs is illustrated in figure 3 where we take $\alpha = 1$ so that profits are zero in autarky in the emerging market. Profits as a function of transaction costs depend both on expectations and also whether the investor is in the emerging economy or in the industrialized country. The $\pi_I^e(z_E^e > 0, z_I^e > 0)$ schedule shows the dependence of asset prices in the industrialized country on transaction costs in the interior ("optimistic") case. It decreases as transaction costs are lowered as asset prices in the industrialized country and in the emerging market converge. The inverse happens with the $\pi_E^e(z_E^e > 0, z_I^e > 0)$ schedule with illustrates that profits in the emerging market increase with lower transaction costs. The $\pi_E^e(z_E^e = 0)$ schedule

shows the dependence of profit in the emerging market on transaction costs in the "pessimistic" case. Multiple equilibria arise between ϕ_1 and ϕ_2 . Note that in financial free trade ($\phi = 1$), the profit level is identical in all countries irrespective of expectations. With $\alpha < 1$, lower fixed cost, all curves would be shifted up so that the area for which the crash is possible would be smaller.

As usual with multiple equilibria models, some sort of circular causality exists. Here it rests on the following mechanism: if agents believe that other agents will engage in no projects, they then expect aggregate income in the emerging market at the end of the period to be low. Lower expected income entails a lower demand for assets. When financial markets are segmented and assets are imperfect substitutes, then this fall of demand of assets will be larger on local assets than on foreign ones. This in turn generates a low relative asset price in the emerging market. This is a home bias effect. Finally, the optimal investment rule says that investment depends positively on the expected asset price which we can interpret as the inverse of the cost of capital. In some sense, this circular causality mechanism is close to the agglomeration phenomena described in the "new economic geography" literature. Here, one could talk of an "agglomeration of expectations" which produces a coordination failure. The connection is not surprising as the model we use bears some resemblance with models of this strand of literature which rely heavily on imperfect substitution of goods and on iceberg transaction costs.

Is the emerging market more vulnerable to a financial crash than the industrialized economy? To answer this question we can compare the profit level of a single "pessimistic" investor in the emerging market ($z_E^e = 0$) given in equation (22) to its symmetric in the industrialized country ($z_I^e = 0$). It can be checked easily that the $\pi_I^e(z_I^e = 0)$ function is the same as in equation (22) except for the tram in s_w in the denomintaor which is replaced by $1 - s_w$. One can see immediatly that $\pi_I^e(z_I^e = 0) - \pi_E^e(z_E^e = 0) > 0$ as long as $\phi < 1$ so that the "pessimist" profit function of the industrialized country is always higher than the one for emerging market as illustrated in figure 3. The reason is that due to higher wage income in the industrialized economy, the demand for assets in that market even when depressed by pessimist expectations is always higher than in the emerging market. This is turn implies a higher price for assets and higher profitability on the industrialized country asset market even in expected bad times: the industrialized country can never be as pessimistic on its own income level and therefore its asset prices as the emerging market. The area of parameters for which a financial crash is possible in the industrialized country is then, if it exists, always smaller than for the emerging economy.

How do fundamentals affect the possibility of a financial crash? In particular,we are interested by the level of world income and the distribution of world income between the emerging market and the industrialized economy. For a given distribution of wage income (a given s_w), equation (22) shows that when "world" fundamentals ($w_E + w_I$), i.e. productivity and wage levels are high at the global level, the profit function of a single "pessimistic" agent is higher and therefore the set of parameters for which a financial crash is possible is smaller. The reason is that higher world income generates

a higher demand for shares, irrespective on expectations, which partially will fall on the emerging market.

Also, fundamentals of the emerging market are important. For given world fundamentals (w_E+w_I), a higher productivity and wage level in the emerging market, a higher s_w, will increase the profit level of a "pessimistic" agent as we know $\phi < 1$. The reason is that higher local income will generate higher demand for shares, which because of transaction costs on capital flows, will disproportionately favor shares of the emerging market.

We have defined the "pessimistic equilibrium" as one where all agents in a given country decide rationally, given their expectations, not to invest. A natural question arises whether asymmetric equilibria may exist also in which only a fraction of agents is expected to invest. In this case, even though agents share the same expectations they do not have the same actions. For such equilibria to exist it must be that in equilibrium the expected profit of investing is zero. This defines the portion of agents (which we call l_E) who invest. We show in appendix III that when $F \leqslant F_1$or $\alpha \leq 1$, the case which we concentrated on, these asymmetric equilibria cannot exist. Such equilibria can exist however when $F > F_1$.

The financial crash in the emerging market is characterized by a fall in asset prices, a fall in investment, a fall in income and consumption (both in first period and in second period). The fall in asset prices should be clear by now. If we were to graph the dependence of asset prices in the emerging market on transaction costs and expectations it would have the same form as for profits on figure 3. Between ϕ_1 and ϕ_2, as the crash becomes a possible equilibrium, the asset price in the emerging market would fall in the event that the crash realizes. Per-capita income in the emerging market is lower in the case of a financial crash (w_E) than in the case of autarky ($2(1+\beta)w_E/(2+\beta)$) which itself is the lowest for the emerging market when we consider only interior equilibria with positive investment. Also, contrary to the interior equilibrium where the emerging market has a current account deficit, in the situation of the crash, it is in a position of current account surplus, basically because it has no assets to sell. In this case, we can also characterize the financial crash as a situation of capital flight since the only assets that agents can buy to save are foreign.

We have seen that "when things go well", financial globalization decreases volatility of consumption in the last period as it decreases market incompleteness measured by ($N - Lz_E - Lz_I$). Obviously, as investment crashes in the emerging market the number of assets goes down in this country but how much does the number of assets go down at the world level? To look at this we compare, the extent of market incompleteness in the case of a financial crash induced by self-fulfilling expectations ($z_E = 0$), to the measure of market incompleteness in the non crash equilibrium in financial autarky ($\phi = 0$), which we know is the situation where market incompleteness is at its maximum for the interior equilibrium. The total number of assets in the later situation is: $L[2\beta/(2+\beta)]^{1/2}(w_E^{1/2}+w_I^{1/2})$ which is higher than in a situation of financial crash where the number of assets is: $L[2\beta/(2+\beta)]^{1/2}(w_E+w_I)^{1/2}$.

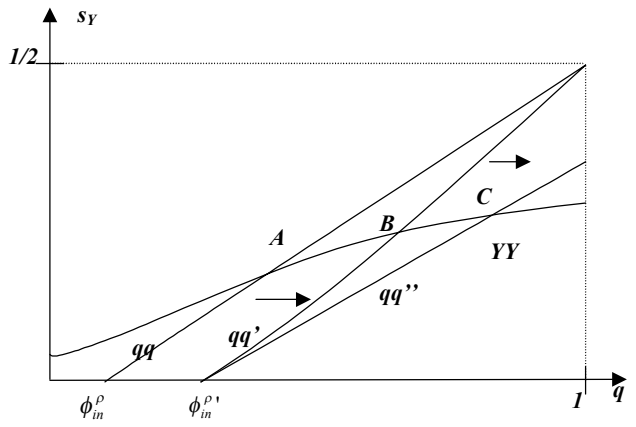

Figure 4: A decrease in transaction costs on inflows

Hence market incompleteness is higher in the situation of the financial crash than in the situation of financial autarky. This implies that in a crash not only income and consumption levels are lower but volatility of second-period consumption is also higher.

5 Asymmetric financial liberalization

Our framework allows us to distinguish between transaction costs on inflows and outflows so that we can analyze the impact of asymmetric liberalization policies. In the case of asymmetric transaction costs, the YY schedule, the equilibrium income relation (equation 13) still applies. The qq schedule however that defines the stock market equilibrium is altered in the following way:

$$s_Y = \frac{\left(q^2 + \phi_{out} q^{1/\rho}\right)\left(1 - \phi_{in} q^{-1/\rho}\right)}{\left(1 + q^2\right)\left(1 - \phi_{in}\phi_{out}\right)} \tag{24}$$

Contrary to the case of symmetric transaction costs, the relative price of assets in the emerging market may be equal to or higher than 1. The condition for this is that transaction costs on outflows must be higher than on inflows (or $\phi_{in} > \phi_{out}$) in the following way:

$$\phi_{in} - \phi_{out} \geq \frac{\left(1 - \phi_{in}\phi_{out}\right)\left(1 - 2s_w\right)\left(2 + \beta\right)}{2\left(1 + \beta\right)} \tag{25}$$

Note that the difference between transaction costs on inflows and outflows must be higher the larger the difference in productivities, and the higher the overall level of transaction costs is. The reason is that lower transaction costs on inflows effectively increase the demand and the price of assets in the emerging market, and the opposite is true for transaction costs on outflows.

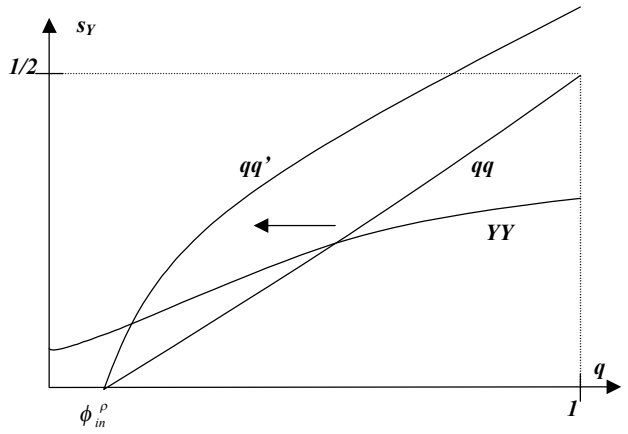

Figure 5: A decrease in transaction costs on outflows

The impact of a decrease in transaction costs on inflows (an increase in ϕ_{in}) can be analyzed on figure 4. It implies a rightward shift of the modified qq curve (see appendix IV for the proof). To compare the impact of symmetric and asymmetric financial globalization, we depicted both types on the same graph. Starting from a situation with identical transaction costs on inflows and outflows (point A), a symmetric decrease in transaction costs leads to point B which implies an increase in both q and s_Y, if $w_I > w_E$. A decrease in transaction costs on inflows, will shift the equilibrium to point B, implying a larger increase in both q and s_Y than in the symmetric case. Remember that an amplification mechanism is at work as the higher demand for assets from the industrialized market generated by lower transaction costs on inflows, induces an increase in the asset price of the emerging market which itself generates an increase in income (through a wealth effect) and investment. This induces a higher domestic demand for assets in the emerging market which reinforces the price effect. Another way to say this is that both the substitution and the income effect go in the same direction.

It is easy to check that a decrease in transaction costs on outflows shifts the modified qq curve on the left as shown on figure 6 which illustrates an increase in ϕ_{out} starting from a situation with identical transaction costs on inflows and outflows. Bot the asset price and the income level decrease because lower transaction costs on outflows induce domestic agents in the emerging market to switch from domestic to foreign assets. Note that contrary to the case of symmetric liberalization, the sign of the impact of asymmetric liberalization on asset prices and income share does not depend on the difference in wage rates.

5.1 Asymmetric transaction costs and financial crashes

We can perform the same analysis as in section 4 and analyze how asymmetric transaction costs affect the possibility of a financial crash driven by self-fulfilling expectations. The condition for the zero-investment equilibrium to exist becomes:

$$\frac{\beta(w_E+w_I)}{2+\beta}\left\{1+\left[\frac{2(1+\beta)}{s_w\left(2+\beta\right)\left(\frac{1}{\phi_{out}}-\phi_{in}\right)+2(1+\beta)\phi_{in}}\right]^{2\rho}\right\}^{-1}-F<0 \tag{26}$$

Hence, quite intuitively, a combination of low transaction costs on outflows and high transaction costs on inflows makes it easier to have a zero-investment equilibrium where a "pessimistic" agent does not expect it to be profitable to start investment projects. The reason is that such combination increases outflows of capital and decreases inflows so that the expected asset price will be low.

6 Domestic and international financial liberalization

6.1 Domestic transaction costs and the interior equilibrium

We can also use our framework to analyze how the interaction of domestic and international financial liberalization affect asset prices and investment. To do this, we introduce a new type of transaction costs on financial markets of the emerging country. More precisely, we assume that on top of the transaction costs on inflows and outflows (which to simplify we take to be identical in this section: $\phi_{in}=\phi_{out}=\phi$), agents in the emerging market, when they buy domestic assets pay a domestic transaction cost, which also takes the form of an iceberg cost. This may be thought as a proxy for domestic financial development. We assume that no such transaction cost hampers the domestic market in the industrialized market so that we depart from the rest of the paper where the only difference between the two countries was their productivity level. We call ϕ_D, the transformation of domestic transaction costs: $\phi_D=(1+\tau_D)^{1-1/\rho}$, where τ_D is the domestic transaction cost which we assume is lower than the international transaction cost so that $\phi_D>\phi$. The model is unchanged except for the stock market equilibrium conditions which become:

$$\begin{aligned} 1 &= \frac{1}{p_E}\frac{\beta}{1+\beta}\left[\frac{Y_E\phi_D}{z_E\phi_D+z_I\phi q^{1/\rho-1}}+\frac{Y_I\phi q^{1-1/\rho}}{z_I+z_E\phi q^{1-1/\rho}}\right] \\ 1 &= \frac{1}{p_I}\frac{\beta}{1+\beta}\left[\frac{Y_I}{z_I+z_E\phi q^{1-1/\rho}}+\frac{Y_E\phi q^{1/\rho-1}}{z_E\phi_D+z_I\phi q^{1/\rho-1}}\right] \end{aligned} \tag{27}$$

This just says that higher domestic transaction costs reduce asset demand from domestic agents. The qq schedule now becomes:

$$s_Y=\frac{\left(\phi_D q^2+\phi q^{1/\rho}\right)\left(1-\phi q^{-1/\rho}\right)}{\left(1+q^2\right)\left(\phi_D-\phi^2\right)} \tag{28}$$

Hence, a decrease in domestic financial transaction costs shifts the qq curve to the right and induces an increase in asset prices, investment and income. The working is qualitatively the inverse of the one shown in figure 6. This is not surprising as an increase in transaction costs on outflows and a decrease in domestic transaction sosts both lead to an increase of demand of assets by domestic agents.

6.2 Domestic transaction costs and financial crashes

The introduction of domestic transaction costs makes it easier to get the zero-investment equilibrium. The reason is that by decreasing demand for domestic assets it decreases further the relative expected asset price and therefore expected profitability of investment projects when agents are pessimistic. To see this, we derive the price of an asset when agents in the emerging market are "pessimistic":

$$q^e = \left\{ \frac{s_w (2+\beta) \left(\frac{\phi_D}{\phi} - \phi \right) + 2(1+\beta)\phi}{2(1+\beta)} \right\}^{\rho} \tag{29}$$

The expected price is lower, the higher the domestic transaction costs (the lower ϕ_D). The profit function has, just as in the symmetric transaction costs case, a U-shaped form as a function of transaction costs. Hence, lower transaction costs on domestic markets in the emerging market will reduce the parameter set for which zero-investment equilibrium driven solely by self-fulling expectations is possible.

7 Welfare implications

The welfare implications are numerous and complex. In the previous sections, we have seen that lowering transaction costs on asset trade had consequences on: real resources lost in the transaction, relative asset prices, investment and income and therefore consumption in both first and second period, the degree of market incompleteness and therefore the volatility of consumption in second period. Lowering transaction costs on trade in assets could also move the emerging market in a totally different situation characterized by a financial crash driven by self-fulfilling pessimistic expectations. We first analyze the welfare impact of lower transaction costs in the "optimistic" case with positive investment in both countries. The level of utility of an agent in the emerging market is given by the following expression:

$$U_E = C + (1+\beta)\ln Y_E + \beta \left[\frac{\rho}{(1-\rho)} - 1 \right] \ln p_E + \frac{\beta\rho}{1-\rho} \ln \left[1 + \phi_{out} q^{1/\rho - 2} \right] \tag{30}$$

where C is a constant. There are three distinct effects of lowering transaction costs on international asset trade that can be identified in the three last terms of the above equation: 1) an income effect: For the emerging market, we know it will be a positive effect for a symmetric decrease of transaction

costs on inflows and outflows and for a decrease of transaction costs on inflows. It will be negative on income in the case of a decrease of transaction costs on outflows. 2) a price effect: the price of assets of the emerging market will follow the same pattern as income. However, the welfare effect may be different. On the one hand, for a given income, higher prices in the emerging market imply lower demand for those assets which lowers welfare. On the other hand, higher asset prices in the emerging market generate higher investment and a higher number of assets and therefore more diversification possibilities. If $\rho > 1/2$, so that agents are "very" risk averse, the increase in diversification possibility will be highly valued and an increase in p_E will increase welfare. 3) a direct effect: with lower transaction costs on outflows (higher ϕ_{out}) , it becomes less costly to diversify. Hence, this effect is always positive.

We will not be able to analytically derive the welfare impact of decreasing transaction costs on trade in asset for all levels of transaction costs. However, we can evaluate welfare impacts of liberalization of capital flows around the autarky equilibrium and the perfect capital mobility equilibrium. For example, an asymmetric decrease of transaction costs around the autarky situation has the following impact on utility in the emerging economy:

$$\underset{\phi_{out}=\phi_{in}=0}{\frac{\partial U_E}{\partial \phi_{out}}} = \frac{\beta\rho}{(2+\beta)(1-\rho)}\left[(2+\beta)\left(\frac{w_E}{w_I}\right)^{1/\rho-2} - (1+\beta)\left(\frac{w_E}{w_I}\right)^{1/\rho-2}\right] \tag{31}$$

As $w_E < w_I$, it implies that if $\rho \geq 1/2$, then the expression above is always positive and utility increases with liberalization of capital outflows[8]. The intuition is that in this case of high risk aversion, the possibility to diversify at a lower cost is highly valued by agents of the emerging market. If $\rho < 1/2$ and the wage difference is sufficiently large, then the negative income effect dominates and the utility of agents in the emerging market will decrease. Evaluated in the perfect capital mobility equilibrium, the impact of imposing restrictions on capital outflows would always be negative for welfare as:

$$\underset{\phi_{out}=\phi_{in}=1}{\frac{\partial U_E}{\partial \phi_{out}}} = \frac{\beta(1+\rho)}{4(1-\rho)} \tag{32}$$

The impact of a decrease in transaction costs on inflows on welfare evaluated at autarky is given by:

$$\underset{\phi_{out}=\phi_{in}=0}{\frac{\partial U_E}{\partial \phi_{in}}} = \frac{\beta\rho(1+\beta)}{(2+\beta)(1-\rho)}\left(\frac{w_E}{w_I}\right)^{-1/(2\rho)-1} \tag{33}$$

which is always positive. This is also the case when evaluated in the perfect capital mobility case.

The impact of a symmetric decrease in transaction costs on inflows and outflows on welfare evaluated at autarky is given by:

[8] Note that if the two countries have equal wages, the utility always increases with liberalization of capital flows.

$$\frac{\partial U_E}{\partial \phi}_{\phi=0} = \frac{\beta\rho}{(1-\rho)}\left(\frac{1+\beta}{2+\beta}q^{-1/\rho} + \frac{1}{2+\beta}q^{1/\rho-1}\right) \tag{34}$$

which is always positive. This is not surprising as we know that all effects described above are positive in this case for the emerging market.

These results on welfare are valid only for the interior equilibrium and as usual in models with possible multiple equilibria, we cannot say anything definitive about welfare. In cases where the crisis equilibrium is a possible equilibrium we can however show that if the emerging market falls in the crisis equilibrium its welfare is always less than in the interior equilibrium at the same level of transaction cost. This is obvious as the crisis equilibrium implies lower income and therefore less consumption (in both periods) and more market incompleteness (as measured by the difference between the number of states and the number of assets) and therefore more second-period consumption volatility. However, it is impossible to give a definitive answer to the question: should emerging economies liberalize capital movements, say in a symmetric fashion (an increase in ϕ)?. We know that if they could, they should go all the way to perfect capital mobility ($\phi = 1$), because in this case income in the emerging market is maximized, market incompleteness is minimized and financial crash cannot occur. However, our view is that transaction costs always hinder international trade in assets (due to difference in regulations, cost of aquiring information, exchange rate movements...) even without government imposed transaction costs. We can answer a more limited but sort of benchmark question: is welfare in the emerging economy higher in the autarky equilibrium or in the crisis equilibrium? The difference between the two levels of welfare is given by:

$$U_E(\phi = 0) - U_E(crisis) = (1+\beta)\ln\left[\frac{2(1+\beta)}{2+\beta}\right] + \frac{\beta\,(2\rho-1)}{2(1-\rho)}\ln s_w - \frac{\beta\rho}{1-\rho}\ln\phi \tag{35}$$

where parameters (in particular the level of transaction costs) must be such that a crisis is a possible equilibrium. The first term of the expression is positive and reflects the fact that income is higher in autarky than in crisis with capital movements. The last term is negative and reflects the welfare gain of being able to better diversify by purchasing foreign assets even in a financial crash. The second term has an ambiguous sign and reflects the fact that in a crisis equilibrium there are more assets to buy than in autarky but which must be purchased at a higher price. If agents are sufficiently risk averse (high ρ) they will value this and therefore the expression is negative. When we evaluate this expression at levels of ϕ for which a financial crash is possible (that is between the two roots of the quadratic expression 23), we find that the sign is ambiguous. In particular, if agents are not too risk averse (low ρ) welfare can be higher in autarky than in the financial crisis equilibrium. This is because in this case the welfare gain of being able to buy foreign assets is not valued very much and the loss of income in the financial crash situation is what matters most.

Again, our implications for welfare should be taken with caution as we can not say which equilibrium will prevail. Hence, our model can only point to the conclusion that financial globalization

carries benefits and risks in terms of welfare for emerging markets.

8 Conclusion

Under which conditions can financial globalization be held responsible for the recent series of financial crashes in emerging markets? In answering this question, the existing literature has insisted on the fact that financial globalization, in particular because it makes borrowing on world financial markets easier and less costly, may strengthen the potential danger of market failures prevalent in emerging markets: in particular, moral hazard and credit constraints have been shown to facilitate the advent of financial crisis driven by self-fulfilling expectations. In this paper, we show that the existence of such market failures is not a necessary condition for emerging markets to become vulnerable to a financial crash when capital flows are liberalized. This, we believe, is a central result of the model, as it stresses that the higher vulnerability of emerging markets to financial crash is due simply to their lower income level and not to bad fundamentals, bad institutions, bad financial markets (credit or liquidity constraints), bad incentives (bailouts) or bad exchange rate regimes. This is not to say of course that these problems do not exist or do not constitute important channels through which financial globalization can make emerging markets more vulnerable to a crisis driven by self-fulfilling expectations. That financial globalization can make emerging markets more vulnerable to a financial crash under the mere condition that these countries have a lower income than industrialized countries has also potentially important policy implications. The recent literature which has emphasized the key role of credit constraints and moral hazard to explain crashes in emerging markets has logically recommended policies which address the informational and institutional frictions which are at the origin of these credit market imperfections. Among such policies, Mendoza (2001) for example, cites microeconomic policies such as the development of credit bureaus in Mexico. Similarly, currency mismatches in fixed exchange rate regimes have listed as prime suspects in the crises of these countries which has led several countries to switch to floating. Our paper shows that these policies and institutional changes may not be sufficient to prevent crises in intermediate income countries and that financial crises may be a much more general phenomenon in those countries.

Appendix

Appendix I: The characteristics of the YY and qq curves

For equation (13), the slope is:

$$\partial s_Y/\partial q = \frac{\beta q}{(1+\beta)\left(1+q^2\right)^2} > 0 \tag{A1}$$

For equation (14), the slope is:

$$\partial s_Y/\partial q = \frac{2q\left(1-\phi q^{-1/\rho}\right)\left(1-\phi q^{1/\rho}\right)+\frac{1}{\rho}\phi\left(1+q^2\right)\left(q^{1/\rho-1}+q^{1-1/\rho}\right)}{\left(1-\phi^2\right)\left(1+q^2\right)^2} > 0 \tag{A2}$$

Appendix II: The effect of a symmetric decrease in transaction costs

An increase in ϕ has always a positive impact on q as long as $q < 1$, that is as long as $s_W < 1/2$. To see this, use equilibrium equations (13) and (14) to get $\partial q/\partial\phi$:

$$\frac{2\phi\left\{1-2s_w+\beta\left[1-s_w\left(1+q^2\right)\right]+\beta(1-q^2)+1-2s_wq^2\right\}+2(1+\beta)(q^{2-1/\rho}-q^{1/\rho})}{4q(1+\beta)(1-\phi q^{-1/\rho})+\frac{2}{\rho}\phi(1+\beta)(q^{1/\rho-1}+q^{1-1/\rho})-2q(1-\phi^2)\left[2\beta+(2+\beta)s_w\right]} \tag{A3}$$

which is positive if $s_W < 1/2$. Combining this with the fact that $\frac{\partial s_Y}{\partial\phi} < 0$ on the qq curve also proves that the YY and qq curves cross only once in the relevant range ($0 < q < 1$) so that a unique interior (i.e. where both countries invest) exists. This is because if the two curves were to cross more than once in the relevant range, they would have to cross three times (the YY curve starts over the qq curve and in $q = 1$ is below the qq curve if $s_W < 1/2$). In this case a downward shift of the qq curve (caused by an increase in ϕ) would have to imply that for some parameters, a decrease in q is possible. As $\partial q/\partial\phi > 0$ always, this is not possible.

Appendix III: Asymmetric equilibria in the emerging market

Suppose only a portion l_E of the L agents in the emerging market invest. The stock market equilibrium relation as well as the income relation can easily be rewritten accordingly and it can be checked that world income is the same as in the text. For $0 < l_E < 1$, the profit of investing must be zero, or using the the constant world income equation: $l_E + q^{-2} = \frac{\beta(w_E+w_I)}{F(2+\beta)}$. The intuition is that an increase in the relative price of assets in the emerging market induces entry which in this case implies a rise in the proportion of agents who invest. As in the text, it proves convenient to rewrite the fixed cost as $F = \alpha F_1$. We then get $l_E + q^{-2} = \frac{1}{\alpha s_w}$. A modified YY curve is derived from the definition of aggregate income in the emerging economy: $Y_E = L(w_E + \frac{1}{2}l_E p_E^2)$ and the zero profit condition. This defines s_Y the share of aggregate income in the emerging market as an increasing function of l_E:

$$s_Y = \frac{s_w\left(2+\beta+\alpha l_E\right)}{2\left(1+\beta\right)} \tag{A4}$$

A modified qq curve is derived from the stock market equilibrium:

$$s_Y = \frac{\left(\alpha l_E q^2 + \phi q^{1/\rho}\right)\left(1 - \phi q^{-1/\rho}\right)}{\left(1 + \alpha l_E q^2\right)\left(1 - \phi^2\right)} \tag{A5}$$

with q defined by the zero profit condition. Note of course that if $\alpha = l_E = 1$, we get equations (13) and (14) in the text, the "optimistic" case. If $l_E = 0$, the combination of (A4) and (A5) produces equation (20), the "pessimistic" case.

We now show that the modified YY curve is always above the qq curve and therefore never cross in the domain for which $0 < l_E < 1$. The sign of the difference between the YY curve and the qq is given by the following quadratic equation in ϕ:

$$\begin{aligned} &\phi^2 \left\{2\left(1+\beta\right)\left(1-\alpha l_E s_w\right) - s_w\left[2+\beta(1+\alpha l_E)\right]\right\} + \\ &2\phi(1+\beta)\left[\alpha l_E s_w q^{-1/\rho} - (1-\alpha l_E s_w) q^{1/\rho}\right] + (2+\beta)(1-\alpha l_E) s_w \end{aligned} \tag{A6}$$

Only when the middle term is negative, could this expression be negative for some level of ϕ. It is possible to show that in this case, the determinant of the above expression is always negative if $\alpha \leq 1$, that is if $F \leq F_1$.This proves that no asymmetric equilibrium exists for $F \leq F_1$.

An example where an asymmetric equilibrium exists is in the autarky situation ($\phi = 0$) if $\alpha > 1$. In this case, a symmetric equilibrium with $l_E = 1$ cannot be an equilibrium as it would involve negative profits. It can be shown easily that $l_E = 1/\alpha < 1$.

Appendix IV: Asymmetric transaction costs

A increase in ϕ_{in} shifts the qq curve to the right as from equation (24), we get:

$$\partial s_Y / \partial \phi_{in} = \frac{\left[q^2 + \phi_{out} q^{1/\rho}\right]\left(\phi_{out} - q^{-1/\rho}\right)}{\left(1 - \phi_{in}\phi_{out}\right)\left(1 + q^2\right)} < 0 \tag{A7}$$

We can sign this expression by the restriction that $s_Y < 1$.

Appendix V: A more general investment cost function

Suppose that the cost function is: $f(z_E) = \frac{1}{m} z_E^m$ with $m > 1$, so that we retain the convexity property of the cost function. In this case, the YY schedule becomes:

$$s_Y = \frac{s_w\left(m+\beta\right)}{m\left(1+\beta\right)} + \frac{\beta(m-1)}{m(1+\beta)(1+q^{-m/(m-1)})} \tag{A8}$$

and the qq curve:

$$s_Y = \frac{\left(q^{m/(m-1)} + \phi q^{1/\rho}\right)\left(1 - \phi q^{-1/\rho}\right)}{\left(1 + q^{m/(m-1)}\right)\left(1 - \phi^2\right)} \tag{A9}$$

It remains true that $q < 1$ in equilibrium as long as $w_E < w_I$. The working of figure 2 remains similar. If $m \geq 2/(2-\rho)$, then the qualitative result of figure 2 is unchanged: a symmetric decrease of transaction costs generates an increase in asset prices and income in the emerging market. A sufficient

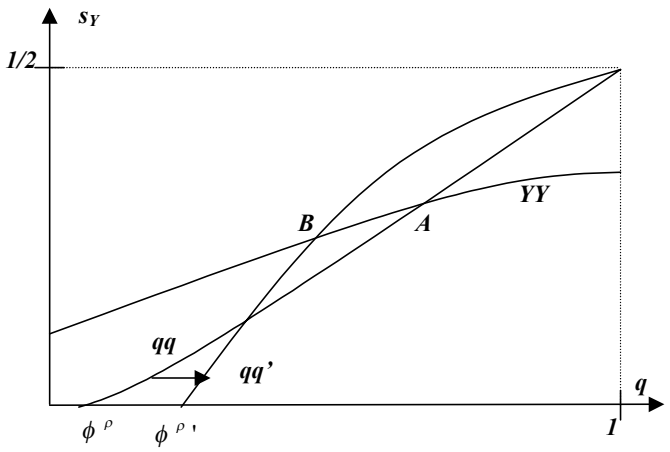

Figure 6: Lower transaction costs: the case of weak convexity and high transaction cost

condition is that $m \geq 2$. However, if $m < 2/(2-\rho)$ and transaction costs are high enough (ϕ is low), then a symmetric decrease in transaction costs can lead to a decrease in asset price and income in the emerging market. At some point however the lower transaction costs lead to increase in asset prices and income. The reason for this result is that the slope of the qq is also altered by a change in ϕ. The effect of an increase in ϕ on the qq curve can be analyzed by looking at how s_Y is affected by an increase in ϕ for a given q:

$$\frac{\partial s_Y}{\partial \phi} = \frac{\left(1+\phi^2\right)\left(q^{1/\rho} - q^{m/(m-1)-1/\rho}\right) - 2\phi(1-q^{m/(m-1)})}{\left(1+q^{m/(m-1)}\right)\left(1-\phi^2\right)^2} \tag{A10}$$

This can be positive (implying an upward shift of the qq curve) for $m < 2/(2-\rho)$ and high transaction costs. This case is shown on figure 6.

Hence, when the cost function is not very convex, financial globalization can in a first phase decrease asset prices and income in the emerging market. In this case, it also leads in a first phase to a current account surplus in the emerging market. The intuition is that in this case (which can also be interpreted as high risk aversion case) the diversification purpose is strong relative to the arbitrage one: this implies that agents in the industrialized country will not exploit much the difference in price between markets when transaction costs go down (at least for high transaction costs) but agents in the emerging market will want to diversify and buy assets in the industrialized country.

The analysis of the possibility of a crash driven by self-fulfilling expectations is more complex but not fundamentally altered in the case of a more general cost function as long as it is convex. It implies finding parameter values for which the investment is zero if agents expect zero investment and positive if they expect positive investment.

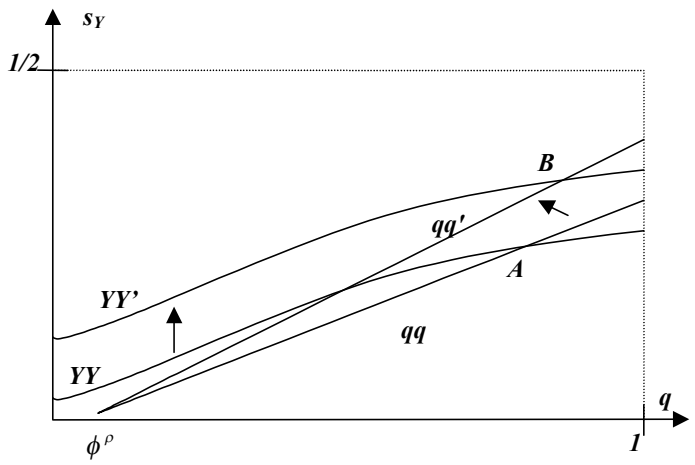

Figure 7: An increase population size of E: the case where asset prices in E decrease

Appendix VI: The impact of different population size

Because we want to focus on the consequences of lower productivity and wage in emerging market compared to industrialized countries, we have not allowed for different population size between the two countries. Doing this has potentially important consequences because of two features in our model: the market size effect and the fact that a larger population implies a larger number of projects/assets. Hence both demand and supply of assets are affected. To see this suppose now that wages are identical in the two countries but that populations (rather than being equal as in the paper) are L_E and L_I respectively. The YY curve becomes:

$$s_Y = \frac{(2+\beta)\,L_E}{2\,(1+\beta)\,(L_E+L_I)} + \frac{\beta L_E}{2(1+\beta)(L_E+L_I q^{-2})} \tag{A11}$$

where $s_Y = L_E Y_E/(L_E Y_E + L_I Y_I)$ is now the share of the E country in aggregate world income. The qq curve is now:

$$s_Y = \frac{\left(L_E q^2 + L_I \phi q^{1/\rho}\right)\left(1-\phi q^{-1/\rho}\right)}{\left(L_E q^2 + L_I\right)\left(1-\phi^2\right)} \tag{A12}$$

The equilibrium is graphed on figure 7 where we assumed that $L_E < L_I$:

It can be shown that the equilibrium relative price when $\phi < 1$ is less than 1. Hence, imperfect integration of financial markets implies lower asset prices in the small country. From this point of view the effect resembles a lot the market size effect when wages differ. An increase in population size has however an ambiguous effect. As shown on figure 7 both the YY and qq curves are affected. This is because both demand and supply of assets are increased. It can be shown that for low levels of ϕ (high transaction costs), the supply effect dominates so that an increase in L_E implies a decrease in q.

For high levels of ϕ (low levels of transaction costs), the demand effect dominates so that an increase in L_E implies an increase in q.

It can be shown that at $\phi = 0$ and $\phi = 1$, asset prices are identical ($q = 1$) in the two countries (again as long as wage rates are identical) even if population differ. At $\phi = 1$, perfect capital mobility, the reason is again perfect arbitrage. At $\phi = 0$, financial autarky, this is because the demand and the supply effect of population size cancel each other. A small population implies a lower demand for assets but also implies a small number of assets. Given this, it can be shown that the relative price of assets q is U-shaped as a function of ϕ when wages are equal and $L_E < L_I$.

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