Journal of International Money and Finance 32 (2013) 324–340

Contents lists available at SciVerse ScienceDirect

Journal of International Money and Finance

journal homepage: www.elsevier.com/locate/jimf

# Financial integration, capital misallocation and global imbalances☆

Kenza Benhima*

*University of Lausanne, UNIL-Dorigny, Extranef, Room 250, 1015 Lausanne, Switzerland*

*JEL codes:*
F36
F43
O16
O33

*Keywords:*
Growth
Capital flows
Credit constraints
Financial globalization
Technological change.

A B S T R A C T

This paper shows that in a stylized model with two countries, characterized by different levels of financial development, the following facts can be replicated: 1) persistent current account surpluses and 2) high TFP growth in China. Under autarky, entrepreneurs in the emerging country overinvest in short-term projects and underinvest in long-term projects because short-term assets help them secure long-term investments in the presence of credit constraints. This creates an aggregate misallocation of capital. When financial markets integrate, entrepreneurs with long-term projects can have access to cheaper short-term assets abroad, which leaves them with more resources to invest in their projects. This both reduces capital misallocations and generates capital outflows.



## 1. Introduction

The purpose of this paper is to explain two stylized facts that have attracted economists' attention. The first one is the so-called global imbalances: (1) *China has accumulated a considerable amount of net*

☆ I would like to thank an anonymous referee, Philippe Bacchetta, Daniel Cohen, Imen Ghattassi, Guy Laroque, Philippe Martin, Valérie Mignon, Romain Rancière and Hélène Rey for helpful comments. I also thank seminar participants at CREST-INSEE, the European Economic Association 2008 (Milan), the ADRES Doctoral Days 2009 (Louvain-la-Neuve), the AFSE Congress 2008 (Paris). Part of this research has been carried out within the project on "Macro Risk, systemic risks and international finance" (A2) of the National Centre of Competence in Research "Financial Valuation and Risk Management" (NCCR FINRISK). The NCCR FINRISK is a research instrument of the Swiss National Science Foundation.

* Tel.: +41 0 21 692 36 92.
*E-mail address:* Kenza.Benhima@unil.ch.

0261-5606/$ – see front matter © 2012 Elsevier Ltd. All rights reserved.
doi:10.1016/j.jimonfin.2012.04.009

*foreign assets*. Fig. 1(a) shows that its net external position, as a share of world GDP, has increased steadily since 1996. Actually, this surge can be dated back to 1990–1993 when the most illiquid assets, FDI, are excluded. This accumulation of net foreign assets in China is the main counterpart of the negative external position of the US, as illustrated in Fig. 1(a). The second fact is illustrated in Fig. 1(b): (2) *growth of total factor productivity (TFP) in China relatively to the US has accelerated*. Fig. 1(b) shows that China's relative TFP increased steadily during the period.[1] Between 1980 and 1989, TFP moved from 10% of the US value to 13%, which corresponds to an average catch-up rate of 2.5% per year. From 1990 to 2007, it moved from 13.5% to 32%, which corresponds to an average catch-up rate of 5%. This relative TFP growth contributed to two thirds of the relative growth of output per worker in China during that last period.

This paper lays down a three-period stylized model to explain this conjunction of TFP growth and capital outflows in the form of liquid assets as the endogenous outcome of financial integration. It focuses on the role of financial integration between US and China. Indeed, despite limited *de jure* financial integration, apparent in Fig. 2 through the stability of the Chinn and Ito (2007) index, China has experienced a significant trend of *de facto* integration during the period. Financial integration increases steadily before 1990, then accelerates after 1990 and stabilizes in the end of the nineties at approximately 50% of the US level.[2] This apparent contradiction between *de jure* and *de facto* integration has to be related to the increasing role of public flows. Fig. 1(a) shows that reserves constitute the bulk of financial outflows. Despite legal restrictions on capital flows, private agents indirectly hold foreign assets thanks to the intermediation role played by the Central Bank.[3]

The key feature of the framework is the interaction between financial integration, financial development and capital misallocation. Under autarky, entrepreneurs in the emerging country overinvest in short-term projects and underinvest in long-term projects because short-term assets help them secure long-term investments in the presence of credit constraints. This creates an aggregate misallocation of capital. When financial markets integrate, entrepreneurs with long-term projects can have access to cheaper short-term assets abroad, which leaves them with more resources to invest in their projects. This both reduces capital misallocations and generates capital outflows.

We model these effects in a three-period model where two types of entrepreneurs invest in technologies with decreasing returns on capital and in a liquid bond. Some entrepreneurs have access to short-term projects while the others have access to long-term projects. Long-term projects, because they take more time to mature, can be subject to liquidity shocks that might threaten the completion of the projects, especially in the presence of credit constraints, as in Holmstrom and Tirole (1998).[4]

Because of liquidity shocks and credit constraints, the investment behavior of entrepreneurs with long-term projects has two features that are key to our results: (i) the demand for bonds is "excessive", in the sense that it is larger than in the absence of credit constraints; (ii) bonds and long-term investment are complements, in the sense that a decrease in the price of bonds (i.e. an increase in the interest rate) has a positive effect on investment in long-term projects.[5] The first

[1] Capital stocks in EM and U are estimated with the perpetual inventory method, using the procedure of Caselli (2004) and the data from Heston et al. (2009). In order to calculate TFP, we calculate capital stocks using a perpetual inventory method, then we use the following definition of production per worker: $y = Ak^{\alpha}l^{(1-\alpha)}$, where $x$ is the level of capital per worker and $A$ is TFP. TFP values in China and the US are then estimated as $y/x^{\alpha}$, where $\alpha = 0.3$.

[2] As another evidence of *de facto* financial integration, see Cheung et al. (2006). They examine the deviations from real interest parity, uncovered interest parity, and relative purchasing power parity, and find that China is surprisingly financially integrated. They also document that the magnitude of deviations from the parity conditions is shrinking over time.

[3] See also Song et al. (2011). They document the parallel trend of bank deposits and reserves, which is consistent with the idea of savings-driven accumulation of reserves by the Central Bank.

[4] Several papers examine the macroeconomic consequences of liquidity risk in similar three-period settings. See, among others: Caballero and Krishnamurthy (2001), Holmstrom and Tirole (2002), Aghion et al. (2010), Chen and Leung (2008), Lorenzoni (2008), Brutti (2010) and Broner et al. (forthcoming).

[5] Bacchetta and Benhima (2010) also highlight this property of bonds in the presence of credit constraint and working capital but they develop a representative agent model that does not allow them to study misallocations.

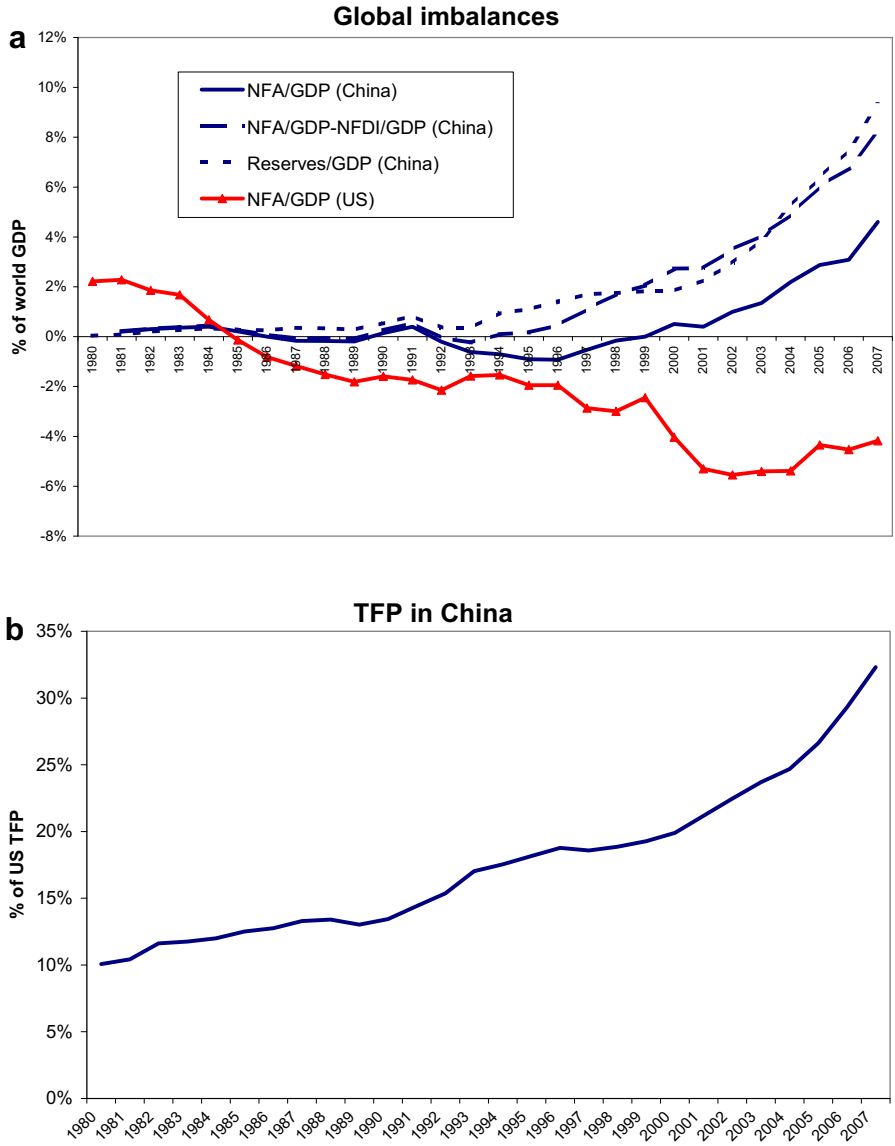


**Fig. 1.** Stylized facts - global imbalances and relative growth in China. Source: World bank (world development Indicators), Lane and Milesi-Ferretti (2007) and Penn world Tables 6.3 (Heston et al., 2009). Chinese data correspond to the version 2 of the Penn world Tables.

feature is crucial since it depresses the autarky interest rate on bonds. The second one is also critical because it makes short-term and long-term investments move in opposite directions when the interest rate increases. When financial integration occurs, the interest rate increases in the emerging country, which enables agents with long-term projects in the developing economy to invest more by holding cheaper liquid assets in the industrial economy. At the same time, investment in the short-term projects decrease, because the interest rate rises. This translates into higher TFP and a positive current account.

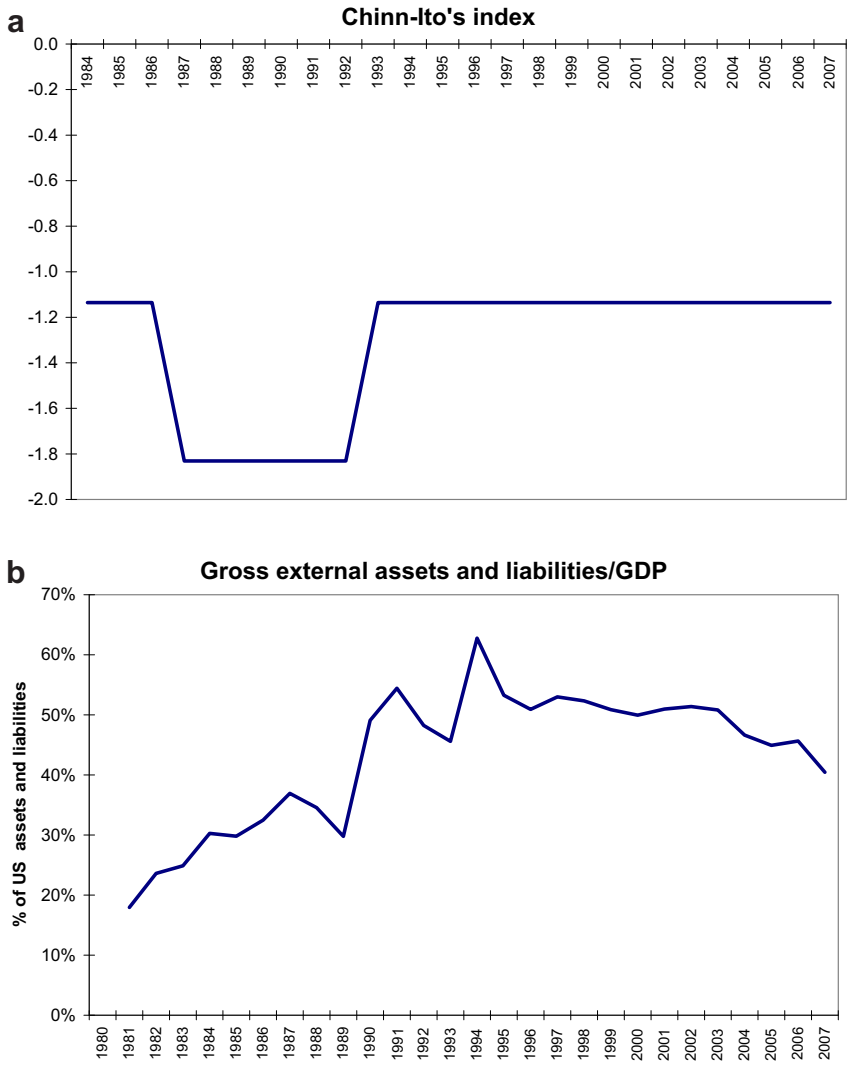


**Fig. 2.** Financial integration of China. Source: Chinn and Ito (2007)World bank (world development Indicators), Lane and Milesi-Ferretti (2007) and Penn world Tables 6.3 (Heston et al., 2009). Chinese data correspond to the version 2 of the Penn world Tables.

The remainder of the paper is organized as follows: Section 2 reviews the related literature; Section 3 lays down model while Section 4 compares the autarky and financial globalization equilibria. Section 5 concludes.

## 2. Related literature

This paper is related to the literature on capital misallocation. In particular, Matsuyama (2007); Aghion et al. (2010, forthcoming); Song et al. (2011); Midrigan and Xu (2010); Buera et al. (2011); Jeong and Townsend (2007) have stressed the impact of financial development on the allocation of capital. These studies assume that more financially demanding investments are also more productive. However, misallocations emerge even in the absence of TFP differences between firms. Indeed, with

decreasing returns, efficiency requires the equalization of marginal returns across firms. When these returns are not equalized, as Hsieh and Klenow (2009) show in the case of China, TFP losses are substantial.[6] In the model, we do not make any assumption regarding the relative productivity of long-term and short-term projects. Underinvestment in the long-term projects naturally creates a wedge with the return of the short-term projects. This comes from decreasing returns on capital.

The paper's focus on the role of decreasing returns rather than TFP differences is motivated by the literature on the effects of financial integration on growth. In particular, Levchenko et al. (forthcoming) find that financial integration do not increase the relative size of high TFP sectors. Since, as they document, financial integration does not have any effect on sectoral TFP growth, this finding is puzzling given the positive aggregate effects of financial opening (Bonfiglioli, 2008). However, these apparently contradicting empirical results can be reconciled in the presence of decreasing returns. Indeed, the reallocation of capital from a sector with overinvestment to a sector with underinvestment has positive aggregate effects on production because the output losses in the sector with overinvestment are smaller than the gains in the sector with underinvestment, because the marginal returns are larger in the latter. Supportive our hypothesis, Abiad et al. (2008) document the decrease in variation in marginal returns following financial liberalization in a sample of Asian countries.

Decreasing returns on capital can be a result of decreasing returns to scale at the firm level, but not only. Imperfect labor mobility between sectors is a source of decreasing returns, even in the presence of constant returns to scale at the firm level. In China, labor markets are particularly segmented. The Hukou system maintains barriers to migration between rural and urban areas, and between regions. Despite the huge flow of rural migrants to cities that followed reforms, the access of rural migrants to urban labor markets is selective (Wang and Zuo, 1999). Employers need administrative authorization to hire them, and some occupations are simply prohibited. All this limits labor to move freely between industries. Differentiated products and imperfect substitutability can also generate relevant misallocations due to the curvature of preference.[7] In the model, we choose the hypothesis of decreasing returns to scale in order to capture misallocations effects while keeping the model simple.[8]

This paper is also close to the rich literature on the "saving glut". Possible explanations include a transition process with financial frictions (Song et al., 2011; Sandri, 2010), the build-up of war chests by Central Banks (Bernanke, 2005; Gruber and Kamin, 2007; Obstfeld et al., 2010; Jeanne and Rancière, 2011; Caballero et al., 2008), but also financial integration of countries with high demand for safe and liquid assets (Mendoza et al., 2009a, b; Matsuyama, 2005; Ju and Wei, 2006, 2010). This last explanation is closest to mine. It is backed by the empirical results of Forbes (2010): she finds that financial development and capital controls are the main determinants of investment in US assets.[9]

Some of these papers deal with the link between growth and capital outflows, but with different approaches. In our paper, as in Caballero et al. (2008), high growth economies have a limited supply of domestic assets, but growth is endogenous in our framework. Even closer to our approach, Song et al. (2011) explain the improvement in aggregate TFP in China by a better allocation of capital, but the mechanism hinges on a different composition effect: productive firms converge slowly to the balanced growth path because they are credit-constrained and crowd out the financially integrated but less productive firms only in the long run.[10] In this paper, aggregate TFP effects arise even though the relative wealth of constrained and unconstrained firms is constant. Here, what matters is the effect of financial integration on the firms' investment decisions, for a given wealth. The static framework is useful to isolate this effect from the long-run composition effects.[11] Finally, in Antràs and Caballero

[6] See also Banerjee and Duflo (2005) and Restuccia and Rogerson (2008).

[7] See Hsieh and Klenow (2009) and Alfaro et al. (2009) for empirical applications of the differentiated-products framework. With an elasticity of substitution equal to 3, they find that misallocations are responsible for up to 30% of the TFP difference between China and the US.

[8] Restuccia and Rogerson (2008) use a similar approach.

[9] Another way to interpret excess savings in China is exchange rate management and export-led growth (Dooley et al., 2004, 2005; Rodrik, 2006, 2007). However, this view is not exclusive of the finance-based view. Indeed, high domestic savings helps the government maintain a low exchange rate through sterilized interventions.

[10] A similar mechanism is at play in Sandri (2010) since growth comes from structural reforms.

[11] See Benhima (2010) for a dynamic version of the model.

(2009), financial integration generates both capital outflows from the emerging country and a better allocation of resources, but, contrary to our approach, the effects come from an adjustment in labor between sectors, not in capital.

## 3. A model with liquidity needs

### 3.1. Economic environment

The economy is populated by two continuums of entrepreneurs, each of length 1: $S$ entrepreneurs, with short-term, or liquid projects, and $L$ entrepreneurs, with long-term, or illiquid projects. There are 3 periods, $t = 0,1,2$.

The timeline is represented in Fig. 3. Entrepreneurs are endowed with wealth $w$. At date 0, they allocate these resources between capital, denoted $k$ for short-term projects and $z$ for long-term projects, and bonds, denoted respectively $b^S$ and $b^L$. At date 1, $S$ entrepreneurs get the return from their portfolio $f(k)+k+rb^S$, where $f$ is positive, increasing and concave with $f(0) = 0$ and $r$ is the interest rate. $L$ entrepreneurs get only $rb^L$. Between date 1 and date 2, firms have access to a storage technology that yields one unit of good for one unit invested. We are interested in the domestic supply of liquid assets by firms and how it interacts with investment in the illiquid project at date 0, so we assume that there is no storage technology between date 0 and date 1.

The long-term projects are more sophisticated than the short-term projects and therefore they are more risky and submitted to possible hazards. This kind of investment can be interpreted as R&D expenses, or as the cost of adopting a new technology that has to be adapted or involves more human capital. This type of investment can be subject to a liquidity shock threatening the completion of the production process. For example, the new machines have to be adapted to a new legislation or the entrepreneur that has acquired new skills falls ill. In either case, all the investment expenditure can be lost if the liquidity shock is not overcome. We therefore assume that, at date 1, half of the $L$ entrepreneurs incur a liquidity shock $\rho z$, $\rho > 0$. If the cost is paid, then the long-term investment yields its full return $g(z) + z$, where $g$ is positive, increasing and concave with $g(0) = 0$. If not, then the whole return on long-term investment is lost. The other half of the $L$ entrepreneurs receive $\rho z$, which they can either lend or store.

By construction, the liquidity shock is equal to zero in expectations. This assumption is made in order to insure that, in the absence of credit constraints, the cash-rich entrepreneurs (who receive $\rho z$) can supply funds to the cash-poor entrepreneurs (who have to pay $\rho z$), so there is no aggregate

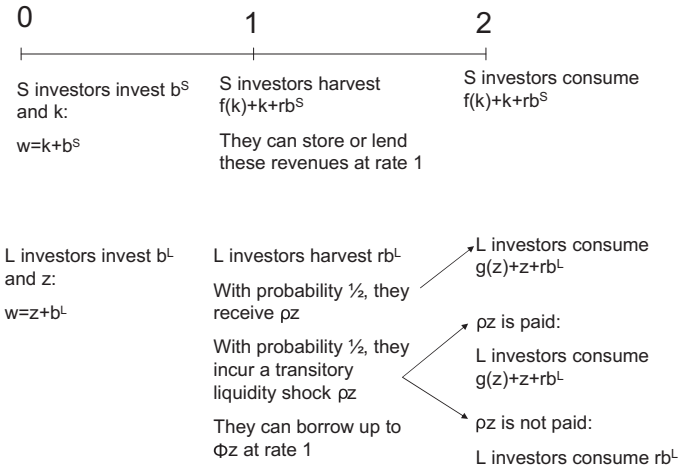


**Fig. 3.** Timeline.

shortage of liquidity. As a consequence, the only impediments to financing the bad liquidity shock will be due to credit constraints.

We also assume that the shock is only transitory and has no impact on the present value of the project, so it is not a shock on fundamentals. Namely, when the entrepreneur has to pay $\rho z$ in period 1, the project yields $g(z) + (1 + \rho)z$ in period 2 and the entrepreneur consumes $g(z) + z + rb^L$, because the interest rate is pinned down to 1 by the storage technology between periods 1 and 2. When he receives $\rho z$, then the project yields $g(z) + (1 - \rho)z$ and the entrepreneur consumes $g(z) + z + rb^L$ as well. These assumptions enable us to focus on the consequences of liquidity issues, independently from solvability.

Projects $S$ and $L$ differ in terms of the maturing time, but also in terms of the pledgeability of assets. Namely, when they borrow, $L$ entrepreneurs can pledge only a fraction $0 < \phi < 1$ of their capital, while $S$ entrepreneurs can pledge the totality of their assets. So $\phi z$ is the maximum amount that cash-rich $L$ entrepreneurs can extend to cash-poor $L$ entrepreneurs. This can be justified by the fact that long-term production involves intangible assets that cannot be seized by creditors. For example, technologically intensive projects take more time to produce and rely more on human capital, which is an intangible asset.

### 3.2. Entrepreneurs with short-term projects

As summarized in Fig. 3, at date 0, $S$ entrepreneurs can invest $w$ only in the short-term asset $k$ and in bonds $b^S$. At date 1, they invest the return of this portfolio in the storage technology. Since the return on storage is 1, they consume $f(k) + k + rb^S$ at date 2, where $b^S = w - k$. We focus on equilibria with $r \geq 1$, so that $k \geq -r(w - k)$, which means that $S$ entrepreneurs are never constrained.[12] Their program is then the following:

$$\max_k \{f(k) + k + r(w - k)\} \tag{1}$$

which yields:

$$f'(k) + 1 = r$$

The interest rate pins down the first-best investment in short-term capital. We denote this investment level by $k^*(r)$. Bonds are then defined by the difference between wealth and investment needs: $b^{S*}(r) = w - k^*(r)$.

### 3.3. Entrepreneurs with long-term projects

As summarized in Fig. 3, at date 0, $L$ entrepreneurs invest in the long-term capital $z$ and in short-term bonds $b^L$. At date 1, they receive $\rho z$ with probability 1/2. In that case, they store $rb^L + \rho z$ and consume $g(z) + z + rb^L$ in period 2. With probability 1/2, they have to pay $\rho z$. If the cost is paid, they consume $g(z) + z + rb^L$ at date 2. If not, they consume $rb^L$. Throughout the process, total borrowing should never exceed $\phi z$.

At date 0, the entrepreneur will then face a trade-off between investing in the productive asset and investing in liquid bonds that help secure the productive process, in particular if period 1 credit constraints are stringent ($\phi$ is small) and if the liquidity shock is potentially large ($\rho$ high). We show that the entrepreneur is typically in one of the following three situations: (i) the entrepreneur is rich enough to both invest in the optimal amount of productive asset and hoard sufficient liquidity; (ii) the entrepreneur has to give up part of the productive investment to secure it by holding liquid bonds; (iii) the opportunity cost of bonds is too high and the entrepreneur prefers an unsecured strategy.

Since the entrepreneur cannot borrow more than $\phi z$ in period 1, the condition for firms to be able to finance the liquidity shock is

[12] Indeed, in equilibrium, $f'(k) + 1 = r$. Since $f'(k) \geq 0$, then $r \geq 1$.

$$rb^L + \phi z \geq \rho z \tag{2}$$

which, combined with the period 0 budget constraint, yields $z \leq \bar{z}(w,r)$ with:

$$\bar{z}(w,r) = \frac{r}{r+\rho-\phi} w \tag{3}$$

$\bar{z}(w,r)$ is the maximum amount that can be secured by liquid bonds, which takes into account the entrepreneur's borrowing capacities in period 1, $\phi z$. If $z > \bar{z}$, the entrepreneur does not have enough liquidity to overcome the bad liquidity shock. This "secured", or "constrained" $z$ is increasing in the degree of access to financial markets $\phi$ and decreasing in the magnitude of the liquidity shock $\rho$. When $\rho > \phi$, this level is strictly lower than $w$. This simply means that when the liquidity shock exceeds his borrowing capacities, the entrepreneur has to hold a positive amount of bonds in order to be able to finance the bad shock.

Note that when investing in period 0, entrepreneurs must satisfy the period 0 credit constraint as well, which implies $z \leq z_{max}(w,r) = rw/(r-\phi)$. However, since $\rho > 0$, $z_{max} > \bar{z}$, which implies that the period 0 credit constraint is not relevant when the entrepreneurs decide to hold a sufficient amount of liquidity to pay for the bad liquidity shock.

In order to further describe the entrepreneur's program, define the safe and risky profits as follows:

$$\pi^*(z) = g(z) + z + r(w-z)$$

$$\pi^{**}(z) = \frac{1}{2}(g(z)+z) + r(w-z)$$

$\pi^*$ represents expected profits when the entrepreneur has sufficient funds to secure the long-term production process, i.e., the financing constraint (2) is satisfied. When (2) is not satisfied, then the long-term production process becomes risky, and yields its full return only with probability 1/2 (see Fig. 3). In that case, profits are given by $\pi^{**}$.

The entrepreneur's program can be written as follows:

$$\max\left\{ \max_{\{z\}/0\leq z\leq \bar{z}(w,r)} \pi^*(z); \max_{\{z\}/\bar{z}(w,r)<z\leq z_{\max}(w,r)} \pi^{**}(z) \right\} \tag{4}$$

Entrepreneurs choose whether to satisfy or not the financing constraint. When choosing the first case, they can overcome the bad shock and therefore get the long-term production in all states of nature. Their objective is then to maximize $\pi^*(z)$. In the second case, they lose the long-term production in the bad state. Their objective is then to maximize $\pi^{**}(z)$. Indeed, if $z$ is sufficiently productive with regards to the liquid bond, it can be profitable to choose not to satisfy the constraint, even with the risk of losing $g(z)$.

It is useful to define the following variables:

$$z^*(r) = g'^{-1}(r) \tag{5}$$

$$z^{**}(r) = g'^{-1}(2r) \tag{6}$$

$z^*$ is the first-best level of long-term investment, defined by $g'(z^*) = r$. It maximizes $\pi^*$. $z^{**}$ is the level that maximizes $\pi^{**}$. $z^{**}$ is the investment level when the entrepreneur chooses the risky strategy, provided that $z^{**}(r) \leq z_{max}(w,r)$.

The following Proposition describes the decisions of the entrepreneur:

**Proposition 1**. For each (r, $\phi$) :

(i) There exists $w^*(r)$ strictly positive such that $z = z^*$ for all $w \geq w^*(r)$ and $z = z^{**}$, $\bar{z}$ or $z_{\max}$ otherwise;

(ii) *If $\rho > \phi$, then there exists $\overline{w}(r)$, $\overline{w}(r) < w^*(r)$, such that $z = \bar{z}$ for all $\overline{w}(r) < w < w^*(r)$ ;*

(iii) *If $\rho > \phi$, then $\overline{w}(r)$ and $w^*(r)$ are both decreasing in r.*

Results (i)–(ii) of Proposition 1 are summed up in Figure 4. When $w$ is larger than $w^*$, the entrepreneur is sufficiently rich to both implement the optimal level of long-term investment $z^*$ and to secure it by the appropriate amount of liquid bonds. This is the case as long as $w \geq w^*$, where $w^*$ is the amount of wealth for which the maximum level of "secured" long-term investment coincides with the first-best level, that is $\bar{z}(w^*, r) = z^*(r)$. For $w < w^*$, the first-best long-term investment cannot be achieved and secured at the same time: $\bar{z}(w^*, r)$ is strictly lower than $z^*(r)$. At that point, the risk of output loss is too high as compared to the opportunity cost of liquidity, so the entrepreneur prefers to lower the investment level in order to be able to secure it by holding bonds. This is the case as long as $w \geq \overline{w}$, where $\overline{w}$ is the amount of wealth for which the secured strategy gives the same profit as the risky one, that is $\pi^*(\bar{z}(\overline{w}, r)) = \pi^{**}(z^{**}(r))$. When $w$ decreases further, the secured investment $\bar{z}$ decreases and it becomes more costly to hoard liquidity than to adopt the risky strategy. For $w < \overline{w}$, the entrepreneur gets a higher profit by ignoring the period 1 financing constraint and investing more in the long-term technology, even though this makes the production process more risky.

Actually, the investment behavior becomes more complex when $w < \overline{w}$. However, in the rest of the paper, we will consider only "standard" cases where they invest either in the constrained or first-best allocation, that is where $w > \overline{w}$. This is why (iii) is useful: it tells us whether changes in the interest rate moves us out of the standard zone.

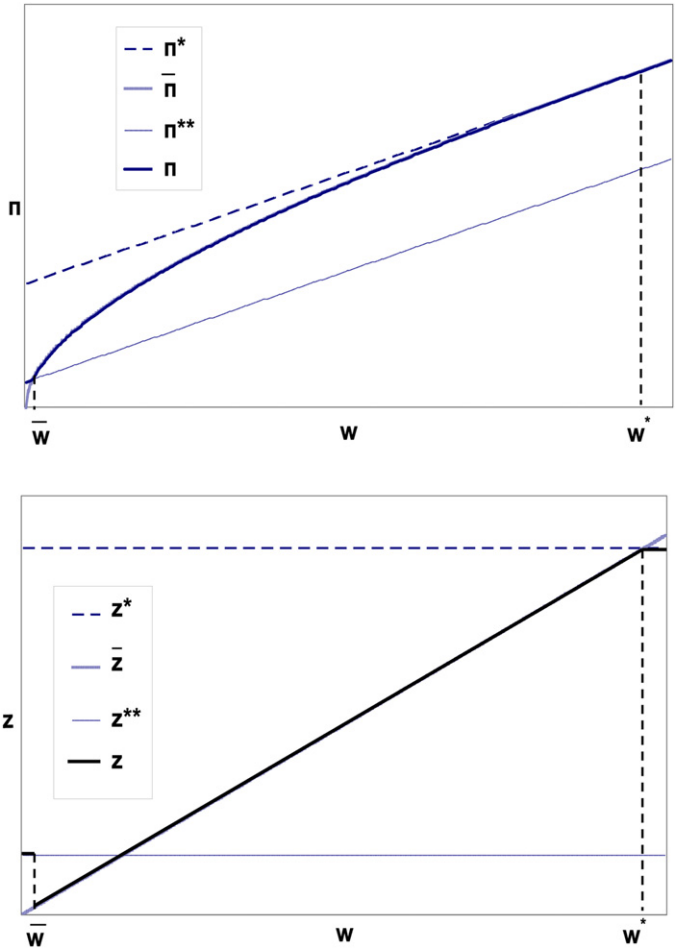


**Fig. 4.** Investment and profits Note: The solid lines denote the values of $z$ and $\pi$ that characterize the behavior of the entrepreneur.

The intuition for (iii) is as follow. $\partial\overline{w}(r)/\partial r < 0$ means that the constrained allocation can be sustained for lower levels of wealth when the interest rate increases. This is because, as apparent in Equation (3), and as will be explained further, a higher interest rate alleviates the financing constraint by allowing a higher long-term investment, which has a positive effect on the constrained profits. $\partial w^*(r) / \partial r < 0$ means that the first-best allocation holds for lower levels of wealth when the interest rate increases. This is because a rise in the interest rate both increases the constrained long-term investment and decreases the first-best one, which makes it easier for a constrained entrepreneur to achieve the first-best.

### 3.4. Specificities of constrained economies

Several aspects of constrained economies (that is, countries where $L$ entrepreneurs are constrained) are worth highlighting at that point, since they will have important consequences on the effect of financial integration. First, if the entrepreneur is constrained, we have $\bar{z}(w,r) \leq z^*(r)$. $L$ entrepreneur underinvest in the more productive technology as compared to the first-best solution because they have to hold an additional amount of bonds in order to satisfy the financing constraint. Second, and consistently, the entrepreneurs overinvest in short-term bonds. Third, while the supply of short-term capital $k$ is standard and depends negatively on the interest rate, the effect of the interest rate on the supply of long-term capital $z$ is positive when credit constraints are tight. Fourth, the effect of the interest rate on the domestic excess demand for bonds $b = b^S + b^L$, which also represents net foreign assets, is ambiguous. However, under some condition, which we will justify later, the interest rate has a standard positive effect on the excess bond demand. While the first two points are straightforward, the last two deserve more explanation.

The positive effect of the interest rate on long-term capital can be uncovered by differentiating the financing constraint (3):

$$\frac{\partial \bar{z}}{\partial r} = \frac{\rho - \phi}{(r + \rho - \phi)^2} w \tag{7}$$

When credit constraints are tight and liquidity shocks are large ($\rho > \phi$), this derivative is strictly positive. This comes from an income effect: when the interest rate increases, less bonds are necessary to secure the long-term investment, because the period 1 revenues from bond holdings increase mechanically. This generates more resources to invest in long-term capital.

Indeed, when the entrepreneur invests in $z$ units of long-term capital, he needs an amount of liquidity equal to $(\rho - \phi)z$ to face the liquidity shock in period 1. Therefore, a decrease in $1 / r$, which is the cost of liquidity, amounts to a decrease in the average cost of $z$. In other words, more resources become available to invest in $z$.

The excess demand for bonds in the constrained economy ($\bar{b}$) is obtained by subtracting the domestic supply by $S$ entrepreneurs from the domestic demand by $L$ entrepreneurs:

$$\bar{b} = \frac{\rho - \phi}{r + \rho - \phi} w - \left( f'^{-1}(r) - w \right)$$

The derivative of $\bar{b}$ with respect to $r$ is:

$$\frac{\partial \bar{b}}{\partial r} = -\frac{(\rho - \phi) w}{(r + \rho - \phi)^2} - \frac{1}{f''(k(r))} \tag{8}$$

The sign of this derivative is ambiguous because the supply of liquidity by $S$ entrepreneurs and the demand of $L$ entrepreneurs move in the same direction. The demand for liquidity purposes $(\rho - \phi)w/(r + \rho - \phi)$ is decreasing in $r$ through the same income effect described above: less short-term assets are needed to face the liquidity shock while the supply $f'^{-1}(r) - w$ is decreasing in $r$ too through a standard arbitrage effect. Both the demand and supply are depressed by the interest rate. In the remainder of the paper, we assume that the following condition holds:

**Condition 1**. There exists $X > 0$ such that $|f''(k)| < X$ for all $k \geq 0$ and $wX < (\rho - \phi)$.

Under Condition 1, the derivative in (8) is strictly positive, which is a standard assumption about the excess demand for bond. This condition states that the standard supply effect dominates the unconventional demand effect. This is the case when the supply of capital is elastic to the interest rate ($|f''(k)|$ is small) and when the income effect on demand is small ($w$ is small and $\rho - \phi$ is large). Indeed, the potential effect of $r$ on demand is milder when bond holding and therefore $w$ are small. Similarly, a stringent financing constraint ($\rho - \phi$ large) mitigates the effect of $r$ because increasing $z$ increases period 1 risk.

## 4. Global imbalances

We consider two countries indexed by $i \in \{I,E\}$, $I$ denoting the industrial country and $E$ the emerging one. The approach here is to compare the investment decisions under autarky and financial globalization, defined by cross-border trade in bonds. As in Mendoza et al. (2009a), the two countries are supposed to be identical, except for the level of financial development $\phi$. The industrial country $I$ is financially developed while the emerging one $E$ is not. In order to be more specific, we define the two following situations:

**Definition 1**. *Perfect financial markets (PFM): $w > w^*(1)$. According to Proposition 1, this condition is sufficient for the first-best decisions to apply for all r, since $r \geq 1$.*

**Definition 2**. *Imperfect financial markets (IFM): $\rho > \phi$ and $\overline{w}(1) < w < w^*(r^{a*})$, where $r^{a*}$ is the autarky interest rate that would prevail under PFM.*

We assume that the industrial country $I$ has PFM, while the emerging country $E$ has IFM. The IFM condition insures that $w$ is not too high or too low so the constrained allocation is a solution under autarky and financial integration.

We first examine the allocation of capital under autarky, then we study the impact of financial integration between $I$ and $E$. We are interested in the way financial globalization affects the net external position $b = b^S + b^L$ and investment in both kinds of capital $k$ and $z$.

### 4.1. Autarky

Consider the investment decisions under perfect and imperfect financial markets when the economy is under autarky. For any variable $X$, $X^{a*}$ denotes its autarky value under PFM and $\overline{X}^a$ its autarky value under IFM.

Under autarky, the domestic bond market is in equilibrium, so $b^a = b^{Sa} + b^{La} = 0$. Combining this condition with the date 0 budget constraints of $S$ and $L$ entrepreneurs, we get the aggregate resource constraint of the economy:

$$2w = k^a + z^a$$

The total resources are allocated between the short-term and the long-term capital stocks.

The following Proposition summarizes the features of the autarky equilibrium:

**Proposition 2**. *In autarky, under Condition 1, the constrained allocation is a solution under IFM. The autarky interest rate is lower under IFM than under PFM. Besides, k is higher and z is lower under IFM than under PFM.*

The formal proof is available in the Appendix.

Under PFM, the marginal returns on the long-term investment and short-run investment are equal, so the optimal allocation satisfies $g'(2w - k^{a*}) = f'(k^{a*})$. This defines the short-term investment $k^{a*}$ and the long-term investment $z^{a*} = 2w - k^{a*}$. The autarky interest rate is $r^{a*} = f'(k^{a*})$.

Under IFM, the constrained economy has an excessive demand for bonds as compared to the first-best: $\overline{b}(w,r) > b^*(w,r)$. Under Condition 1, the bond demand responds positively to the interest rate, so the autarky interest rate should be lower in a constrained economy. Namely, to diminish the excess demand for bonds, the interest rate must decrease in order to stimulate the supply of short-term capital, which serves as a store of liquidity for the economy.

A low interest rate implies that the constrained economy invests excessively in the short-term capital. As a consequence, less resources are available for the long-term capital, according to the aggregate resource constraint. This is in line with the findings of the empirical literature: in financially repressed countries, industries dependent on external finance are less developed.[13] This constitutes a justification for Condition 1.

Figure 5 illustrates the mechanism. It represents the demand for bonds and for short-term and long-term capital in the Industrial country $I$, with perfect financial markets, and in the Emerging country $E$, with binding financing constraints. These countries differ only with regards to the level of financial development. The short-term investment $k$ is decreasing in $r$ and it is identical in both countries since it follows the same optimality rule. Bonds $b$ are increasing in $r$ in both countries, but, for a given interest rate, the demand for bonds is higher in the constrained economy because of the precautionary hoarding motive. As a corollary, the demand for long-term investment is lower, because less resources are available to $L$ entrepreneurs. In order to satisfy the equilibrium on the domestic bond market, the autarky interest rate has to be lower in $E$ than in $I$ so that the demand for bonds is discouraged. The corresponding level of short-term capital is higher in $E$ than in $I$ while the level of long-term capital is lower.

An important aggregate consequence of the binding financing constraint in the emerging country is the over-accumulation of the short-term investment $k$. Because of financial market imperfections, it has to be used as a store for liquidity. Consistently, there is an under-accumulation of the long-term investment $z$.

### 4.2. Financial globalization

What is the effect of the possibility to trade bonds between countries on foreign assets, investment and production, from a comparative statics point of view? In order to answer this question, remember that Proposition 2 showed that $\overline{r^a} < r^{a*}$. Besides, under Condition 1, the aggregate demand for bonds, and thus the external position, are increasing in $r$ in both the Emerging and the Industrial countries. Therefore, for the world bond market to clear, the world interest rate $r^w$ should lay between the two autarky interest rates. We should thus have: $\overline{r^a} < r^w < r^{a*}$. As illustrated in Figure 5, the general equilibrium is fixed between the two autarky interest rates in order to satisfy $b^I = -b^E$. When capital markets integrate, the Industrial country therefore experiences a drop in interest rate and capital inflows while the Emerging one experiences a rise in interest rate and capital outflows. The consequences of financial integration are fully described in the following proposition:

**Proposition 3**. *Effect of financial integration on investment: When financial markets integrate, under Condition 1, there is a unique solution where the constrained allocation is chosen in E and this solution exhibits the following features:*

- *I experiences a drop in the interest rate. Besides, k and z rise and b becomes negative.*
- *E experiences a rise in the interest rate. Besides, k falls, z rises and b becomes positive.*

The formal proof is provided in the appendix.

The effect of financial markets integration is illustrated in Figure 5: when financial markets integrate, the Industrial economy experiences a drop in the interest rate, so the entrepreneurs take advantage of the new financing opportunities by increasing their debt and reallocating their resources in favor of the productive assets. In the Emerging country, the mechanisms are different. The Emerging country experiences an increase in interest rate. This increase has a standard crowding-out effect on short-term capital, but has a positive crowding-in effect on long-term capital, through the positive income effect discussed above: it becomes easier to secure the long-term investment.

In a nutshell, liquidity is relatively more expensive in the emerging country than in the industrial country. Therefore, when the bond market integrates, $L$ entrepreneurs in the emerging country benefit

[13] See Levine (2005) for a survey.

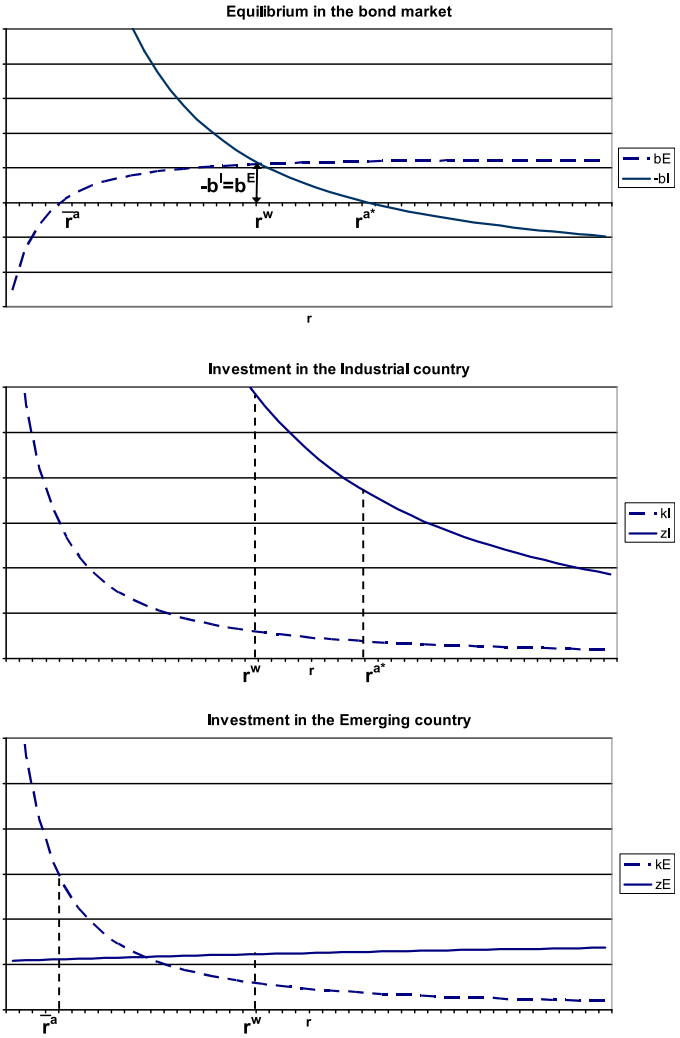


**Fig. 5.** Investment under PFM and IFM.

from the lower international price of liquidity $1/r$ to increase their investment $z$. Indeed, because of the financing constraint, liquidity and the long-term investment are complements in the emerging economy.

In the appendix, it is also shown that the condition $\overline{w}(1) < w < w^*(r^{a*})$, which rules out the first-best and risky allocations for $r = \overline{r}^a$ in the developing country, is also sufficient to rule them out for $\overline{r}^a < r < r^{a*}$. Indeed, according to Proposition 1, for $\overline{r}^a < r < r^{a*}$, the condition $\overline{w}(r) < w < w^*(r)$ holds.

Finally, we can derive the consequences of financial integration on output by differentiating total production $y = f(k) + g(z)$ with respect to $r$:

$$\frac{\partial y}{\partial r} = f'(k)\frac{\partial k}{\partial r} + g'(z)\frac{\partial z}{\partial r}$$

After rearranging, we find that the effect on output can be decomposed into an aggregate investment effect and an investment composition effect:

$$\frac{\partial y}{\partial r} = f'(k)\frac{\partial(k+z)}{\partial r} + (g'(z) - f'(k))\ \frac{\partial z}{\partial r}$$

The composition effect (second term) corresponds to the efficiency gains in the allocation of capital. It can be seen as a "TFP" effect, since it represents the effect on output that is not explained by the change in total investment $k + z$.

In the industrial country, both investments increase thanks to the decrease in the interest rate ($\partial r < 0$), but the TFP effect is absent because the allocation of investment is always efficient: $g'(z^*) = f'(k^*)$. As a consequence, production increases after financial markets integration:

$$\partial y^* = f'(k^*)\underbrace{\frac{\partial(k^*+z^*)}{\partial r}}_{<0}\underbrace{\partial r}_{<0} + \underbrace{(g'(z^*) - f'(k^*))}_{=0}\frac{\partial z^*}{\partial r}\underbrace{\partial r}_{<0} > 0$$

In the emerging country, the impact of financial integration on production is ambiguous. The rise in the interest rate ($\partial r > 0$) implies a diminution in aggregate investment and an increase in efficiency:

$$\partial \overline{y} = f'(\overline{k})\underbrace{\frac{\partial(\overline{k}+\overline{z})}{\partial r}}_{<0}\underbrace{\partial r}_{>0} + \underbrace{(g'(\overline{z}) - f'(\overline{k}))}_{>0}\underbrace{\frac{\partial z}{\partial r}}_{>0}\underbrace{\partial r}_{>0}$$

On the one hand, the industrial country experiences a deterioration of its external position which results in a current account account deficit. On the other, the aggregate TFP increases in the emerging country. This rise in TFP comes from the reallocation of investment from the technology with a low marginal return to the technology with a high marginal return.

## 5. Conclusion

This paper has shown that the presence of financing constraints on the long-term technology in emerging markets can generate both capital outflows and TFP growth following financial integration. The latter is due to a better allocation of capital enabled by the replacement of the short-term capital with external bonds in the portfolio of emerging countries. Indeed, since the developed world has better financial markets, its demand for liquid assets for hoarding purposes is lower than that of the developing countries; as a result, when financial globalization occurs, the emerging economies hold external bonds in order to use them as a buffer.

## Appendix A

*Proof of Proposition 1*

(i) $z^*$ is independent of $w$ while $\overline{z}$ is strictly increasing in $w$ with $\overline{z}(0,r) = 0$ and $\lim_{w\to+\infty}\overline{z}(w,r) = +\infty$. Therefore, for a given $r$, there exists a unique $w^*$ such that $\overline{z}(w^*,r) = z^*(r)$. Besides, for $w > w^*$, $\overline{z} > z^*$, so $\text{argmax}\{z\}/0 \le z \le z(w,r)\pi^*(z) = I^*$. $z^*$ is therefore the solution for (4) when $w > w^*$.

(ii) For $w < w^*$, $\overline{z} < z^*$, so the solution is either $\overline{z}$, $z^{**}$ or $z_{\max}$.

We show that there exists a unique $\overline{w}$ in $(0,w^*)$ such that $\pi^*(z(r)) = \pi^{**}(z^{**}(r))$, and that for all $w\in(\overline{w},w^*)$, $\pi^*(z(w,r)) > \pi^{**}(z^{**}(r))$. This is enough to prove that $\overline{z}$ is the solution to (4) for all $\overline{w} < w < w^*$. Indeed, $\overline{z}(w,r) \le z_{max}(w,r)$, which implies that $\overline{z}$ always satisfies the period 0 credit constraint, and $\pi^{**}(z^{**}(r)) > \pi^{**}(z_{\max}(w,r))$, which implies that $\pi^*(\overline{z}(w,r)) > \pi^{**}(\min\{z^{**}(r), z_{max}(w,r)\})$.

We now show that $\overline{w}$ indeed exists and is unique. Consider $\Delta\pi(w,r) = \pi^*(\overline{z}(\overline{w},r)) - \pi^{**}(z^{**}(r)) = g(\overline{z}(w,r)) - r\overline{z}(w,r) - [g(z^{**}(r))/2 - rz^{**}(r)]$. $\Delta\pi$ is strictly increasing in $w$ on $(0,w^*)$ with $\Delta\pi(0,r) = -[g(z^{**}(r))/2 - rz^{**}(r)]\langle 0$ and $\Delta\pi(w^*,r) = g(z^*(r)) - rz^*(r) - [g(z^{**}(r))/2 - rz^{**}(r)]\rangle 0$.

Therefore, for a given $r$, there exists a unique value of $w\varepsilon(0,w^*)$ such that $\pi^*(\bar{z}(\overline{w},r)) = \pi^{**}(z^{**}(r))$. Then, by continuity, $\Delta\pi(w,r)>0$ for $w\in(\overline{w},w^*)$. This means that $\pi^*(z(w,r))>\pi^{**}(z^{**}(r))$, so, according to the above discussion, the solution is $\bar{z}$ for $w\in(\overline{w},w^*)$. This proves (ii).

(iii) First, by definition, $w^*(r)$ is such that $\bar{z}(w^*,r) = z^*(r)$. Differentiating this equation with respect to $r$ and rearranging, we obtain:

$$\frac{\partial w^*}{\partial r} = \frac{\dfrac{\rho-\phi}{r}+1}{g''(z^*)} - \frac{(\rho-\phi)z^*}{r^2} < 0$$

since $g''<0$ and $\rho > 0 > \phi$.

Second, by definition, $\overline{w}(r)$ is such that $\pi^*(z(w,r))=\pi^{**}(z^{**}(r))$. Differentiating it with respect to $r$ in the first case and rearranging, we obtain:

$$\frac{\partial\overline{w}}{\partial r}\frac{\partial\Delta\pi}{\partial w} = -\frac{\partial\Delta\pi}{\partial r}$$

$\partial\Delta\pi/\partial w$ is strictly positive. In order to derive $\partial\overline{w}/\partial r$, we then need to derive$\partial\Delta\pi/\partial r$

$$\frac{\partial\Delta\pi}{\partial r} = (z^{**}-\bar{z}) + (g'(\bar{z})+1-r)\ \frac{\rho-\phi}{(r+\rho-\phi)^2}$$

This derivative is strictly positive because $\rho>\phi$, $g'(\bar{z})+1>r$ and $z^{**}>\bar{z}$. The first inequality is an assumption. The second inequality is due to the suboptimality of $\bar{z}$ for $z<z^*$. The third inequality is due to the fact that the risky allocation yields a lower expected output. To achieve the same profit, $z^{**}$ must indeed be strictly higher than $\bar{z}$. The following argument establishes this formally: $\pi^*(\bar{z}(\overline{w},r)) = \pi^{**}(z^{**}(r))$ implies that $g(\bar{z}(\overline{w},r)) - r\bar{z}(\overline{w},r) = g(z^{**}(r))/2 - rz^{**}(r)$. As a consequence, $g(\bar{z}(\overline{w},r)) - R\bar{z}(\overline{w},r) < g(z^{**}(r)) - rz^{**}(r)$. $g(z)-rz$ is increasing on $[0,z^*]$, so this inequality implies that $\bar{z}(\overline{w},r) < z^{**}(r)$.

As a result, $\partial\overline{w}/\partial r \le 0$, which implies that $\overline{w}$ is decreasing in $r$.

*Proof of Proposition 2*

Assume first that $\overline{w}(\bar{r}^a) < w < w^*(\bar{r}^a)$ so the constrained allocation holds under IFM. The constrained economy has an excessive demand for bonds: $\bar{b}(w,r) > b^*(w,r)$. By definition of $r^a$, $b^*(w,r^{a*})=0$. Therefore, a constrained economy would have a positive net demand for bonds with $r=r^{a*}$ : $\bar{b}(w,r^{a*}) > 0$. Since the autarky interest rate $\bar{r}^a$ is such that $\bar{b}(w,\bar{r}^a,\phi) = 0$, then we have $\bar{b}(w,r^{a*}) > \bar{b}(w,\bar{r}^a)$.

Under Condition 1, $\partial\bar{b}/\partial r > 0$. Therefore, the autarky interest rate in a country with the constrained allocation is lower than the first-best one $\bar{r}^a < r^{a*}$.

Besides, since $\bar{r}^a < r^{a*}$ and $f'(k)=r$, then $\bar{k}^a > k^{a*}$. Moreover, since $z^a = 2w - k^a$, then $\bar{z}^a < z^{a*}$.

Finally, the constrained allocation does constitute an autarky equilibrium since $1 \le \bar{r}^a < r^{a*}$ implies that $\overline{w}(\bar{r}^a,\phi) \le \overline{w}(1) < w < w^*(r^{a*}) < w^*(\bar{r}^a)$, according to Proposition 1.

*Proof of Proposition 3*

Assume first that $\overline{w}(r^w) < w < w^*(r^w)$, so entrepreneurs are constrained under financial integration in the Emerging country.

$b^*$, the demand for bonds in the industrial country, is increasing in $r$. Under Condition 1, the demand for bonds is also increasing in $r$ in the emerging country. Besides, $\bar{b} > b^*$. Therefore, for $r < \bar{r}^a$, both $b^*$ and $\bar{b}$ are negative. For $r > r^{a*}$, both $b^*$ and $\bar{b}$ are positive. For $\bar{r}^a \le r \le r^{a*}$, $b^* \le 0$ and $\bar{b} \ge 0$, so, if there exists a solution $r^w$ verifying $b^*(r^w) = -\bar{b}(r^w)$, it is necessary in the $[\bar{r}^a, r^{a*}]$ interval. Such a solution exists and is unique because $\partial(b^*+\bar{b})/\partial r$ is strictly positive under Condition 1.

Now, we can show that for $r = r^w$, the condition $\overline{w}(r^w) < w < w^*(r^w)$ is satisfied, so the credit constraint is still binding in the emerging economy. Since $\overline{w}$ is decreasing in $r$ and $r^w > \bar{r}^a \ge 1$, then

$\overline{w}(r^w) < \overline{w}(1)$. Similarly, since $w^*$ is decreasing in $r$ and $r^w < r^{a*}$, then $w^*(r^w) > w^*(r^{a*})$. Therefore, IFM implies that $\overline{w}(r^w) < w < w^*(r^w)$.

As a conclusion, there is a unique solution with a binding financing constraint in the emerging markets and it is characterized by an interest rate $r^w$ in the $(\overline{r}^a, r^{a*})$ interval.

Consider this equilibrium solution. Since the industrial economy experiences a drop in the interest rate when financial markets integrate, $k^*$ and $z^*$ rise and $b^*$ decreases. Since the emerging economy experiences a drop in the interest rate when financial markets integrate, $\overline{k}$ falls while $\overline{z}$. Additionally, since Condition 1 is satisfied, $\overline{b}$ rises.

## References


Abiad, A., Oomes, N., Ueda, K., 2008. The quality effect: does financial liberalization improve the allocation of capital? Journal of Development Economics 87 (2), 270–282.

Aghion, Philippe, Angeletos, George-Marios, Banerjee, Abhijit, Manova, Kalina, 2010. Volatility and growth: credit constraints and the composition of investment. Journal of Monetary Economics 57, 246–265.

Aghion, Philippe, Askenazy, Philippe, Berman, Nicolas, Cette, Gilbert, Eymard, Laurent. Credit Constraints and the Cyclicality of R&d Investment: Evidence from France. Weatherhead Center for International Affairs, Harvard University. Working Paper 2007–2014, Journal of the European Economic Association, forthcoming.

Alfaro, L., Charlton, A., Kanczuk, F., 2009. Plant-size distribution and cross-country income differences. In: NBER International Seminar on Macroeconomics 2008. National Bureau of Economic Research, Inc, pp. 243–272. NBER Chapters.

Antràs, Pol, Caballero, Ricardo J., 2009. Trade and capital flows: a financial frictions perspective. The Journal of Political Economy 117 (4), 701–744.

Bacchetta, P., Benhima, K., 2010. The Demand for Liquid Assets, Corporate Saving, and Global Imbalances. Cahiers de Recherches Economiques du Département d'Econométrie et d'Economie politique (DEEP) No 10.12. Université de Lausanne, Faculté des HEC, DEEP.

Banerjee, A.V., Duflo, E., 2005. Growth theory through the lens of development economics. In: Aghion, P., Durlauf, S. (Eds.), Handbook of Economic Growth.

Benhima, K., 2010. Financial development, technological change in emerging countries and global imbalances. Cahier De Recherches Économiques Du DEEP No. 10.10.

Bernanke, B., 2005. 'The Global Saving Glut and the US Current Account', Remarks at the Sandridge Lecture. Virginia Association of Economics, Richmond, VA. March 10.

Bonfiglioli, A., 2008. Financial integration, productivity and capital accumulation. Journal of International Economics 76 (2), 337–355.

Broner, F.A., G. Lorenzoni and S.L. Schmukler (forthcoming), 'Why do emerging economies borrow short term?' Journal of the European Economic Association.

Brutti, F., 2010. Legal Enforcement, Public Supply of Liquidity and Sovereign risk, Iew. Institute for Empirical Research in Economics - University of Zurich. Working papers.

Buera, F.J., Kaboski, J.P., Shin, Y., 2011. Finance and development: a tale of two sectors. American Economic Review, American Economic Association 101 (5), 1964–2002.

Caballero, R.J., Krishnamurthy, A., 2001. International and domestic collateral constraints in a model of emerging market crises. Journal of Monetary Economics 48 (3), 513–548.

Caballero, R.J., Farhi, E., Gourinchas, P.-O., 2008. An equilibrium model of "global imbalances" and low interest rates. American Economic Review 98 (1), 358–393.

Caselli, F., 2004. Accounting for Cross-country Income Differences. NBER. Working Paper No 10828.

Chen, N.-K., Leung, C., 2008. Asset price spillover, collateral and crises: with an application to property market policy. The Journal of Real Estate Finance and Economics 37 (4), 351–385.

Cheung, Yin-Wong, Chinn, Menzie D., Fujii, Eiji, 2006. The chinese economies in global context: the integration process and its determinants. Journal of the Japanese and International Economies 20 (1), 128–153.

Chinn, M., Ito, H., 2007. A New Measure of Financial Openness. mimeo.

Dooley, M.P., Folkerts-Landau, D., Garber, P., 2004. The revived bretton woods system. International Journal of Finance and Economics 9 (4), 307–313.

Dooley, M.P., Folkerts-Landau, D., Garber, P., 2005. Direct investment, rising real wages and the absorption of excess labor in the periphery. In: Proceedings, Federal Reserve Bank of San Francisco (Issue Feb).

Forbes, K.J., 2010. Why do foreigners invest in the United States? Journal of International Economics, Elsevier 80 (1), 3–21.

Gruber, J.W., Kamin, S.B., 2007. Explaining the global pattern of current account imbalances. Journal of International Money and Finance 26 (4), 500–522.

Heston, A., Summers, R., Aten, B., 2009. Penn World Table Version 6.3. Center for International Comparisons of Production, Income and Prices at the University of Pennsylvania.

Holmstrom, B., Tirole, J., 1998. Private and public supply of liquidity. Journal of Political Economy 106, 1–40.

Holmstrom, B., Tirole, J., 2002. Domestic and international supply of liquidity. American Economic Review 92 (2), 42–45.

Hsieh, C.-T., Klenow, P.J., 2009. Misallocation and Manufacturing TFP in China and India. The Quarterly Journal of Economics, MIT Press 124 (4), 1403–1448.

Jeong, Hyeok, Townsend, Robert, 2007. Sources of tfp growth: occupational choice and financial deepening. Economic Theory 32, 179–221.

Jeanne, O., Rancière, R., 2011. The optimal level of international reserves for emerging market countries: a new formula and some applications. Economic Journal 121 (555), 905–930, 09.

Ju, J., Wei, S.-J., 2006. A Solution to Two Paradoxes of International Capital Flows. NBER. Working Paper No 12668.

Ju, J., Wei, S.-J., 2010. Domestic Institutions and the Bypass Effect of Financial Globalization. American Economic Journal: Economic Policy, American Economic Association 2 (4), 173–204.
Lane, P.R., Milesi-Ferretti, G.M., 2007. The external wealth of nations mark II: revised and extended estimates of foreign assets and liabilities, 1970–2004. Journal of International Economics, Elsevier 73 (2), 223–250.
Levchenko, A. A., R. Rancière and M. Thoenig (forthcoming), 'Growth and risk at the industry level: the real effects of financial liberalization', Journal of Development Economics.
Levine, R., 2005. Finance and growth: theory and evidence. In: Aghion, P., Durlauf, S. (Eds.), 2005. Handbook of Economic Growth, vol. 1. Elsevier (chapter 12).
Lorenzoni, G., 2008. Inefficient credit booms. Review of Economic Studies 75 (3), 809–833.
Matsuyama, K., 2005. Credit market imperfections and patterns of international trade and capital flows. Journal of the European Economic Association 3 (2–3), 714–723.
Matsuyama, K., 2007. Credit traps and credit cycles. American Economic Review 97 (1), 503–516.
Mendoza, E.G., Quadrini, V., Ríos-Rull, J.-V., 2009a. Financial integration, financial development, and global imbalances. Journal of Political Economy, University of Chicago Press 117 (3), 371–416, 06.
Mendoza, E.G., Quadrini, V., Ríos-Rull, J.-V., 2009b. On the welfare implications of financial globalization without financial development. NBER Chapters. In: NBER International Seminar on Macroeconomics 2007. National Bureau of Economic Research, Inc, pp. 283–312.
Midrigan, V., Xu, D.Y., 2010. Finance and Misallocation: Evidence from Plant-level Data, NYU Working Paper.
Obstfeld, M., Shambaugh, J.C., Taylor, A.M., 2010. Financial stability, the trilemma, and international teserves. American Economic Journal: Macroeconomics, American Economic Association 2 (2), 57–94.
Restuccia, D., Rogerson, R., 2008. Policy distortions and aggregate productivity with heterogeneous plants. Review of Economic Dynamics, Elsevier for the Society for Economic Dynamics 11 (4), 707–720.
Rodrik, D., 2006. Industrial Development: Stylized Facts and Policies. Mimeo, Kennedy School of Government.
Rodrik, D., 2007. The Real Exchange Rate and Economic Growth: Theory and Evidence. Mimeo, Kennedy School of Government.
Sandri, D., 2010. Growth and Capital Flows with Risky Entrepreneurship. IMF Working Paper WP/10/37.
Song, Z.M., Storesletten, K., Zilibotti, F., 2011. Growing like China. American Economic review 101 (1), 196–233.
Wang, F., Zuo, X., 1999. Inside china's cities: Institutional barriers and opportunities for urban migrants. The American Economic Review 89 (2), 276–280.