WP/07/47

IMF Working Paper

Financial Globalization and the Governance of Domestic Financial Intermediaries

Thierry Tressel and Thierry Verdier

INTERNATIONAL MONETARY FUND

 WP/07/47

IMF Working Paper

Research Department

Financial Globalization and the Governance of Domestic Financial Intermediaries

Prepared by Thierry Tressel and Thierry Verdier[1]

Authorized for distribution by Arvind Subramanian

March 2007

Abstract

We model an economy in which domestic banks and firms face incentive constraints, as in Holmstrom and Tirole (1997). Firms borrow from banks and uninformed investors, and can collude with banks to reduce the intensity of monitoring. We study the general equilibrium effects of capital flows (portfolio investments and loans, FDI) on the governance of domestic banks. We find that liberalization of capital flows may deteriorate the governance of the domestic financial system by increasing firms' incentives to collude with banks, with negative effects on productivity. We also show that systemic bailout guarantees increase the risks of collusion.

JEL Classification Numbers: F3, F43, G21, G32, O16, O43

Keywords: financial globalization, domestic banks, collusion, bailout guarantees

Author's E-Mail Address: ttressel@imf.org; tv@pse.ens.fr

[1] Thierry Tressel: Research Department, International Monetary Fund, Email: ttressel@imf.org; Thierry Verdier: Paris-Jourdan Sciences Economiques (PSE), Email: tv@pse.ens.fr. The authors would like to thank Simon Johnson, Raghu Rajan, Arvind Subramanian and participants at seminars at the Research Department of the IMF, at PUC (Rio de Janeiro), and at the 2006 meeting of the European Economic Association for very helpful comments.

Page Contents

I. INTRODUCTION

A large literature argues that the development of financial systems and of property rights stimulates growth (Levine, 1997, 2005). In a recent paper, Bekaert et al., (2005) show for instance that financial liberalization, identified as the opening up of the domestic stock market to foreigners, can have large positive effects on growth. Over the past two decades, however, a number of emerging markets experienced periods of financial instability associated with volatile capital flows. The stylized facts are now well known. A credit boom associated with a surge in capital flows precedes a sudden reversal which precipitates a credit crunch followed by a fall in real credit to the private sector (Tornell and Westerman, 2002; Schneider and Tornell, 2004). The evidence showed that lending booms leading to twin crisis were often preceded by capital account liberalization (Kaminsky and Reinhart, 1999; Demirguc-Kunt and Detragiache, 2005).

A prevalent view among policy-makers and academics is that pre-existing weaknesses in domestic financial systems increase the risks of financial crisis following capital account liberalization (Calvo, 1998; Fischer, 1998).[2] For instance, Prasad et al., (2003) argue that the conditions under which capital account liberalization takes place is an important determinant of its consequences, noting that "soft" factors such as governance and the rule of law are likely to have first order effects on cross-country differences in per capita incomes.

This view implicitly or explicitly assumes that the governance structure ("weak" or "strong") of domestic financial intermediaries is exogenously given.[3] Anecdotal evidence however suggests that the impact of capital account liberalization on the governance relationships between domestic banks and firms is not always positive. For instance, the IMF Independent Evaluation Office (2003) notes that, in Indonesia, before the 1997 crisis, "the easy flow of financial resources to conglomerates through the banking system was facilitated by an international environment that encouraged flows of foreign capital into emerging markets." In a country in which "cronyism and corruption (...) created moral hazard in the banking sector," the IEO remarks the changing nature of corruption after the financial liberalization of the late 1980s: "originally, corruption in Indonesia was akin to a tax on cost of a project

---

[2] The IMF (1999) notes that, during the precrisis period in East Asia, "weaknesses in bank and corporate governance and lack of market discipline allowed excessive risk taking, as prudential regulations were weak or poorly enforced. Close relationships between governments, financial institutions, and borrowers worsened the problems, particularly in Indonesia and Korea."

[3] In their more recent survey, Kose and others (2006) point at the endogenous response of institutional structures to financial globalization. They conclude that the growth and stability benefits of financial globalization are realized mainly through a broad set of “collateral benefits”—for example, financial market development, better institutions and governance, and macroeconomic discipline.

(...) its impact on efficiency was said to be limited by the certainty and the relatively low levels of the charge. In the early 1990s, however, the media began to see a change in the system of corruption (...) corruption was being transformed into an ever-widening system of deliberate rent-creation for the well connected."[4] In Korea, the liberalization of short-term capital flows in the early 1990s partly resulted from lobbying efforts of the large conglomerates (the chaebols) to take advantage of relatively low short-term interest rates in global markets (IEO, 2003; and Cho, 2002). According to Cho (2002), "they [the chaebols] had acquired substantial control over the financial system through the ownership of most of the significant nonbanking institutions [the merchant banks]," which were inadequately supervised, and as a result, the liberalization of the capital account weakened corporate governance mechanisms by giving them easy access to cheap credit through those financial intermediaries.

In this paper, we analyze theoretically the impact of international capital flows on the governance structure of domestic financial intermediaries and firms. We endogenize the bank-firm relationships and show that various categories of capital flows can have adverse effects on banks and firms' governance in countries with institutional weaknesses. In contrast to the existing theoretical literature (reviewed in Section II), we argue that the propensity of a country to financial instability after liberalization of capital flows does not merely reflect agency costs within firms, or the capacity of banks to monitor firms, but also the ability of financial intermediaries and firms to adopt collusive behaviors. Put differently, our theory emphasizes the governance of bank-firm relationships over asymmetric information problems between borrowers (firms) and lenders (intermediaries or markets).

Our emphasis on governance problems is consistent with Friedman, Johnson and Mitton (2002) who find that, in Asian countries open to capital flows before the 1997 crisis, corporate debt was higher in firms with weaker governance, even after controlling for standard financial considerations.[5] Moreover, Johnson et al., (2006) find that, in Malaysia, financial accounts before the crisis indicate that connected firms outperformed unconnected firms.[6] Similarly, Fisman (2001) found that political connections were a primary determinant of firm value in Indonesia before the crisis, which is consistent with the view that investment decisions were distorted by connected lending practices. After the Asian crisis, measures of corporate governance explained the severity of exchange rate depreciation and stock market decline better than standard macroeconomic measures (Johnson et al., 2000). In a recent paper, Khwaja and Mian (2005) investigate the rents to the politically connected firms in Pakistanis' banks, and estimate the cost of these rents to be economically large.

---

[4] Prudential limits were not enforced during that period. "This was demonstrated most clearly in the removal of the head of prudential supervision at the Bank of Indonesia in 1993, when he attempted to enforce connected lending limits on the largest of the private banks, which had close political connections. With this precedent, banks flouted prudential rules with impunity." (Annex I of the IEO report).

[5] They also found that this effect was stronger where country-level institutions were weaker.

[6] Johnson and Mitton (2003) estimate the value of political connections of Malaysian firms when the imposition of capital controls in September 1998 protected those firms from a potentially costly resolution (for them) of the crisis.

Our model builds on Holmstrom and Tirole (1997). As in their model, firms can borrow from banks and from uninformed investors on the capital market. Uninformed finance is cheaper, but banks can monitor firms to reduce agency costs between firms and lenders, thus enhancing the capacity of the former to borrow from uninformed lenders. We add to this framework the possibility of collusion between firms and banks: firms can offer side-payments to banks so the latter agree to reduce the intensity of monitoring, thus permitting some inefficient investments to take place. In addition to this microeconomic ingredient, we close the model by allowing domestic agents to allocate their capital between entrepreneurship and banking.

We characterize loan contracts between banks and firms under full monitoring and under partial monitoring with collusion. In presence of idiosyncratic uncertainty in the costs of collusion, entrepreneurs can be better off choosing contracts allowing for collusion with banks in some states of nature to save on monitoring costs. By relaxing the bank incentive constraints, partial collusion contracts allow firms to improve their borrowing capacity by reducing the capital invested by the bank in the project. This permits to increase the share of external finance from uninformed lenders, and increase firms' borrowing capacity (because bank capital is more costly than uninformed capital). This, however, has costs: collusion induces the choice of less productive projects. We show that contracts allowing collusive behaviors to occur in some states of nature are more likely to be chosen when bank capital becomes scarcer relative to uninformed capital. In our model, bank capital and uninformed capital become substitutes when collusion increases, in contrast to Holmstrom and Tirole (1997) where they are always complements.

Our model is also related to Rajan (1994) who develops a theory of bank behavior over the business cycle. In his model, banks have an incentive to set excessively liberal credit policies in good times when bank earnings are very informative about bank ability. Conversely, in bad times, bad earning performance is more likely to be attributed to the state of nature than to the ability of the bank: this increases incentives to disclose bad earnings.

Our model provides a basis to study the general equilibrium effects of capital account liberalization on the governance of domestic banks. We first analyze the effects of portfolio capital inflows. Opening up to portfolio capital flows (or allowing banks to borrow abroad) makes domestic banks' capital relatively scarcer, and therefore increases the costs of collusion-proof contracts. We show that, in the general equilibrium, capital account liberalization may deteriorate the governance of the domestic financial system by increasing firms' incentives to collude with banks in the states of nature in which the costs of collusion are low.

The deterioration of banks' governance is associated with an acceleration in investment and a deterioration in firms' productivity, so the overall effect on output is ambiguous. The effect on output is more likely to be positive if only a small fraction of firms choose collusive behaviors ex post. Our model also makes predictions on the impact of capital account liberalization on the size of the domestic banking system. Surprisingly, the liberalization of portfolio investments or bank borrowing may induce a contraction in domestic bank capital.

Our argument is related to the observation of Rajan and Zingales (2003) that capital account liberalization may not, just by itself, improve the access to domestic financial markets by nonincumbent firms. In absence of strong competitive pressures, caused for instance by the liberalization of trade, industrial incumbents will in fact *oppose* improvements in the transparency of the domestic financial system to limit domestic competition. We take however one more step by arguing that the effect may even be negative if the domestic financial system is initially institutionally opaque.

We also analyze the impact of foreign direct investment in the corporate and in the banking sector. We show that, sometimes, foreign direct investment in the corporate sector can worsen the collusion problem between domestic banks and domestic firms by crowding-out domestic firms' demand for credit. On the contrary, foreign investment in the banking sector can improve domestic banks' governance by increasing competition. If, however, some firms are harder to monitor for foreign-owned banks than for domestic banks, the credit market can become endogenously segmented, and the entry of foreign banks can worsen domestic banks' governance with potentially negative effects on firms' output.

Finally, we show that bailout guarantees are likely to exacerbate the governance problem between banks and firms. In contrast to the existing literature, in our model bailout guarantees can induce a fall in aggregate output even in absence of aggregate real shocks. Coordination on the "bad equilibrium" occurs through the choice of financial contracts with collusion.

The paper is organized as follows. Section II discusses the related theoretical and empirical literature. Section III lays down the structure of the model. Section IV describes financial contracts between firms and lenders. Section V describes the general equilibrium while Section VI discusses the effects of liberalization of international portfolio investment and bank borrowing. Section VII studies the effect of foreign direct investment in the corporate sector and the banking sector. Section VIII analyzes the effects of systemic bailout guarantees. Section IX concludes.

II. Literature Review

A recent theoretical literature has studied the instability of economies with an open capital account when firms face borrowing constraints caused by asymmetries of information (moral hazard or adverse selection) between firms and the providers of external finance. In presence of credit constraints, economies opened to portfolio capital inflows can experience endogenous boom-bust cycles and financial crisis (Schneider and Tornell, 2003; Aghion, Baccheta and Banerjee, 2003).[7] In Schneider and Tornell (2003) a good news on the future

[7] See also Mendoza (2006), and Rey and Martin (2005).

productivity of the nontradable sector initiates a boom in that sector in presence of bailout guarantees, which may end up in a financial crisis. Aghion, Baccheta and Banerjee (2003) show that instability can endogenously arise at intermediate levels of development in small open economies with Leontieff technologies and a country-specific factor. In Caballero and Krishnamurthy (2001), the inability to aggregate collateral valued by international lenders interacts with credit market imperfections to generate fire sales and crisis. In contrast to these papers, we explicit model the bank-firm relationship and analyze how it evolves as capital flows are liberalized. Others have shown that capital inflows may increase the propensity for bank runs in a model a la Diamond-Dybvig (Chang and Velasco, 2001; Allen and Gale, 2000). Alessandria and Qian (2005) study the impact of capital account liberalization on intermediation but do not analyze incentive problems arising within domestic banks.

Several papers have analyzed the impact of foreign bank entry on domestic financial systems. While foreign bank entry may bring benefits by importing better technologies and supervision, foreign banks may also weaken the franchise value of domestic banks and lead to more risky behavior (Hellmann et al., 2000). Detragiache et al., (2006) show that foreign bank presence adversely affects financial development in a way that is consistent with "cream-skimming" of better firms by foreign banks.[8] Mian (2006) finds that, in Pakistan, foreign banks avoid lending to "informationally difficult" yet fundamentally sound firms requiring "relational contracting," which leads to a segmentation of the credit market (See also Gormley (2006b) for evidence from India). Mian (2006) also finds that foreign banks are less likely to bilaterally renegotiate, and are less successful at recovering defaults. Dell'Ariccia and Marquez (2004) model the impact of greater competition by foreign banks on banks credit allocation in presence of adverse selection. They show that domestic banks reallocate credit towards more captive sectors with greater information asymmetries.

There is also a debate on the potential spillover effects of FDI in the corporate sector, as the presence of foreign firms may help spread better technologies and management techniques. A surprising result is the one of Aitken and Harrison (1999) who found that, in the case of Venezuelan firms, foreign investment negatively affected the productivity of domestically owned firms. Our model suggests a mechanism through which entry of foreign firms could have such effects on the productivity of domestically owned firms, by crowding-out their demand for bank credit and increasing incentives to collude. Harrison and McMillan (2003) provide empirical evidence that domestic borrowing by foreign firms exacerbates domestic firm credit constraints in Cote d'Ivoire.

Our predictions on the impact of bailout guarantees bear some resemblance to the results of Schneider and Tornell (2003), and of Ranciere, Tornell and Westermann (2005) who show that occasional crisis can be associated with faster long-run growth by enhancing the borrowing capacity of entrepreneurs when there are bailout guarantees. In contrast to these models, the effect of bailout guarantees arise even in absence of real macroeconomic shocks,

[8] Gormley (2006a) develops a model of "cream-skimming" by foreign banks and derives the welfare and output effects of the induced segmentation of the credit market.

and the coordination on a potentially less stable equilibrium occurs through financial contracts. In addition, in our model, enforceability problems do not necessarily have to interact with systemic guarantees to observe both borrowing constraints and excessive risk-taking.

Our paper draws from the literature on collusion in hierarchies (See Tirole (1986) and Tirole (1992) and Laffont and Rochet (1997) for surveys). While it is well known that there is no loss of generality in designing only collusion-proof contracts under certain conditions, collusion can however occur in equilibrium when there is some uncertainty in the technology used for side transfers (see Tirole ,1992 for a discussion). In the context of financial contracts, Dessi (2005) derives optimal collusion proof contracts between venture capitalists and entrepreneurs, and analyze the optimal allocation of control rights when projects need to be refinanced.

Our analysis is finally somewhat related to the ongoing debate on the costs and benefits of allowing some connected lending to occur in the development process. Inspired by the experience of Japan and Germany, a long standing view has been that bank-firm ties are valuable in environments with large informational imperfections and weak enforcement mechanisms. Rajan (1992) shows for instance that bank-firm ties can help reduce ex ante financing constraints. Maurer and Haber (2005) argue that related lending often exists as a response by bankers to high information and contract enforcement costs, and find no evidence that firms receiving related lending loans had worse performance that other firms in Mexico over 1888-1913.[9]

III. STRUCTURE OF THE MODEL

We consider an economy a la Holmstrom and Tirole (1997) with two types of agents: many uninformed investors and many active investors. There is no aggregate uncertainty in the model. A single good can be used for consumption and investment. The economy lasts three periods: in the first period, active investors decide to become bankers or entrepreneurs; in the second period, financial contracts are signed and investment decisions are made; in the third period, output is realized, financiers are repaid and agents consume.

Each active investor is born with an endowment A=1, and chooses to become a banker (financial intermediary) or an entrepreneur. An active investor must acquire skills to become an entrepreneur and access a productive technology, at a cost a. Active investors differ in their ability to become entrepreneurs, which is measured by the cost a drawn from the uniform distribution over [0,1].

---

[9] On the other hand, related lending may lead to inefficient resource allocation when such loans are used for looting (La Porta, Lopez-de-Silanes, and Zamarrripa, 2003).

Investment in period one is financed through internal funds (the entrepreneur's endowment *A*, net of the cost *a*), and a combination of bank loans and direct borrowing on the capital markets from uninformed investors.[10]

A. Production Technology

The technology is subject to moral hazard, and is linear in all parameters. Entrepreneurs can reduce the probability of success of the project and enjoy greater private benefits. The project generates a verifiable financial return equal to *R* per unit of capital invested (if it succeeds) or to *0* (if it fails), but private benefits of control are not verifiable.

There are three versions of the project. The high return project succeeds with probability p_H, but does not yield any private benefits of control. The entrepreneur has also access to two other versions of the project with a low probability of success p_H, yielding private benefits (per unit of capital invested) of *B* and *b* respectively, with $B > b > 0$. Define $\Delta p = p_H - p_L > 0$ and $\Delta B = B - b$.

Only the good project is economically viable:

Assumption A: $p_H RI > \gamma I > p_L RI + BI$

where *I* is the size of the project, and γ the cost of capital.

B. Financial Intermediaries

The banking sector consists of competitive intermediaries who monitor firms to alleviate the moral hazard problem. A financial intermediary can monitor an entrepreneur by paying a nonverifiable cost *c* per unit of capital invested in the project. This prevents the entrepreneur from undertaking the project with a high level of shirking *B*, thereby reducing the opportunity cost of choosing the productive project from *B* to *b*.

We assume that each bank finances projects that are perfectly correlated (typically each bank finances only one project). While this assumption is unrealistic, it however captures, in a highly stylized fashion, some often observed characteristics of banks in developing countries, such as large exposures to small numbers of borrowers, and the prevalence of connected lending.

Assuming a limited diversification of risk in banks' portfolios allows to analyze the role of bank capital in incentive problems arising on the lending side of banks. Indeed, it is well known that there is no need for bank capital when banks diversify individual risks perfectly: standard deposit contracts suffice to provide incentives for banks to monitor borrowers (Diamond, (1984).

[10] An alternative interpretation is that uninformed investors deposit their money with a bank, which lends the deposits and its own capital to entrepreneurs (Holmstrom and Tirole, 1997).

C. Uninformed Investors

Firms can also levy funds on capital markets at a cost γ. Investors on the capital markets are small and do not monitor firms to which they lend. As mentioned earlier, uninformed investors can also be interpreted as uninformed depositors. The aggregate domestic supply of capital by uninformed investors is equal to F.

D. Collusion

After signature of the financial contract, entrepreneurs and banks may have an incentive to collude so that the intermediary does not *always* monitor. Collusion requires a costly nonverifiable transfer from the entrepreneur to the bank: the benefit to the bank of a side payment of 1 is only k, with $0 < k < 1$; thus $1 - k$ can be seen as the cost of hiding the side payment.[11]

We assume that the cost of collusion is uncertain. Uncertainty on the cost of collusion is revealed after the financial contract is signed, but *before* the entrepreneur chooses which version of the project to undertake. We assume that this uncertainty in the cost of collusion is *idiosyncratic*.

Agents know that the parameter k can take two values k_L (in state L) and k_H (in state H), with $0 < k_L < k_H < 1$ occurring with probabilities q and $1 - q$ respectively. Define $\Delta k = k_H - k_L$. Thus, the expected cost of collusion is $E(1 - k) = q(1 - k_L) + (1 - q)(1 - k_H) = 1 - k_H + q\Delta k$. Dispersion in the cost of collusion across entrepreneurs is measured by Δk.

We assume that the bank has all the bargaining power. If the firm decides to bribe the bank, the benefits of collusion are transferred to the bank in the form of a nonverifiable side payment S, leaving the entrepreneur indifferent between colluding and not colluding.[12]

The cost of collusion k may reflect the quality of outside investor protection, or of the court system. It could also be related to the quality of supervision, for instance on connected lending, or transparency of accounts. Uncertainty on the costs of collusion may reflect uncertainty about the overall institutional, policy, or political environment.[13]

---

[11] Transaction costs of collusion are standard in the literature (see for instance Tirole, 1992).

[12] We assume that firms cannot default on promised side payments to banks contingent on the state of nature realized.

[13] For example, there could be uncertainties in the political connections of firms or of banks.

IV. FIRMS' FINANCIAL CONTRACTS

In this section, we derive the financial contracts in the noncollusion and partial collusion cases, for an entrepreneur with internal funds A who undertakes a project of size I. Contracts specify the maximum borrowing capacity of the entrepreneur (I - A), the amount borrowed from bankers (I_m) and from uninformed lenders (I_u), as well as the payments to each party if the project succeeds.

A. Incentive and Participation Constraints

If the project of size I succeeds, the return R - I is shared between the bank (R_m), the uninformed investors (R_u) and the firm (R_f), with: $R.\, I = R_f + R_m + R_u$.

The entrepreneur receives a payment inducing the choice of the most productive project:

$$R_f \geq \frac{bI}{\Delta p}$$

The expected payment on bank loans, net of monitoring costs, must be at least equal to β, the return to bank capital:

$$p_H R_m - cI \geq \beta I_m$$

where I_m is the amount of funds invested by the bank in the project. If there is no collusion, payments must be as well large enough to guarantee that the bank monitors in each state H and L, given a potential bribe S, where $k \in \{k_H, k_L\}$:

$$p_H R_m - cI \geq p_L R_m + kSI$$

Under the assumption that the bank has all bargaining power, the maximum side payment S that the firm is willing to transfer to the bank is given by:

$$p_H R_f = p_L R_f + BI - SI$$

Combining with the previous inequality, and given that $k_H > k_L$, the incentive constraint for the bank becomes:

$$R_m \geq \frac{cI + k_H\left(BI - \Delta p R_f\right)}{\Delta p}$$

Let us assume now that the contract allows for collusion to occur in the state H after the signature of the financial contract. So, the contract is collusion-proof only in the state of nature L in which the cost of collusion 1 - k_L is high, and the incentive constraint is:

$$R_m \geq \frac{cI + k_L\left(BI - \Delta p R_f\right)}{\Delta p}$$

For these two contracts to be feasible, uninformed investors must break even on average:

$$p_j R_u \geq \gamma I_u$$

with $p_j = p_H$ if the contract is collusion-proof, and $p_j = \tilde{p} = q.p_H + (1-q)\cdot p_L$ if the contract allows partial collusion.

The bank must also break even if collusion occurs (when the contract does not prevent collusion in state *H*):

$$q\cdot\left(p_H R_m - cI\right) + (1-q)\cdot\left(p_L R_M + k_H SI\right) \geq \beta I_m$$

which simplifies into:

$$\tilde{p}R_m - qcI + (1-q)k_H \Delta BI \geq \beta I_m$$

So, the bank saves on monitoring costs, and enjoys a bribe at the cost of a lower expected probability of success of the project.

In this type of model, incentive constraints are always binding (Holmstrom and Tirole, 1997). First, given that bank capital is more costly than uninformed investors' capital, the entrepreneur will minimize the share of bank capital in external finance given project size *I*, and the amount repaid to the bank. Therefore the incentive constraint of the bank will be binding. Next, to achieve maximum leverage, the entrepreneur will retain the minimum share of profits necessary to provide incentives to choose the productive project (the "nonpledgeable income"), so the incentive constraint of the entrepreneur will also be binding.

Finally, note that since bad projects are socially inefficient, contracts with collusion occurring in *all* states of nature can be ruled out a *priori*. Indeed, if a contract always permitted collusion, given assumption *A*, the gross expected return on the project including private benefits would be less than γ, and therefore participation' constraints would be violated.

B. The Borrower's Maximization Program

Given the rates of return *γ* and *β*, an entrepreneur with initial internal funds *1-a* will choose a financial contract that solves the following program (*j* = *NC* stands for a collusion-proof contract, and *j* = *C* for a contract allowing collusion to occur in state *H*):

Maximize: $U_{E,j} = p_j RI_j - p_j R_{m,j} - p_j R_{u,j}$

where p_j is the probability of success of the project ($j \in \{C, NC\}$), subject to:

(i) $(1 - a) + I_{m,j} + I_{u,j} = I_j$;

(ii) participation constraint of the bank;

$$p_H R_{m,NC} - cI_{NC} \geq \beta I_{m,NC}$$ for collusion proof contracts

$$\tilde{p} R_{m,C} - qcI_C + (1-q) k_H \Delta B I_c \geq \beta I_{m,C}$$ for partial collusion contracts

(iii) incentive constraints of the bank;

$$R_{m,NC} \geq \frac{cI_{NC} + k_H \left(BI_{NC} - \Delta p R_{f,NC}\right)}{\Delta p}$$ for collusion proof contracts

$$R_{m,C} \geq \frac{cI_C + k_L \left(BI_C - \Delta p R_{f,C}\right)}{\Delta p}$$ for partial collusion contracts

(iv) participation constraint of the uninformed investors;

$$p_H \cdot R_{u,NC} \geq \gamma I_{u,NC}$$ for collusion proof contracts

$$\tilde{p} \cdot R_{u,C} \geq \gamma I_{u,C}$$ for partial collusion contracts

(v) incentive constraint of the entrepreneur.

$$R_{f,j} \geq \frac{bI}{\Delta p} \text{ for } j \in \{C, NC\}$$

Contracts are derived under the following assumptions:

Assumption B: $$R - \frac{c + b + k_H \Delta B}{\Delta p} \geq 0$$

Assumption B says that uninformed investors must earn a positive return in case of success of a project;

Assumption C: $$p_L \Delta k \frac{\Delta B}{\Delta p} < \Delta p \cdot \left(R - \frac{c + b + k_H \Delta B}{\Delta p} \right)$$

Assumption C says that allowing for collusion can be possible only if the probability of collusion is not too high.

C. Project Size

In this section, we derive the optimal project size in collusion-proof contracts, and in contracts allowing for partial collusion. For expositional convenience, we suppress the subscript $j \in \{C, NC\}$ whenever there is no ambiguity.

Project Size in Collusion-proof Contracts

By combining the participation and incentive constraints of a bank, one obtains the size of bank loans:

$$I_m = \frac{1}{\beta} \frac{\{p_L c + p_H k_H \Delta B\}}{\Delta p} . I$$

Hence, bank loans finance a larger share of projects (i) the higher the monitoring cost c, (ii) the lower the cost of collusion 1- k_H, (iii) the lower the cost of bank capital β.

Next, from the participation constraint of the uninformed investors:

$$I_u = \frac{p_H}{\gamma} R_u = \frac{p_H}{\gamma} . (RI - R_m - R_f)$$

and combining with incentive constraints, one shows that the project size is proportional to the entrepreneur internal funds $1 - a$:

$$I_m = \frac{1}{V_{NC}(\gamma, \beta)} \cdot (1 - a)$$

where the multiplier $\frac{1}{V_{NC}(\gamma,\beta)}$ is given by:

$$V_{NC}(\gamma, \beta) = 1 - \frac{\Phi_{NC}}{\gamma} - \frac{\Lambda_{NC}}{\beta}$$

with:

$$\begin{cases} \Phi_{NC} = p_H \left(R - \dfrac{c + b + k_H \Delta B}{\Delta p} \right) \\ \Lambda_{NC} = \dfrac{1}{\Delta p} (p_L c + p_H k_H \Delta B) \end{cases}$$

where the parameters Λ_{NC} and Φ_{NC} are respectively the minimum financial return per dollar invested for the bank to always monitor the firm and the financial return per dollar invested paid to uninformed investors in the collusion proof contract *NC*.

$$\Lambda_{NC} = p_H(R_m)_{\text{when } I=1} - c = p_H \frac{c + k_H\left[B - \Delta p(R_f)_{\text{when } I=1}\right]}{\Delta p} - c$$
$$= \frac{1}{\Delta p}(p_L c + p_H k_H \Delta B)$$

and

$$\Phi_{NC} = p_H\,(R_m)_{\text{when } I=1} = p_H\left[R - (R_m)_{\text{when } I=1} - (R_f)_{\text{when } I=1}\right]$$
$$= p_H\left(R - \frac{c + k_H \Delta B}{\Delta_p} - \frac{b}{\Delta_p}\right)$$

The credit multiplier has the following properties summarized in the following Lemmas.

Lemma 1 The credit multiplier $\frac{1}{V_{NC}(\gamma,\beta)}$ decreases with the costs of uninformed capital γ and of informed capital β, increases with the project return *R* , and decreases with (i) the monitoring cost c, (ii) the intensity of moral hazard b, and (iii) the cost of preventing collusion in all states of nature, measured by $\frac{p_H k_H \Delta B}{\Delta p}$.

Lemma 2 The marginal cost of preventing collusion increases as bank capital becomes scarcer relative to uninformed capital. Formally, the cross derivative of the multiplier function $\frac{1}{V_{NC}(\gamma,\beta)}$ with respect to (a) $\frac{p_H k_H \Delta B}{\Delta p}$ the cost of preventing collusion , and (b) $\frac{\beta}{\gamma}$ the relative cost of informed capital relative to uninformed capital , is negative.

This implies that, as the scarcity of bank capital relative to uninformed capital increases, for instance after an exogenous increase in the supply of uninformed capital, collusion-proof contracts become more costly when the cost of collusion falls. The intuition for this result is that, as the cost of uninformed capital falls *relative* to the cost of bank capital, it becomes more costly to provide incentives to banks because a larger share of investment $\frac{I_m}{I}$ must be provided by banks, which implies that the share of the return paid to the bank $\frac{R_m}{R}$ must increase even further.

Project Size in Contracts with Partial Collusion

Following the same line of reasoning, we can characterize the optimal partial collusion contract, allowing collusion to occur in state H. In this case, the project size is given by:

$$I = \frac{1}{V_C\,(\gamma,\beta)}\,.\,(1-a)$$

where:

$$V_C = 1 - \frac{\Phi_C}{\gamma} - \frac{\Lambda_C}{\beta}$$

and:

$$\begin{cases} \Phi_C = \tilde{p}\left(R - \dfrac{c+b+k_L \Delta B}{\Delta p} \right) \\ \Lambda_C = \dfrac{1}{\Delta p}\left(p_L c + p_H k_H \Delta B - \tilde{p}\Delta k \Delta B \right) = \Lambda_{NC} - \dfrac{\tilde{p}\Delta k \Delta B}{\Delta p} \end{cases}$$

Similarly, Λ_C and Φ_C are respectively then financial return per dollar invested for the bank to monitor the firm only in the state $k = k_L$ and the financial return per dollar invested paid to uninformed investors in the partial collusion contract *C*.

D. When Does Partial Collusion Occur?

We consider now the choice between an optimal collusion proof contract and an optimal partial collusion contract. The previous discussion suggests that partial collusion will be preferred when uninformed capital becomes relatively more abundant than bank capital. This section confirms this intuition in partial equilibrium.

Given the costs of uninformed capital γ and of bank capital β, the utilities of an entrepreneur of type *a* under a contract with partial collusion and under a collusion proof contract are respectively:

$$\begin{cases} U_{E,a}^{NC} = \left(\dfrac{\Omega}{V_{NC}(\gamma, B)} . (1-a) \right) \\ U_{E,a}^{C} = \left(\dfrac{\Omega}{V_{C}(\gamma, B)} . (1-a) \right) \end{cases}$$

where: $\Omega = \dfrac{p_{H.b}}{\Delta_p}$

As mentioned in Section III.A, an entrepreneur will unambiguously prefer a contract that maximizes the size *I* of the project. This implies that the collusion-proof contract will be preferred if and only if:

$$\frac{1}{V_{NC}(\gamma, \beta)} \geq \frac{1}{V_C(\gamma, \beta)}$$

If this condition is not met, entrepreneurs can increase their utility by promising a side-payment to the bank in the state of nature in which collusion is less costly. This allows to save on the share of verifiable profits that must be promised to the bank to guarantee that it will always monitor ex post. By reducing the share of profits going to the bank in case of success, the entrepreneur can promise a larger payment to outside financiers. This, in turn, enhances the borrowing capacity of the firm if the reduction in the probability of success induced by this partial collusion contract is not too large. Finally, the cost of bank loans is reduced by lowering the intensity of monitoring, while banks are compensated for the lower probability of success of the project by enjoying private benefits of control. More precisely:

Lemma 3 Allowing for partial collusion in equilibrium has the following effect on the borrowing capacity of the entrepreneur: (a) it lowers the financial return promised to banks in case of success, thus allowing to increase the financial return paid to uninformed investors; (b) it reduces monitoring intensity by relaxing the incentive constraint of banks; but (c) it reduces the expected "pledgeable income" (the financial income that can be pledged to outsiders), as the probability of success of the project falls. The net effect is positive or negative, depending on which effect dominates.

Proof. See the Appendix.

The following result characterizes the conditions for the choice of an optimal partial collusion contract

Lemma 4 There exists $\overline{q}$ such that for $q > \overline{q}, \Phi_C > \Phi_{NC}$ and the entrepreneur chooses a contract that allows for partial collusion *if and only if* $\beta \geq \gamma$. Ψ (q, Δ k), where $\Psi = \frac{\Lambda_{NC} - \Lambda_C}{\Phi_C - \Phi_{NC}}$ is a decreasing function of q. On the other hand, if $q \leq \overline{q}$, the collusion-proof contract is always preferred to the contract with partial collusion. Moreover, Ψ is a decreasing function of Δk.

Proof. See the Appendix.

It is easy to see that the condition $\Phi_C > \Phi_{NC}$ is equivalent to
$\left(q + \frac{p_L}{\Delta p}\right) \cdot \Delta k \Delta B > (1-q) \cdot \Delta p \cdot \left(R - \frac{b + c + k_H \Delta B}{\Delta p}\right)$ which is equivalent to $q > \overline{q}$.

The intuition is the following. The left hand side of this relationship is the expected financial gain to uniformed investors derived from the reduction in presence of partial collusion. Hence uninformed investors get a higher return with partial collusion when the left hand side is larger than the right hand side. Only in this case can contracts with partial collusion be potentially optimal to the entrepreneur, as these contracts increase its borrowing capacity for uninformed capital.

Intuitively, partial collusion becomes optimal when the relative cost of bank capital $\frac{\beta}{\gamma}$ is large enough (larger than the threshold Ψ (q, Δk)). As a matter of fact, when bank capital becomes relatively more expensive than uninformed capital, reducing the share of the project financed by banks becomes more valuable. But the share of the project financed by a bank has a lower bound imposed by the incentive constraint of the bank. Thus, to reduce the share of the project financed by a bank, its incentive constraint must be relaxed. To relax it, the entrepreneur proposes a side-payment to reduce the intensity of monitoring (the entrepreneur is compensated by enjoying greater private benefits).

Note as well that partial collusion contracts can only be optimal when the probability of large transaction costs of bribing is large enough (ie. $q > \overline{q}$). Indeed for a given relative cost of bank and uninformed capital, as the likelihood of partial collusion falls (q increases), the cost of allowing for some collusion (in term of lower expected probability of success of the project) falls. By saving on monitoring costs, the incentive constraint of the bank can be relaxed, allowing to allocate a lower share of financial returns to the bank and a larger share to uninformed investors. The bank is compensated for the lower expected financial return by receiving a side-payment if the cost of collusion turns out to be low. On the contrary however, when the likelihood of ex post collusion is high (q low), the costs of allowing collusion to occur with probability 1 - q in state H becomes quite significant and outweights the benefits of reducing the share of profits allocated to banks (plus reduction in monitoring cost). In such a case, the collusion proof contract is always preferred to the contract with partial collusion, whatever the value of the relative cost of bank capital.

Finally, note that Δk can be interpreted as a measure of the *dispersion* of collusion costs in the economy, as some (a proportion q) entrepreneurs will turn out to have a large cost of collusion 1 - k_L while the others (a proportion *1 - q*) will have a low cost of collusion 1 - k_H. Therefore, the last part of lemma 4 suggests that an increase in the dispersion of the costs of collusion makes collusion more likely to occur (ie. a reduction in the threshold Ψ ($q, \Delta k$)). The reason is that more dispersion in the costs of collusion increases the benefits of relaxing the incentive constraint of the bank by reducing more the co-financing requirement for the bank (as can be easily noted in the incentive constraints of the bank (iii)).

V. General Equilibrium

A. Occupational Choices and Equilibrium on the Markets for Domestic Capital

Assuming that financial contracts of type $j \in \{NC, C\}$ have been signed, the expected utilities of entrepreneurs, bankers and uninformed investors are respectively:

$$\begin{cases} U_{E,a,j} = \left(\dfrac{\Omega}{V_j(\gamma, B)} \cdot (1-a) \right) \\ U_{B,j} = \beta \cdot A \\ U_{U,j} = \gamma \cdot f \end{cases}$$

The Equilibrium Size of the Banking Sector

Anticipating that financial contracts of type $j \in \{NC, C\}$ will be written in equilibrium, an informed investor will choose to invest in entrepreneurship skills if and only if the cost is not too high, that is if $a \geq \overline{a}_j$ where $\overline{a}_j$ is given by: $U_{E,\overline{a},j} = U_{B,j}$, or equivalently $\overline{a}_j = 1 - \dfrac{\beta . V_j(\beta,\gamma)}{\Omega}$.

Therefore, in our model, "more talented" active investors become entrepreneurs while "less talented" active investors become bankers. Hence, the aggregate supply of bank capital $K_{B,j}$ is given by $K_{B,j} = 1 - \bar{a}_j = \frac{\beta V_j(\beta,\gamma)}{\Omega}$.

Equilibrium on the market for informed capital is then given by:

$$K_{B,j} = \int_0^{\bar{a},j} I_{m,j}(\beta,\gamma)\,(1-u)\,du$$

Proposition 5 (1) The equilibrium return on bank capital is a decreasing function of the return γ on external capital markets; (2) for all $\gamma > \hat{\gamma}$, the return on bank capital is lower in the corruption regime than in the noncorruption regime: $\beta_C(\gamma) < \beta_{NC}(\gamma)$; (3) the size of the banking sector K_B depends only on two parameters: $K_{B,j} = K_B(\Lambda_j, \Omega)$; (4) the size of banking sector is lower in the corruption regime: $K_{B,C} < K_{B,NC}$.

Proof. See the Appendix.

When the cost γ of uninformed capital falls, the overall borrowing capacity and expected utility of entrepreneurs increase. This leads to increased entry of firms (the demand for bank loans shifts up) while bank capital becomes relatively scarcer (the supply of bank loans shifts down). As a result, the expected return on bank loans increases. For a given cost γ of uninformed capital, a shift from collusion-proof contracts to contracts allowing partial collusion leads to a reduction in the demand for bank loans. This makes banking less valuable in equilibrium, leading to a reduction of entry into banking.

The return on uninformed capital in the closed economy

In the rest of the paper, for clarity of exposition, we assume that γ is exogenously given, and model the opening up of the capital account by a downward shift in the parameter γ. However, in the closed economy the cost of capital is easily endogenized by assuming that the aggregate supply of funds is given by $F = \int f df$, where *df* is the mass of uninformed investors with capital *f*. Given contracts of type $j \in \{NC, C\}$, the equilibrium on the domestic market for uninformed capital is simply:

$$F = \int_0^{\bar{a}_j} I_{u,j}(\beta,\lambda)(1-u)du$$

In the Appendix, we derive the equilibrium cost of capital $\gamma_{closed,j,}$. In the sequel of the paper, liberalization of portfolio investments and bank borrowing is studied as a shift in the cost of capital γ from γ_{closed} to γ* the world interest rate, with $\gamma^* < \gamma_{closed}$.

B. Existence of a Mixed Equilibrium

The preceding discussion indicates that some firms will accept contracts with partial collusion if the cost of bank capital is such that $\beta = \gamma \,.\, \Psi\,(q)$. Define then $\bar{\gamma}$ by $\beta_{NC}(\bar{\gamma}) = \bar{\gamma}\,.\Psi(q)$. This is the cost of external capital below which, starting from an equilibrium without collusion, some firms will start accepting contracts with collusion. Similarly, define $\underline{\gamma}$ by $\beta_C(\underline{\gamma}) = \underline{\gamma}\,.\Psi(q)$. This is the cost of external finance above which, starting from a collusion equilibrium, some firms will start accepting lending contracts that are collusion-proof. We show that the following proposition holds:

Proposition 6 ***Existence of a mixed equilibrium.*** There exist $\bar{\gamma}$, $\underline{\gamma}$, with $\underline{\gamma} < \bar{\gamma}$ such that: (1) if $\gamma > \bar{\gamma}$, all credit contracts are collusion-proof; (2) if $\gamma < \underline{\gamma}$, all credit contracts allow for collusion in the state of nature H; (3) if $\gamma \in [\underline{\gamma}, \bar{\gamma}]$, a unique mixed equilibrium exists in which a proportion ν of firms choose contracts that are collusion-proof, where ν is an increasing function of γ with $\nu(\bar{\gamma}) = 1$, and $\nu(\underline{\gamma}) = 0$. In the mixed equilibrium, domestic bank capital and uninformed capital become substitutes.

Proof. See the Appendix.

Corollary 7 (1) For all $\gamma > \bar{\gamma}$, or $\gamma < \underline{\gamma}$, the cost of bank capital β is a decreasing function of the cost of external finance γ. (2) For all $\in [\underline{\gamma}, \bar{\gamma}]$, the cost of capital is an increasing function of the cost of external finance γ.

Proof. See the Appendix.

Over the relevant range, the equilibrium cost of capital β is strictly higher when all contracts are collusion-proof than when all contracts allow collusion in state *H*. As a result, the cost of capital at which at least one firm have an incentive to deviate from a *NC* contract to a *C* contract must be strictly higher than the cost of capital at which at least one firm have an incentive to deviate from a *C* contract to a *NC* contract. This implies that there exists a range of values for γ such that, within that range, the equilibrium interest rate β(γ) is attained when a proportion of exactly ν(γ) firms choose a *NC* contract. At this interest rate, and for these proportions ν and 1-ν, firms are indifferent between the two types of contracts.

The pattern of the equilibrium rate of return of bank capital is described in Figure 1. Correspondingly, we also have the equilibrium size of the banking sector in the economy (see Figure 2).

As expected and similar to Holstrom and Tirole (1997), part 2 of corollary 7 indicates that in the two regimes where contracts are all of one type (collusion proof or partial collusion), the cost of bank capital is a decreasing function of the cost of external finance. A low cost of external finance induces larger investment projects and stimulates the demand for bank capital in the economy. Bank capital (i.e., "informed" capital) is then complementary to external finance ("uniformed" capital). Interestingly however, and in contrast to Holmstrom and Tirole's model, part 1 of corollary 7 shows that in the regime with mixed contracts for γ ∈ $[\underline{\gamma}, \bar{\gamma}]$, the cost of bank capital β is an increasing function of the cost of external finance.

Aggregate bank capital and uninformed capital become now substitute when firms progressively turn to partial collusion contracts. The intuition is the following. As the cost of external finance goes down, firms would like to save on costly bank capital at the benefit of cheaper external finance. In order to do this, they turn progressively to partial collusion contracts. As this happens in the mixed regime, the total demand for bank capital falls, reducing therefore its return β in the economy.

Figure 1. Equilibrium Rate of Return on Informed Capital

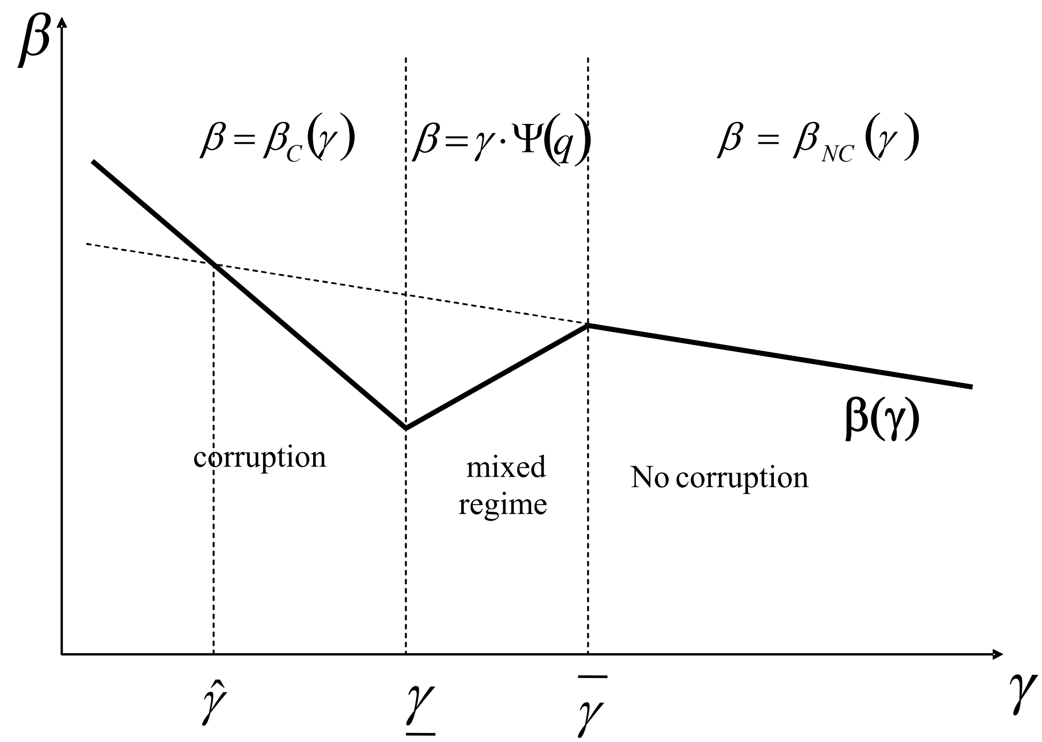
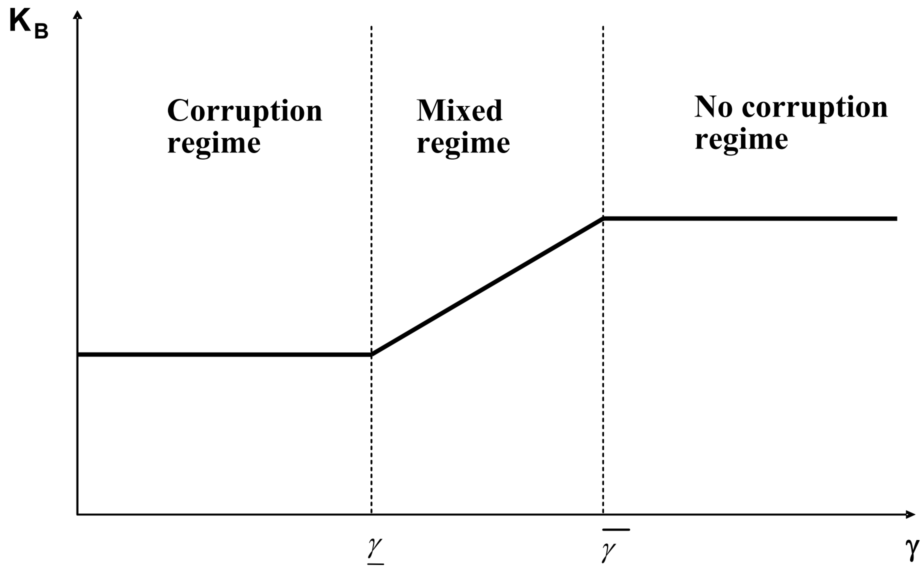


Figure 2. Equilibrium Size of Informed Capital



VI. LIBERALIZATION OF INTERNATIONAL PORTFOLIO INVESTMENT AND BANK BORROWING

In this section, we analyze the impact of the liberalization of international portfolio investment and bank borrowing on domestic investment, productivity and output. Liberalization of these flows is modeled as a shift in the cost of uninformed capital γ. We focus on the case in which the cost of capital in the closed economy γ_{closed} and the world interest rate γ^* are such that $\gamma_{closed} > \bar{\gamma}$, and $\gamma^* < \bar{\gamma}$. The liberalization of the capital account will therefore be accompanied by capital inflows. Figure 3 summarizes the impact on investment, productivity and output.

The liberalization of capital flows induces an increase in aggregate investment, as the cost of capital falls from γ_{closed} to γ^*. Given a cost of capital γ, aggregate investment is given by:

$$I_j(\gamma) = \frac{1}{V_j(\gamma)} \cdot \int_0^{\bar{a}} (1-u)\, du$$

Combining with equilibrium conditions on the informed capital market, one obtains:

$$I_j(\gamma) = \underbrace{\frac{1}{V_j(\gamma, \beta_j(\gamma))}}_{\text{investment multiplier}} \cdot \underbrace{\frac{1}{2}(1-K_{B,j}^2)}_{\text{aggregate entrepreneurial capital}}$$

Hence, two factors are at play. First, as the cost of external finance falls, the moral hazard becomes less severe, and entrepreneurs' borrowing capacity increase (the investment multiplier effect). In addition, as the cost of external finance falls below $\overline{\gamma}$, the economy progressively shifts to a new equilibrium in which a strictly positive share of entrepreneurs will choose contracts allowing partial collusion. As more and more entrepreneurs choose such contracts, the demand for bank capital falls as banks cofinance a diminishing share of projects. As a result, some banks close down, aggregate bank capital falls, and entry in entrepreneurship increases. The larger supply of entrepreneurial capital implies that, in aggregate, investment will increase even further (aggregate entrepreneurial capital effect).

The impact of portfolio capital inflows on total factor productivity is always negative in the configurations in which collusion increases. In our model with only one factor of production, total factor productivity is measured by the expected average return of projects $p_j R$, where:

$p_j = p_H$ if all contracts are collusion-proof ($\gamma > \overline{\gamma}$),

$p_j = \tilde{p}$ if all contracts allow collusion to occur in state H ($\gamma < \underline{\gamma}$),

and $p_j = \nu p_H + (1-\nu)\tilde{p}$ in the region $[\underline{\gamma}, \overline{\gamma}]$ where only a proportion ν of contracts are collusion-proof.

The impact on productivity is as follows. Productivity remains constant, equal to $p_H R$, as long as $\gamma > \underline{\gamma}$. As γ falls below $\overline{\gamma}$, some firms start colluding with banks to enhance their borrowing capacity, at the cost of a reduction of average productivity. For $\gamma \in [\underline{\gamma}, \overline{\gamma}]$, average productivity is given by $[\upsilon p_H + (1-\upsilon)\tilde{p}]R.$ From Proposition 7, it is straightforward to show that, as γ falls within the range $[\underline{\gamma}, \overline{\gamma}]$, aggregate productivity falls. When γ falls below $\underline{\gamma}$, all firms choose to collude, and productivity reaches its lower bound at $\tilde{p}R.$.

To summarize, aggregate total factor productivity is given by:

$$\begin{cases} TFP = p_H R \quad \text{if } \gamma \geq \overline{\gamma} \\ TFP = \{[\nu(\gamma)(1-q)+q]\cdot p_H + (1-\upsilon(\gamma))(1-q)\cdot p_L\}\cdot R \quad \text{if } \gamma \in [\underline{\gamma}, \overline{\gamma}] \\ TFP = \{q\cdot p_H + (1-q)\cdot p_L\}\cdot R \quad \text{if } \gamma \leq \underline{\gamma} \end{cases}$$

Consider now the impact of international portfolio liberalization on aggregate output in the economy. Output in the noncorruption regime is given by:

$$Q_{NC} = p_H R \cdot I_{NC} \cdot \int_0^{\overline{a}} (1-u)\, du$$

Combining with the equilibrium condition on the credit market, one obtains:

$$Q_{NC} = p_H R \cdot \frac{1}{\Lambda_{NC}} \cdot \beta_{NC}(\gamma) \cdot K_{B,NC}(\gamma)$$

similarly,

$$Q_C = \tilde{p}R \cdot \frac{1}{\Lambda_C} \cdot \beta_C(\gamma) \cdot K_{B,C}(\gamma)$$

In the mixed regime, output is given by:

$$\tilde{Q} = \left[\nu p_H R \cdot I_{NC} + (1-\nu)\, \tilde{p}R \cdot I_C \right] \cdot \int_0^{\bar{a}} (1-u)du$$

Again, combining with the credit market equilibrium, one obtains:

$$\tilde{Q} = p(\nu)\, R \cdot \frac{1}{\tilde{\Lambda}(\nu)} \cdot \tilde{\beta}(\gamma) \cdot \tilde{K}_B(\gamma)$$

where $p(\nu) = \nu p_H + (1-\nu)\,\tilde{p}$ is the average fraction of successful projects, $\tilde{\Lambda}(\nu) = \nu\Delta_{NC} + (1-\nu)\Lambda_C$, is the average minimum financial return per dollar invested for the bank to monitor a firm in that regime, $\tilde{K}_B(\nu) = \sqrt{\dfrac{\tilde{\Lambda}(\nu)}{2\Omega + \tilde{\Lambda}(\nu)}}$ is the equilibrium size of informed capital and $\tilde{\beta}(\gamma)$ the corresponding equilibrium rate of return of informed capital.

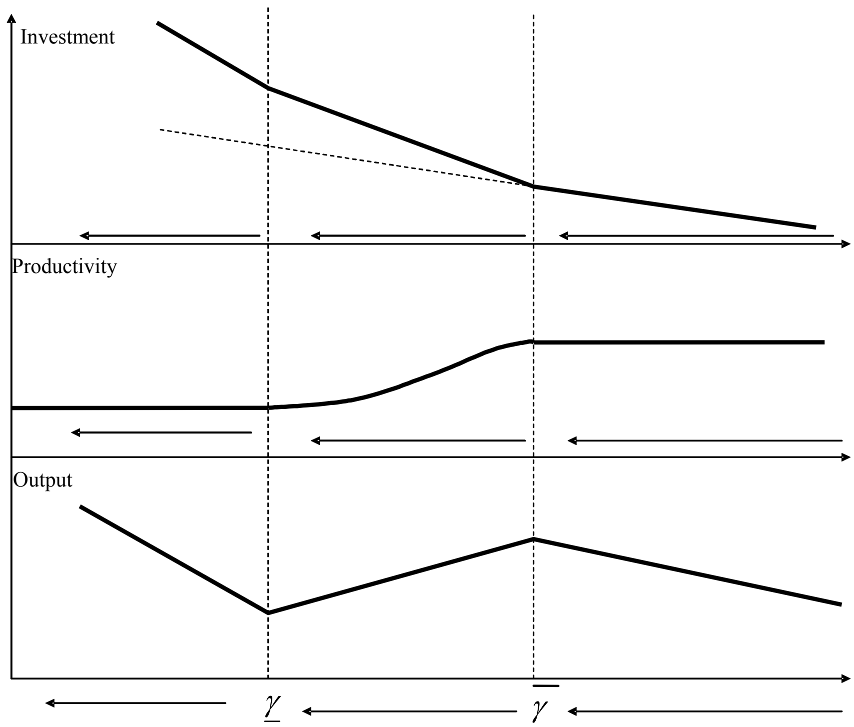
The impact on aggregate output is ambiguous, as it combines the positive effect of collusion on borrowing capacity and the negative effect on productivity. For the negative effect on productivity to dominate, collusion must lead to a sufficiently large fall in firms' average productivity. This implies that the probability q of the good state L must not be too large. Conversely, if the probability of the good state is large, collusion results in a small reduction of average productivity which is more than compensated by the larger borrowing capacity obtained by relaxing banks' incentive constraint in state H. As a result, when the probability of ex post collusion is not too high, allowing collusion becomes optimal. The following proposition formalizes this result.

Proposition 8 There exists γ^{opt} such that it is optimal from a production point of view to shift from the noncorruption to the corruption regime if $\gamma < \gamma^{opt}$, e.g. $\gamma < \gamma^{opt} \Leftrightarrow Q_C > Q_{NC}$. Moreover, there exists $q_{\max}$ such that: (1) $q < q_{\max} \Rightarrow \gamma^{opt} < \underline{\gamma}$; (2) $q = q_{\max} \Rightarrow \gamma^{opt} = \overline{\gamma}$; and (3) $q > q_{\max} \Rightarrow \gamma^{opt} > \overline{\gamma}$.

Proof See the Appendix.

Figure 3 illustrates this result for intermediate values of the probability of the good state L, e.g., when $q \in [\overline{q}, q_{\max}]$. Under this configuration, the liberalization of portfolio investments and bank borrowing will result in a worsening of banks governance as a positive share of firms will switch to contracts allowing collusion in state L. This will be accompanied by a surge of investment, and a degradation of average firm productivity. As collusion will occur relatively often, the net effect on output will be negative.

Figure 3. Impact of Capital Flows on Investment, Productivity and Output



VII. The Impact of Foreign Direct Investment

A. Foreign Direct Investment in the Corporate Sector

In this section, we assume that foreign firms can enter the domestic corporate sector freely. For simplicity foreign firms are identical to domestic firms in every respect, except that they cannot collude with domestic banks. So foreign firms also borrow from the domestic banking system. To focus on the financial relationships between domestic firms and banks, we minimize differences between domestic and foreign firms. The model could be generalized by assuming that foreign firms are less subject to moral hazard (lower b), are more productive (higher R), or are easier to monitor (lower c).

Since foreign firms cannot collude with banks, the cofinancing requirement is smaller for foreign firms than for domestic firms:

$$\Lambda_F = \frac{p_L \cdot c}{\Delta p} < \Lambda_C < \Lambda_{NC}$$

Foreign firms enter the domestic market if and only if the expected return on FDI is larger or equal to the international rate of return on capital γ. Therefore the stock of foreign capital K_F invested domestically is given by:

$$\frac{\Omega}{V_F \beta,\gamma)} = \gamma$$

where V_F is the multiplier function:

$$V_F(\beta,\gamma) = 1 - \frac{\Phi_F}{\gamma} - \frac{\Lambda_F}{\beta}$$

With $\Phi_F = p_H \cdot \left(R - \frac{c+b}{\Delta p} \right)$.

The equilibrium condition on the domestic credit market becomes (j∈{NC,C}):

$$K_{B,j} = \frac{\beta V_j}{\Omega} = \int_0^{\bar{a}} I_{m,j}(\beta,\gamma)(1-u)\,du + I_{m,F} \cdot K_F$$

where $I_{m,F}$ is the demand for domestic bank capital per dollar of foreign direct investment. From this equation, it is clear that the aggregate demand for domestic bank credit is larger in presence of FDI.

Lemma 9 Foreign direct investment leads to an increase in the return β on bank capital, to an increase in the size of the domestic banking system K_B and a reduction in the size of domestic entrepreneurial capital K_E. Moreover, there is complementarity between foreign direct investment and access to international capital market: direct investments in domestic firms' increases when the cost of uninformed capital γ falls.

Proof See the Appendix for a formal proof.

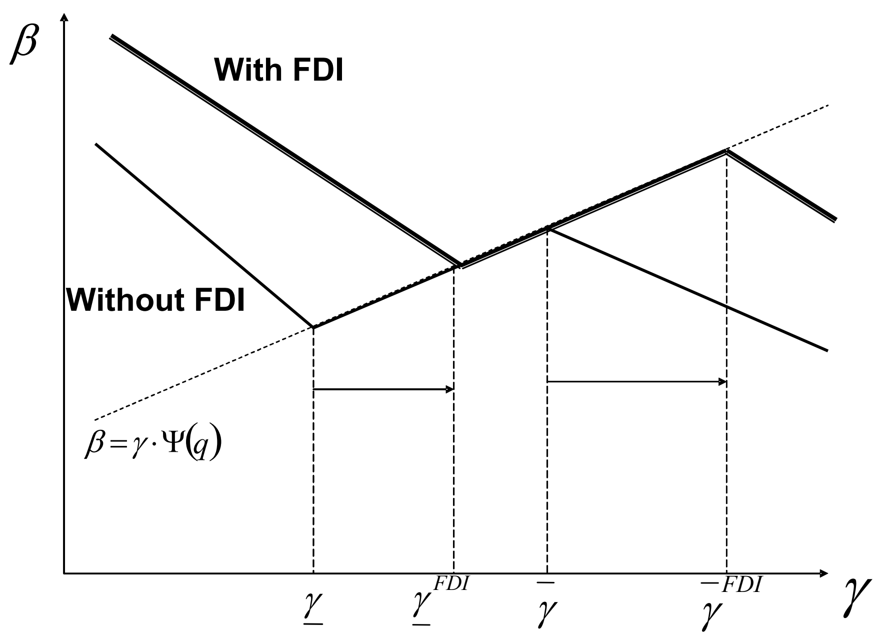
The intuition is the following. Entry of foreign capital in firms operating domestically leads to an increase in the demand for bank loans, hence to an increase in the return on bank loans. As a result, a larger proportion of domestic agents choose to become bankers, so bank capital expands, and domestic entrepreneurial capital contracts.

Proposition 10 Foreign direct investment makes collusion between domestic banks and domestic firms more likely, and can result in a reduction in the productivity and output of domestic firms.

Proof This proposition follows from the previous Lemma.

Since foreign direct investment increases the equilibrium return on bank capital, domestic firms will start colluding with domestic banks at a higher cost of capital γ. For instance, as can be seen in Figure 4a), in the region $\left[\bar{\gamma}, \bar{\gamma}_{FDI}\right]$, the entry of foreign capital moves the economy from the no-collusion equilibrium to the mixed equilibrium in which a proportion of firms choose the partial collusion contract. The productivity and output of those firms will fall, implying that the average output and productivity of domestic firms also falls (assuming that q is not too high). To summarize, the average output and productivity of domestic firms falls for $\gamma \in \left[\underline{\gamma}, \bar{\gamma}_{FDI}\right]$, and remains constant for other values of the cost of capital γ.

Figure 4a. Impact of FDI on the Cost of Bank Capital



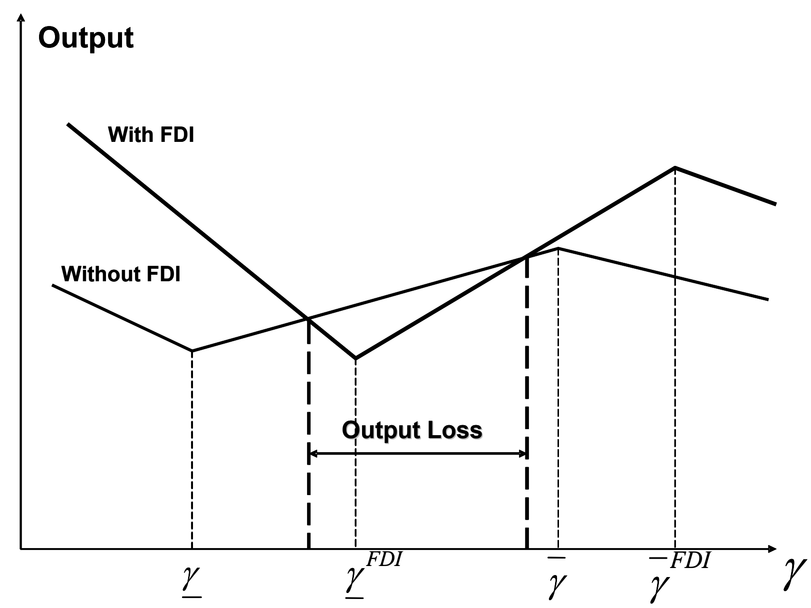
The effect of FDI on total output is discussed in the following proposition:

Proposition 11 There exist $\bar{\gamma}_{FDI}$ and $\underline{\gamma}_{FDI}$ such that, for all $\gamma > \bar{\gamma}_{FDI}$, and $\gamma < \underline{\gamma}$, foreign direct investment increases aggregate output. However, if $\gamma \in \left[\underline{\gamma}, \bar{\gamma}_{FDI}\right]$, the impact of foreign direct investment on aggregate output is ambiguous. It is more likely to be negative the higher the risk of collusion is (low q), and the lower the dispersion in the cost of collusion Δk is.

Proof See the Appendix for a formal proof.

In the pure collusion-proof and partial collusion regimes, aggregate output unambiguously increases because foreign-owned firms have a larger borrowing capacity than domestic firms. In addition, in the partial collusion regime, average productivity also increases in the economy as foreign firms have higher productivity. In the intermediate zone however, the overall effect is ambiguous because foreign direct investment induces a fall in productivity of domestic firms by increasing the demand for domestic bank loans, which induces more firms to choose the partial collusion contract. In such a case, the net impact may be negative as shown for instance in Figure 4b). In addition, we show that, if $\gamma \in \left[\underline{\gamma}_{FDI}, \overline{\gamma}\right]$, FDI does not modify the size of the domestic banking system: the aggregate demand for bank loans does not change as FDI crowds-out domestic firms one for one by inducing a shift towards contracts with partial collusion. In this configuration, the net effect on aggregate output is negative if the probability of collusion is high enough (low q) and the dispersion in the costs of collusion is low.

Figure 4b. Impact of FDI on Output



B. Foreign Investment in the Banking Sector

Homogenous Firms

Assume that foreign banks have a marginally higher cost c_{FB} of monitoring firms than domestic banks, due to informational disadvantages. However, they have access to a perfectly elastic supply of funds at the international rate of return γ, which is lower than the domestic return of capital β. Moreover, foreign banks cannot collude with domestic firms. There is free entry in the domestic banking system; foreign banks enter until the net return on loans is equal to the international cost of capital:

$$p_H \cdot R_m^{FB} - c_{FB} \cdot I = \gamma I_m^{FB}$$

where R_m^{FB} and I_m^{FB} are respectively the financial payment if the project succeeds and the initial investment in the project. The equilibrium condition on the credit market is now given by (j$\in${NC,C}):

$$K_B + K_{BF} = \int_0^{\bar{a}} I_{m,j}\,(\beta,\gamma)\,(1-u)\,du$$

where K_{FB} is the capital of foreign banks.

Assumption D: $c_{FB} < Min\left\{ p_H \dfrac{c + k_H \Delta B}{\Delta p}, \Delta p \cdot (1-q)\left(R - \dfrac{b}{\Delta p}\right) + \widetilde{p} \cdot \left(\dfrac{c + k_L \Delta B}{\Delta p}\right)\right\}$

Under assumption *D*, foreign banks compete domestic banks' rents away when the cost of external finance becomes low enough, even if their monitoring cost is larger. Indeed, given their lower cost of finance, and that they cannot collude, they become relatively more competitive relative to domestic banks as the cost of external finance γ falls. We then have the following result:

Lemma 12 There exist χ_C and χ_{NC}, with $\chi_C > \chi_{NC} > 1$, such that foreign banks enter the domestic market if and only if $\beta_{NC}(\gamma) \geq \gamma \cdot \chi_{NC}$ in the noncollusion regime, or if $\beta_C(\gamma) \geq \gamma \cdot \chi_C$ in the collusion regime.

Proof See the Appendix.

Intuitively, in each regime (no collusion or collusion), foreign banks can enter into the domestic market only if the effective unit cost of capital that they can offer to firms is lower than the autarkic equilibrium cost of domestic banking capital in that regime. As the next proposition shows, this is more likely to happen when the cost of external finance is low.

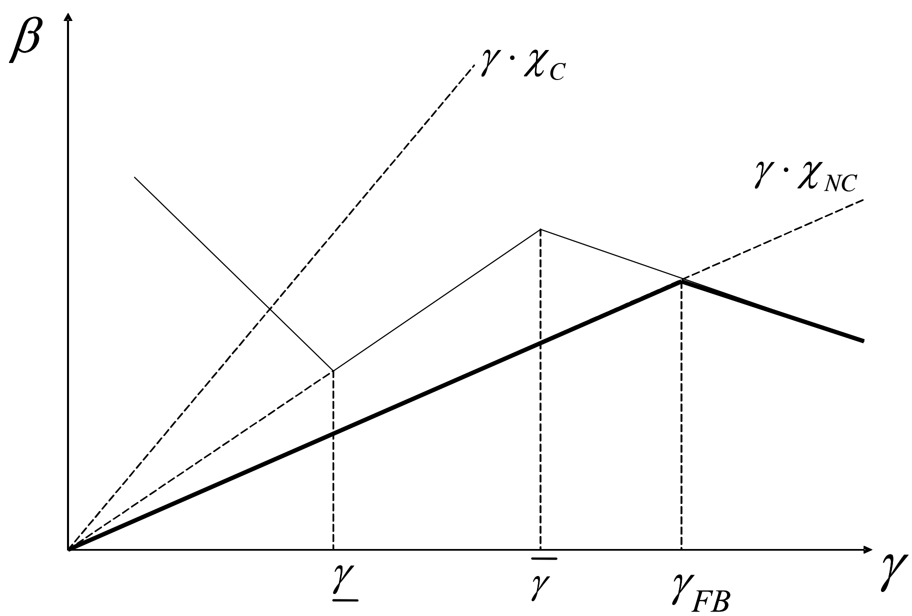
Proposition 13 Liberalization of international portfolio investment and bank borrowing and entry by foreign banks are complementary: there exists γ_{FB} such that foreign banks enter the domestic banking system if and only if $\gamma < \gamma_{FB}$. Moreover the share of foreign banks in the domestic banking system increases as falls.

Proof See the Appendix.

Several configurations can then occur in which foreign banks enter the banking system.

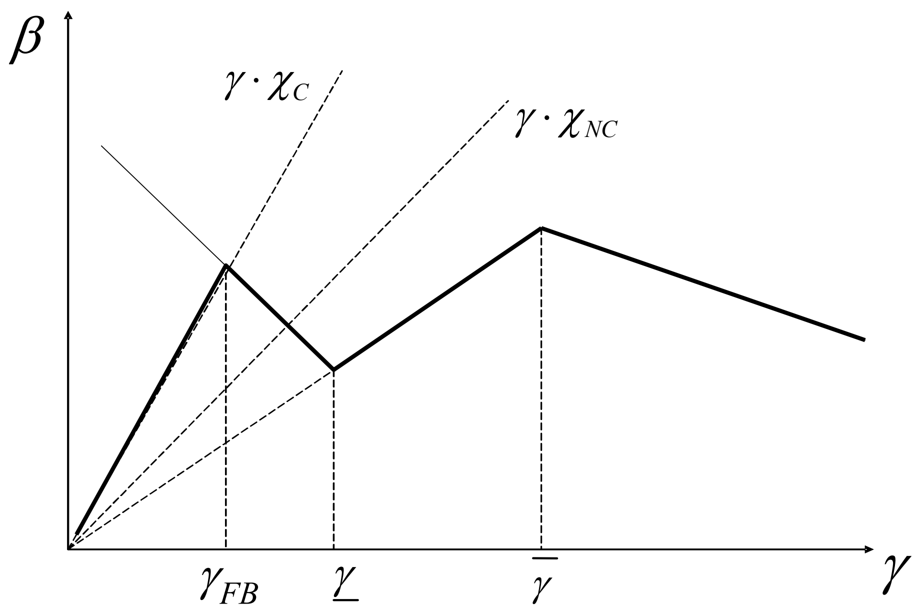
(1) The first situation is the case of countries with large costs of collusion (i.e., when $\chi_{NC} < \Psi(q)$). This is depicted in Figure 5a). In this case, as the cost of external finance falls, foreign banks enter the domestic market before collusion occurs. After their entry the equilibrium cost of banking capital is $\gamma \cdot \chi_{NC}$ and the share of domestic banks progressively falls as the cost of external finance falls.

Figure 5a. Foreign Bank Entry (High Costs of Collusion)



(2) The second situation is the case of countries with low costs of collusion (i.e., when $\chi_{NC} > \Psi(q)$), as depicted in Figure 5b) Entry by foreign banks occurs now only when the whole domestic banking system is corrupt, at a very low cost of external finance. In such situations, the equilibrium return to bank capital becomes $\gamma \cdot \chi_C$ and foreign banks coexist with corrupt domestic banks as goes down.

Figure 5b. Foreign Bank Entry (Low Costs of Collusion)



Heterogenous Firms

There is evidence that foreign banks are less able to monitor more opaque firms (for instance small and medium size enterprises) than domestic banks (Mian, 2005). To analyze the impact of foreign bank entry in this context we introduce a source of heterogeneity among domestic firms.

We assume that entrepreneurs have access to two types of projects that are randomly assigned after individuals have invested in entrepreneurial skills. Projects are identical, except for the cost of monitoring by foreign banks. Projects of type *T*, which occur with probability 1-λ, are easier to monitor for foreign banks. By contrast, projects of type *S*, which occur with probability λ, are harder to monitor for foreign banks as in Detragiache et al., (2006). We assume that foreign banks' cost of monitoring type *T* projects, c_{FB}^{T} is strictly smaller than *c*. It is straightforward to verify that all type *T* firms will then borrow from foreign banks. We also assume that foreign banks' cost of monitoring type *S* projects verifies:

$$c_{FB}^{S} < Min\left\{ p_H \frac{c + k_H \Delta B}{\Delta p}, \Delta p \cdot (1-q)\left(R - \frac{b}{\Delta p}\right) + \widetilde{p} \cdot \left(\frac{c + k_L \Delta B}{\Delta p}\right)\right\}$$

One can show that under this condition, foreign banks cannot compete in the segment of type *S* firms.

Entry by foreign banks leads to a natural segmentation of the credit market. Type *T* firms obtain credit from foreign banks, and type S firms obtain credit from domestic banks. Note that such segmentation could be optimal *a priori*, as each type of banks specializes in the segment in which it is more efficient. In our model, foreign bank entry can have adverse effects only if it induces more collusion in the segment of the market constituted by *S* firms. The following proposition establishes that such adverse effects are more likely to occur the *lower* the cost of monitoring c_{FB}^{T}, and the *larger* the share of type S firms in the economy. This also implies that, the greater the risks of collusion, the more likely the adverse effects of foreign bank entry on small and medium size enterprises.

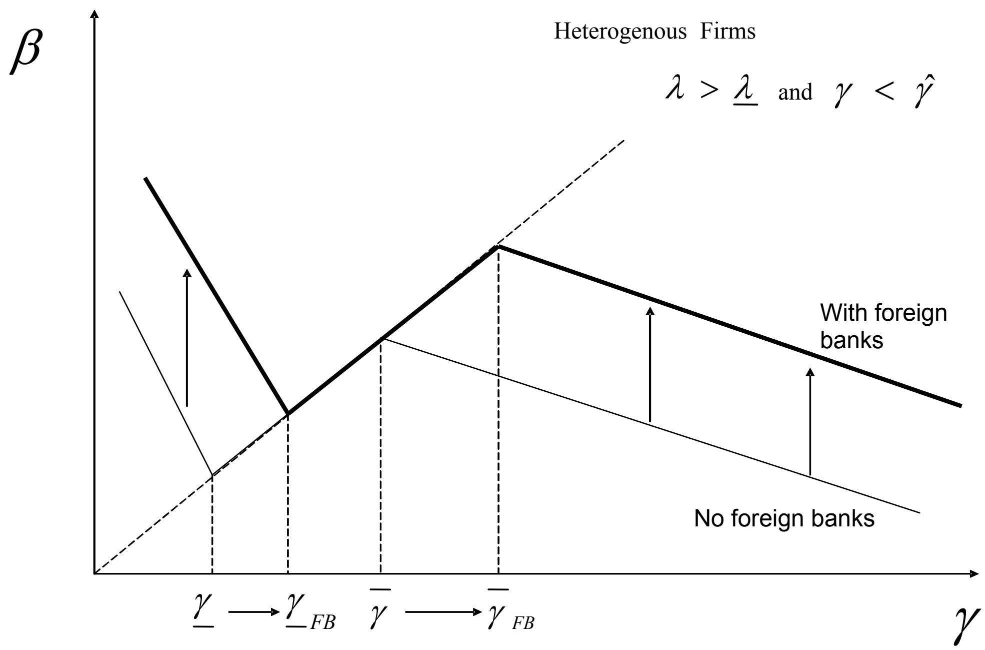
Proposition 14 There exist $\underline{\lambda}$, and $\hat{\gamma}$ such that, if $\gamma < \hat{\gamma}$, and for all <, entry by foreign banks leads to an increase in the equilibrium interest rate β for type S firms. Conversely, there exists $\underline{\underline{\lambda}} < \underline{\lambda}$ such that, if $\lambda < \underline{\underline{\lambda}}$, entry by foreign banks will lead to a fall in the equilibrium interest rate for type S firms. Moreover, the threshold external cost of capital $\hat{\gamma}$ is a decreasing function of c_{FB}^{T}.

Proof See the Appendix.

The intuition is the following. Entry by foreign banks improves the borrowing capacity of *T* firms, which switch from domestic to foreign banks. This has two opposite effects on the interest rate on domestic loans β. First, as borrowing capacity of *T* firms increases, the expected utility of entrepreneurship increases, resulting in a contraction of domestic banks' capital and an expansion of entrepreneurial capital (supply effect). This effect tends to increase the cost of credit for *S* firms.

Second, the demand for domestic banks' loans falls as *T* firms switch to foreign banks (demand effect). This second effect also contracts the domestic banking system, but tends to decrease β the cost of domestic loans. If the share of *S* firms is large in the economy, the first (supply) effect will dominate the second (demand) effect and, as depicted in Figure 6, the cost of domestic banking capital β moves up. This, in turn, increases the likelihood of collusion between domestic banks and opaque *S* firms. Conversely, if there is a large proportion of *T* firms in the economy, the market share of domestic banks will contract significantly following foreign bank entry, resulting in a fall in the cost of domestic banks' loans, reducing as well the likelihood of collusion between local remaining banks and *S* firms.

Figure 6. Foreign Bank Entry with Heterogenous Firms



VIII. THE DESTABILIZING EFFECT OF SYSTEMIC BAILOUT GUARANTEES

Several recent papers have analyzed the implications of bailout guarantees on the functioning of financial systems. Schneider and Tornell (2004), and Ranciere, Tornell and Westermann (2005) for instance show that when there are bailout guarantees, occasional crisis can be associated with faster long-run growth by enhancing the borrowing capacity of entrepreneurs. In this section, we study the impact of systemic bailout guarantees on financial contracts and the likelihood of collusion. In contrast to the previous literature, we will see that bailout guarantees can have effects even in absence of real macroeconomic shocks, with the coordination on a potentially less stable equilibrium occurring through the design of particular financial contracts. In addition, in our model, enforceability problems will not necessarily have to interact with systemic guarantees to observe both borrowing constraints and excessive risk-taking.

More precisely, we assume that a bailout takes place if and only if a critical mass of firms are in default. For concreteness, we assume that a bailout takes place if and only if the value of defaulted loans including interest payments is more than 50 percent of output. If this happens, the government steps in and provides a partial bailout of lenders. We assume that the bailout is partial in the sense that the guarantee covers a share $\theta < 1$ of what is owed by the firm to creditors. The guarantee covers the two types of lenders, and is financed through lump-sum taxes.

Let us first derive conditions under which bail-outs happen in the corruption regime only. *A* bailout will not happen in the collusion-proof regime if and only if:

$$(1-p_H)\cdot\left(R-\frac{b}{\Delta p}\right)<\frac{1}{2}p_H R$$

Conversely, a bailout will take place in the partial collusion regime if and only if:

$$(1-\tilde{p})\ .\left(R-\frac{b}{\Delta p}\right)>\frac{1}{2}\tilde{p}R$$

Thus bailouts take place in the partial corruption regime only if the fall in the expected return relative to the collusion proof regime is large enough. Simple algebra implies that this is the case if and only if:

$$q\le q_{\min}$$

where $q_{\min}=p_H-\dfrac{1}{1+2H}$, and $H=1-\dfrac{b\Delta p}{R}$

In Section IV, we have shown that partial collusion never happens if $q<\bar{q}$, so we now assume:

Assumption D: $q<Min\left[\bar{q},q_{\min}\right]$

Under assumption *D*, partial collusion never happens in equilibrium in absence of bailout guarantees. If, on the contrary, bailout guarantees are anticipated, partial collusion may arise in equilibrium.

First we have to show that anticipated bailout guarantees increase the likelihood of collusion. We introduce the following probabilities:

$$\begin{aligned}
p_H(\theta) &= p_H+(1-p_H)\cdot\theta\\
p_L(\theta) &= p_L+(1-p_L)\cdot\theta\\
\tilde{p}(\theta) &= q(p_H+(1-p_H)\cdot\theta)+(1-q)\cdot(p_L+(1-p_L)\cdot\theta)\\
&= q\cdot p_H(\theta)+(1-q)\cdot p_L(\theta)
\end{aligned}$$

The first probability is the induced probability of repayment in presence of a bailout guarantee if the firm chooses the good project, while the second one is the induced probability of repayment if the firm chooses the bad project. The third probability is the induced probability of repayment in presence of partial collusion. It is easy to check that the probabilities are increasing functions of θ: bailout guarantees transfer part of the credit risk from creditors to tax payers.

Incentive constraints are modified in the following way in presence of bailout guarantees. First, firms' incentive constraints are not affected, as only creditors are bailed out. Second, banks have weaker incentives to monitor when bailout guarantees are anticipated. Indeed, bailout guarantees have a higher expected impact on banks' income when the probability of failure is higher. This, in turn, reduces banks' incentives to monitor. Banks' incentive constraints respectively in the noncorruption and corruption regimes are (noting $\Delta p(\theta) = p_H(\theta) - p_L(\theta)$:

$$R_m^{NC}(\theta) = \frac{c + k_H \Delta B}{\Delta p(\theta)} I \quad and \quad R_M^C(\theta) = \frac{c + k_L \Delta B}{\Delta p(\theta)} I$$

The multiplier functions in the noncorruption and corruption regimes are given by expressions similar to those of Section IV (see the Appendix for the precise definition):

$$V_{NC}(\theta) = 1 - \frac{\Phi_{NC}(\theta)}{\gamma} - \frac{\Lambda_{NC}(\theta)}{\beta}$$
$$V_C(\theta) = 1 - \frac{\Phi_C(\theta)}{\gamma} - \frac{\Lambda_C(\theta)}{\beta}$$

Finally, the borrowing capacity of the entrepreneur is larger with partial collusion if and only if: $q > \overline{q}(\theta)$ and $\beta \geq \gamma \cdot \Psi(q, \theta)$ where: $\Psi(q, \theta)$ and $\overline{q}$ are analogs to $\Psi(q)$ and $\overline{q}$ in Section IV and are precisely defined in the Appendix.

Lemma 15 The anticipation of a bailout makes collusion more likely: $\frac{\partial \Psi}{\partial \theta} < 0$. Moreover, the larger the bailout, the smaller the probability of state L necessary to make collusion feasible: $q'(\theta) < 0$.

Proof See the Appendix.

The anticipation of a bailout increases the likelihood of corruption because it has a disproportionately larger impact on firms borrowing capacity when partial collusion is allowed. This is for two reasons. The direct effect is that a bailout increases the likelihood of repayment more in presence of partial collusion: $p'_H(\theta) = 1 - p_H < \tilde{p}'(\theta) = 1 - \tilde{p}$. Hence bailouts tend to attenuate the negative effect of collusion on the expected repayment. Bailouts also indirectly enhance the borrowing capacity of the firm by increasing the benefits of relaxing the bank's incentive constraint in state H (term $\frac{\tilde{p}(\theta)}{\Delta p(\theta)} \cdot \Delta k \Delta B$ in the multiplier function): this is because it becomes more costly to provide incentive for banks to monitor in all states of nature when a bailout is anticipated.

However, this partial equilibrium effect is not sufficient to ensure that bailouts will indeed increase collusion in equilibrium. Collusion will be more likely if the anticipation of a bailout

θ also increases the equilibrium net return on bank loans β_C .We have then the following result:

Lemma 16 There exists $\hat{\theta}$ such that $\frac{\partial \beta_C}{\partial \theta} > 0$ for all $\theta < \hat{\theta}$, and some $\overline{\theta}$ such that $\beta_C(\theta) > \beta_C(0)$ for all $\theta < \overline{\theta}$.

Proof See the formal proof in Appendix.

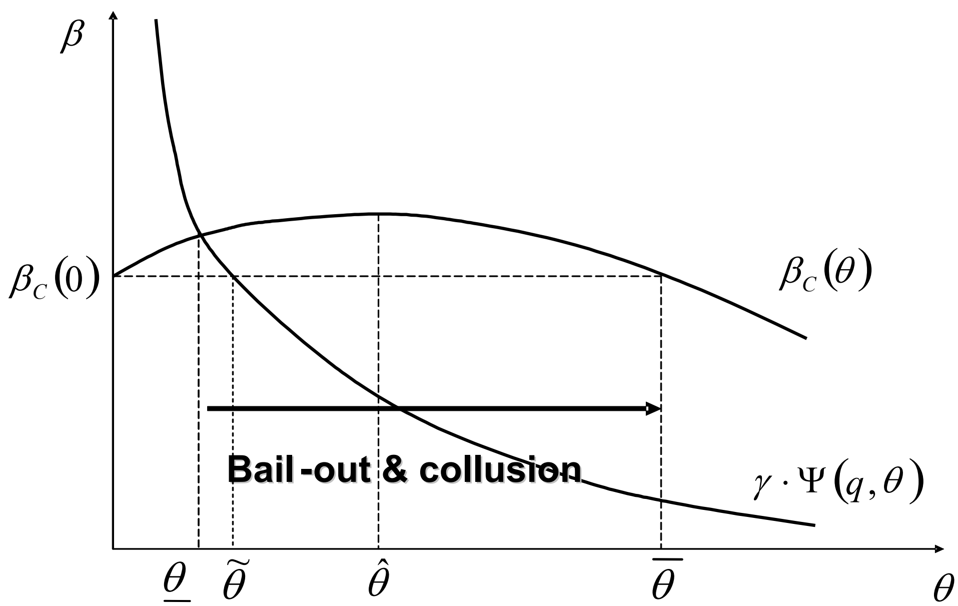
The proof of this Lemma can be sketched as follows. A sufficient condition for bailout to increase the equilibrium interest rate β_C is that $\frac{\partial}{\partial \theta}[\Phi_C(\theta)] > 0$. Under this condition, the anticipation of a bailout always increases the borrowing capacity of firms ($V_C^{'}(\theta) < 0$). This in turn induces more agents to become entrepreneurs and stimulates the demand for informed capital. As discussed in Section IV.A, the condition also implies that larger bailouts increase the financial return paid to informed investors per dollar invested in the project. This in turn stimulates a supply effect of more entry in the banking sector that tends to reduce the return to informed capital. It can be shown that there exists $\hat{\theta}$ such that, when θ is smaller than $\hat{\theta}$, the demand effect dominates the supply effect and the equilibrium interest rate on informed capital indeed increases.

Proposition 17 Let $\widetilde{\theta}$ the level such that $\gamma \cdot \Psi(q,\theta) = \beta_C(0)$. Assume that $\widetilde{\theta} < \overline{\theta}$, then there exists a range of bailout size within which corruption occurs if and only if a bailout is anticipated.

Proof The proof follows from the previous Lemma and the definition of $\widetilde{\theta}$. When θ is between $\widetilde{\theta}$ and $\overline{\theta}$, we know that $\beta_C(\theta) > \beta_C(0) = \gamma \cdot \Psi(q,\widetilde{\theta}) > \gamma \cdot \Psi(q,\theta)$ and therefore the equilibrium interest rate with anticipated bailout θ is in the collusion regime. As we know that, under assumption D a bailout with θ will be realized when there is collusion, the proposition is easily obtained.

Intuitively the size of the bailout must be large enough to ensure that the equilibrium is in the collusion regime, e.g. $\beta \geq \gamma \cdot \Psi(q,\theta)$. Figure 7 illustrates this result.

Figure 7. The Impact of Bailout Guarantees



Note finally that financial liberalization (ie. a reduction of γ) by increasing $\beta_C(\theta)$ and reducing $\gamma \cdot \Psi(q,\theta)$ is in fact enlarging the range $[\tilde{\theta},\bar{\theta}]$of self fulfilling bail-outs with collusion.

IX. Conclusion

We have developed a model showing how various types of capital flows affect the relationship between domestic banks and firms, by inducing, under certain circumstances, greater reliance on collusive mechanisms between domestic firms and banks. The main channel through which this happens is the modification of the relative costs of the capital of domestic banks and of uninformed investors.

Opening up the capital account to portfolio capital flows and bank borrowing increases the relative supply of "uninformed capital" and makes bank capital relatively scarcer. To relax the incentive constraints of banks, entrepreneurs choose contracts allowing collusion to sometime occur ex post. By reducing the share of profits paid to banks, entrepreneurs enhance their borrowing capacity from uninformed investors. Doing so has however a cost, as less efforts from entrepreneurs induces a fall in the productivity of projects. The net effect on output is ambiguous.

Foreign direct investment can induce ambiguous changes in the relationship between domestic banks and firms. Foreign investment in the corporate sector tends to increase the cost of domestic bank capital, and can therefore induce an increase in collusion between domestic banks and domestic firms. Foreign investment in the banking system increases competitive pressures, which tends to reduce collusive behaviors. If, however, foreign banks do not lend to more opaque borrowers, their entry could have the opposite effect on domestic firms-banks relationships.

Finally, we also analyze the effect of systemic bailout guarantees. Such guarantees reduce the benefits of monitoring, and therefore make collusion more likely. We show that, under certain parameter configurations, the shift to an equilibrium with collusion occurs if and only if systemic bailout guarantees are anticipated.

Our framework has policy implications on how to affect governance structures of domestic financial systems. As often discussed, one strategy to improve the weak governance of local financial intermediaries is through "institution importing." This is obtained for instance with the opening of domestic markets to FDI by foreign economic agents (firms, banks ...) who are subject to stronger and more efficient governance structures. It is then generally believed that competitive pressures with these foreign institutions will promote the governance efficiency of local firms. While we show that the benefits of competitive pressures in domestic markets can sometimes materialize, our analysis suggests however some caution on the strategy of "institution importing." In particular, when increased competition leads to market segmentation, one may end up with a first-tier of financial intermediation in which governance links between local agents and foreign institutions are improved. At the same time though, there can be a second-tier level where on the contrary, governance structures among residual local firms could deteriorate under certain circumstances. Therefore, the overall effect on the quality of governance remains ambiguous and depends on specific parameters of the economy.

Following this discussion, it should be recalled that while our framework argues that there are potential costs associated with various types of capital flows, this does not imply that the opening up of the capital account is not beneficial. It suggests however that the effects are likely to be country specific, and to depend on "soft" microeconomic governance factors whose evolution should be monitored carefully.

Appendix

Proof of Lemma 3. The change in the multiplier is given by:

$$\Delta V = V_{NC} - V_C = \left(\tfrac{1}{\gamma} - \tfrac{1}{\beta}\right) \cdot \underbrace{\left[p_H R_m - p_L \widetilde{R}_m\right]}_{\text{benefits due to banks' lower expected financial return}} + \tfrac{1}{\beta} \underbrace{(1-q)\cdot(c + k_H \Delta B)}_{\text{savings due to savings in monitoring costs and colusion proofness relaxed in state H}} - \underbrace{\tfrac{p_H - \widetilde{p}}{\gamma} \cdot \left(R - \tfrac{b}{\Delta p}\right)}_{\text{loss due to fall in the project's probability of success}}$$

Or:

$$\Delta V = V_{NC} - V_C = \tfrac{1}{\gamma}\left\{\tfrac{\widetilde{p}}{\Delta p}\Delta k \Delta B - (1-q)\Delta p\left(R - \tfrac{c+b+k_H\Delta B}{\Delta p}\right) - \tfrac{1}{\beta}\widetilde{p}\Delta k \Delta B\right\}$$

Proof of Lemma 4. From the previous inequality, one can show that:

$$\Delta V \geq 0$$

if and only if:

$$\beta \geq \gamma \cdot \Psi(q) \text{ and } q > \bar{q}$$

or:

$$q \geq \bar{q}$$

where:

$$\begin{cases} \bar{q} = 1 - \frac{p_H}{\Delta p} \cdot \frac{\Delta k \frac{\Delta B}{\Delta p}}{\Delta k \frac{\Delta B}{\Delta p} + R - \frac{c+b+k_H \Delta B}{\Delta p}} \\ \Psi(q, \Delta k) = \frac{\widetilde{p}\Delta k \frac{\Delta B}{\Delta p}}{\widetilde{p}\Delta k \frac{\Delta B}{\Delta p} - (1-q)\cdot\Delta p \cdot \left(R - \frac{c+b+k_H\Delta B}{\Delta p}\right)} = \frac{\Lambda_{NC} - \Lambda_C}{\Phi_C - \Phi_{NC}} \end{cases}$$

and the derivative of Ψ with respect to q is given by:

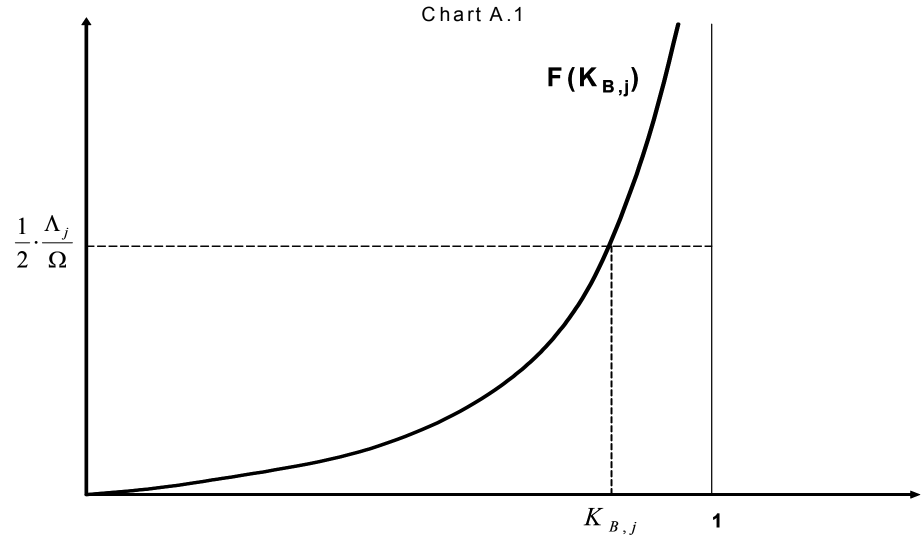
$$\Psi'(q) = -\Delta k \Delta B \cdot \frac{A}{\left\{\widetilde{p}\Delta k \frac{\Delta B}{\Delta p} - (1-q)\cdot A\right\}^2} \cdot \left[(1-q) + \frac{\widetilde{p}}{\Delta p}\right] < 0 \text{ where: } A = R - \frac{c+b+k_H\Delta B}{\Delta p}.$$

Proof of Proposition 5:

The equilibrium relation on the credit market can be rearranged in the following way ($j \in \{NC, C\}$):

$$K_{B,j}^2 = \tfrac{1}{2} \cdot \tfrac{\Lambda_j}{\Omega} \cdot \left[1 - K_{B,j}^2\right]$$

Define $F(X) = \dfrac{x^2}{1-x^2}$. Then, one can show that: $K_{B,j} = F^{-1}\left(\dfrac{1}{2} \cdot \dfrac{\Lambda_j}{\Omega}\right)$ and that $\left(F^{-1}\right)' > 0$. Therefore $K_{B,NC} > K_{B,C}$. Graphically:



Next, note that $\beta \cdot V_j(\beta,\gamma) = \Omega K_{B,j}$,and that $V_j(\beta,\gamma) = 1 - \frac{1}{\gamma}\cdot\Phi_j - \frac{1}{\beta}\cdot\Lambda_j$. One can easily show that:

$$\beta_j(\gamma) = \frac{\Omega K_{B,j}+\Lambda_j}{1-\frac{\Phi_j}{\gamma}}$$

where:

$$K_{B,j} = \sqrt{\frac{\Lambda_j}{2\Omega+\Lambda_j}}$$

Finally, one can show that $\beta_{NC}(\gamma) > \beta_C(\gamma) \Leftrightarrow \gamma > \tilde{\gamma}$ where $\tilde{\gamma}$ is defined by:

$$\tilde{\gamma} = \Phi_C + \frac{\Phi_C - \Phi_{NC}}{\frac{\Omega K_{B,NC}+\Lambda_{NC}}{\Omega K_{B,C}+\Lambda_C}-1}$$

Endogenizing γ

The return on uninformed capital is given by:

$$F = \int_0^{\overline{a_{,j}}} I_{u,j}(\beta,\gamma)(1-u)du = \frac{I_{u,j}}{2}\cdot\left(1-K_{B,j}^2\right)$$

which can be written:

$$I_{u,j}(\beta(\gamma),\gamma) = \frac{2F}{1-K_{B,j}^2}$$

Given that:, $\frac{dI_{u,j}}{d\gamma} = \frac{\overset{+}{\partial I_{u,j}}}{\partial \beta} \cdot \frac{\overset{-}{\partial \beta}}{\partial \gamma} + \frac{\overset{-}{\partial I_{u,j}}}{\partial \gamma} < 0$ the demand curve is well behaved and there is a nonempty set of values of F for which a solution $\gamma_{closed,j}$ always exists.

Proof of Proposition 6 and Corollary 7

The two threshold values of the cost of external finance are given by: $\overline{\gamma} = \frac{\Omega K_{B,NC} + \Lambda_{NC}}{\psi\{q\}} + \Phi_{NC}$, and: $\underline{\gamma} = \frac{\Omega K_{B,C} + \Lambda_C}{\Psi\{q\}} + \Phi_C$.

First, note that $\tilde{\gamma} < \underline{\gamma}$. Indeed:

$$\tilde{\gamma} < \underline{\gamma} \Leftrightarrow \Phi_C + \frac{\Phi_C - \Phi_{NC}}{\frac{\Omega K_{B,NC} + \Lambda_{NC}}{\Omega K_{B,C} + \Lambda_C} - 1} < \Phi_C + \frac{\Omega K_{B,C} + \Lambda_C}{\Psi(q)}$$

so:

$$\begin{aligned} \tilde{\gamma} < \underline{\gamma} &\Leftrightarrow (\Phi_C - \Phi_{NC}) \bullet \Psi(q) < (\Omega K_{B,NC} + \Lambda_{NC}) - (\Omega K_{B,C} + \Lambda_C) \\ &\Leftrightarrow \Lambda_{NC} - \Lambda_C < \Omega(K_{B,NC} - K_{B,C}) + \Lambda_{NC} - \Lambda_C \end{aligned}$$

therefore:

$$\tilde{\gamma} < \underline{\gamma} \Leftrightarrow K_{B,NC} > K_{B,C}$$

which is indeed the case (proposition 1).

Next it is easy to show that $\overline{\gamma} > \underline{\gamma}$.

Indeed, we know that: $\beta_C(\overline{\gamma}) < \beta_{NC}(\overline{\gamma}) = \Psi(q)$. If we had $\underline{\gamma} \geq \overline{\gamma}$, then $\beta_C(\underline{\gamma}) \leq \beta_C(\overline{\lambda})$, which is not possible because, by definition, $\beta_C(\underline{\gamma}) = \underline{\gamma} \cdot \Psi(q)$. So, if $\underline{\gamma} \geq \overline{\gamma}$, it must also be the case that $\beta_C(\underline{\gamma}) = \underline{\gamma} \bullet \Psi(q) \geq \overline{\gamma} \bullet \Psi(q) = \beta_{NC}(\overline{\gamma})$.

Assume now that $\gamma \in [\underline{\gamma}, \overline{\gamma}]$. The proportion of firms ν of firms choosing collusion-proof contracts is given by the equilibrium on the credit market, and the condition that firms must be indifferent between the collusion-proof contract and the partial collusion contract in equilibrium:

$$\begin{aligned} K_B &= [\nu I_m^{NC} + (1-\nu) I_m^C] \bullet \int_0^{\overline{a}} (1-u) du \\ \beta &= \gamma \bullet \Psi(q) \end{aligned}$$

From the equilibrium condition on the credit market, one can easily show that:

$$K_B = \tilde{K}_B(v) = \sqrt{\frac{\tilde{\Lambda}(v)}{2\Omega + \tilde{\Lambda}(v)}}$$

where:

$$\widetilde{\Lambda}(v) = v\Lambda_{NC} + (1-v)\Lambda_C$$

Since $\Lambda_{NC} > \Lambda_{C,}$ $\frac{\partial \tilde{\Lambda}(v)}{\partial v} > 0$, and $\frac{\partial \widetilde{K}_B}{\partial v} > 0$.

Moreover, as $V_{NC} = V_C$, the equilibrium interest rate β must be the following for a given v:

$$\widetilde{\beta}(v) = \frac{\Omega \widetilde{K}_B(v) + \Lambda_C}{1 - \frac{\Phi_C}{\gamma}} = \frac{\Omega \widetilde{K}_B(v) + \Lambda_{NC}}{1 - \frac{\Phi_{NC}}{\gamma}}$$

This implies that:

$$v = \widetilde{\beta}^{-1}\left(\overset{+}{\beta}, \overset{+}{\gamma}\right) = \widetilde{\beta}^{-1}\left(\gamma \cdot \overset{+}{\Psi}(q), \overset{+}{\gamma}\right) = \widetilde{v}\left(\overset{+}{\gamma}\right)$$

This implies that. $\frac{d\widetilde{K}_B(\gamma)}{d\gamma} > 0$.

Output:

Output in the noncorruption regime is given by:

$$Q_{NC} = p_H R \cdot I_{m,NC} \cdot \int_0^{\bar{a}} (1-u)du$$

Combining with the equilibrium condition on the credit market, one obtains:

$$Q_{NC} = p_H R \cdot \frac{1}{\Lambda_{NC}} \cdot \beta_{NC}(\gamma) \cdot K_{B,NC}(\gamma)$$

similarly,

$$Q_C = \widetilde{p} R \cdot \frac{1}{\Lambda_C} \cdot \beta_C(\gamma) \cdot K_{B,C}(\gamma)$$

In the mixed regime, output is given by:

$$Q_{NC} = [v p_H R \cdot I_{m,NC} + (1-v)\widetilde{p} R \cdot I_{m,C}] \cdot \int_0^{\bar{a}} (1-u)du$$

Again, combining with the credit market equilibrium, one obtains:

$$\widetilde{Q} = p(v) R \cdot \frac{1}{\widetilde{\Lambda}(v)} \cdot \widetilde{\beta}(\gamma) \cdot \widetilde{K}_B(\gamma)$$

where $p(v) = v p_H + (1-v)\widetilde{p}$.

Proof of Proposition 8

It is optimal to shift to the corruption regime if and only if:

$$Q_C \geq Q_{NC}$$

which is equivalent to:

$$\widetilde{p}R \bullet \frac{1}{V_C} \bullet \frac{1-K_{B,C}^2}{2} = p_H R \bullet \frac{1}{V_{NC}} \bullet \frac{1-K_{B,NC}^2}{2}$$

Thus the following relation holds when γ :

$$\frac{V_C}{V_{NC}} = \frac{\widetilde{p}}{p_H} \bullet \frac{1-K_{B,C}^2}{1-K_{B,NC}^2}$$

Define γ the cost of external capital such that $Q_C = Q_{NC}$.

At $\gamma = \gamma^*$, the economy will already have shifted to the corruption regime if and only if:

$$\frac{1}{V_C(\gamma^*)} > \frac{1}{V_{NC}(\gamma^*)}$$

or equivalently:

$$\frac{V_C(\gamma^*)}{V_{NC}(\gamma^*)} = \frac{\widetilde{p}}{p_H} \bullet \frac{1-K_{B,C}^2}{1-K_{B,NC}^2} < 1$$

but $\frac{\widetilde{p}}{p_H} \cdot \frac{1-K_{B,C}^2}{1-K_{B,NC}^2}$ is equivalent to: $(1-q)\Delta p \cdot (2\Omega + \Delta_{NC}) > p_H \frac{\Delta k \Delta B}{\Delta p} \cdot (q\Delta p + p_L)$, or to: $q < q_{\max}$ where:

$$q_{\max} = 1 - \frac{1}{\Delta p} \bullet \frac{p_H \Delta k \Delta B}{2b + \left(\frac{p_L}{p_H}\right)c + k_H \Delta B + \Delta k \Delta B}$$

it is straightforward to check that: $q_{\max} \geq \overline{q}$ if and only if:

$$\Delta p R \leq 3b + \left(\frac{p_L}{p_H} + 1\right) \bullet c + 2k_H \Delta B$$

Define $A(q) = \frac{\widetilde{p}}{p_H} \cdot \frac{1-K_{B,C}^2}{1-K_{B,NC}^2}$. The condition above can be expressed in the following way.
It is optimal to shift from the noncorruption to the corruption regime if and only if:

$$\frac{V_C}{V_{NC}} = A(q)$$

If $q = q_{\max}$, $A(q) = 1$ by definition. This means that the shift to the corruption regime will take place at the optimal value γ^*.
More generally, define the function $\varphi(A(q), \gamma)$ by

$$\frac{V_C(\varphi(A(q),\gamma),\gamma)}{V_{NC}(\varphi(A(q),\gamma),\gamma)} = A(q)$$

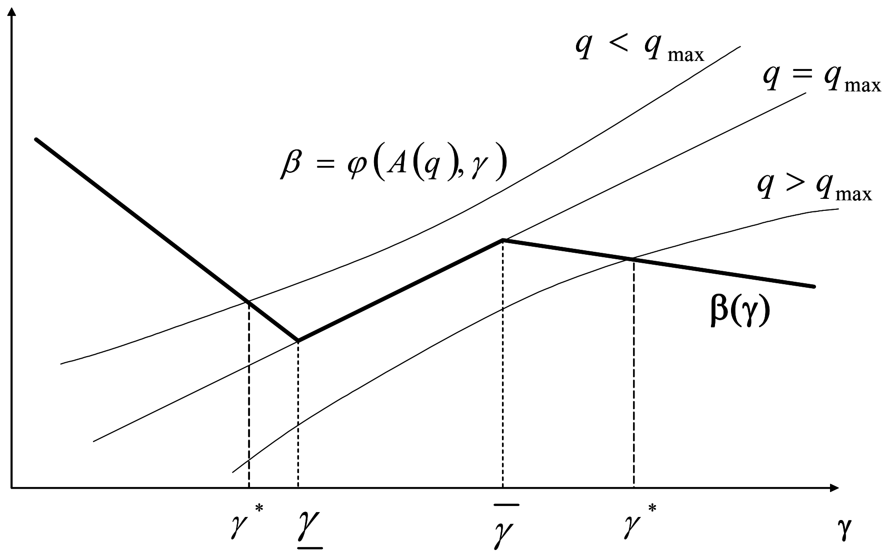
Hence, it is optimal to shift to the C regime if and only if

$$\beta \geq \varphi(A(q), \gamma)$$

where: (1) for all γ, $\varphi(A(q), \gamma) = \gamma \cdot \Psi(q)$ if $q < q_{\max}$; (2) for all γ, $\varphi(A(q), \gamma) > \gamma \cdot \Psi(q)$ if $q < q_{\max}$; and (3) for all γ, $\varphi(A(q), \gamma) < \gamma \cdot \Psi(q)$ if $q > q_{\max}$.

This is summarized on chart: (A2):

Chart A.2



Proof of Lemma 9:

From the equilibrium condition on the credit market in presence and absence of direct foreign investments, we know that, for all $\gamma \left(j \in \{NC, C\} \right)$:

$$\beta_{F,j}(\gamma, K_F) > \beta_j(\gamma)$$

if and only if $K_F > 0$. Moreover, the equilibrium return on bank credit β can be solved for directly. From the free entry condition: $\frac{\Omega}{V_{F(B,\gamma)}} = \gamma$, one obtains:

$$\beta = \beta^{FDI}\left(\bar{\gamma}\right)$$

where:

$$\beta^{FDI} = \frac{\gamma \cdot \Lambda_F}{\gamma - \Phi_F - \Omega}$$

The stock of foreign capital K_F is obtained by inverting the first definition of the bank return β, and plugging the second definition of β in:

$$K_F = \widehat{K}_F(\gamma) = \beta_{F,j}^{-1}(\beta^{FDI}(\gamma))$$

This function K_F is a decreasing function of γ. Indeed, using $\beta^{FDI} = \dfrac{\gamma \cdot \Lambda_F}{\gamma - \Phi_F - \Omega}$ the equilibrium relationship on the credit market can be written in the following way :

$$K_{B,j}^2 = \frac{\Lambda_j}{2\Omega} \cdot \left[1 - K_{B,j}^2\right] + H(K_F, \gamma)$$

With $H(K_F, \gamma) = \dfrac{K_F}{\Omega} \cdot (\gamma - \Phi_F - \Omega)$. Thus, the equilibrium stock of bank capital $K^F{}_{B,j}$ is given by

$$K_{B,j}^F(K_F, \gamma) = \sqrt{\frac{\Lambda_j + 2\Omega \cdot H(K_F, \gamma)}{2\Omega + \Lambda_j}} > \sqrt{\frac{\Lambda_j}{2\Omega + \Lambda_j}} = K_{B,j}(\gamma)$$

This implies that the stock of bank capital is larger in presence of foreign direct investment. The stock of bank capital can also be expressed in the following way:

$$K_{B,j}^F = \frac{\beta^{FDI} \cdot V_j(\beta^{FDI}, \gamma)}{\Omega} = \frac{\Lambda_F}{\Omega} \cdot \frac{\gamma - \Phi_j}{\gamma - (\Phi_F + \Omega)} - \frac{\Lambda_j}{\Omega}$$

with:

$$\frac{\partial K_{B,j}^F}{\partial \gamma} = \frac{\Lambda_F}{\Omega} \cdot \frac{\Phi_j - (\Phi_F + \Omega)}{[\gamma - (\Phi_F + \Omega)]^2} < 0$$

By combining the two expressions of the stock of bank capital:

$$K_{B,j}^F(\overset{-}{\gamma}) = Y\left(\overset{+}{K_F}, \overset{+}{\gamma}\right)$$

With. $Y\left(\overset{+}{K_F}, \overset{+}{\gamma}\right) \overset{def}{=} \sqrt{\dfrac{\Lambda_j + 2\Omega \cdot H(K_F, \gamma)}{2\Omega + \Lambda_j}}$

Hence,

$$\frac{dK_F}{d\gamma} = \frac{\frac{\partial K_{B,j}^F}{\partial \gamma} - \frac{\partial Y}{\partial \gamma}}{\frac{\partial Y}{\partial K_K}} < 0$$

Proof of Proposition 11:

(1) Impact of FDI on aggregate output if $\gamma > \overline{\gamma}_{FDI}$, or $\gamma < \underline{\gamma}$ **.**

For these values of γ, allowing foreign direct investment does not change the regime (C or NC). Aggregate output $Q_{FDI,NC}$ in presence of FDI in the noncorruption regime can be written in the following way:

$$\begin{aligned} Q_{FDI,NC} &= p_H R \cdot I_{m,NC} \cdot \int_0^{\overline{a}} (1-u)du + p_H R \cdot \frac{1}{V_F} \cdot K_F(\gamma) \\ &= \frac{p_H R}{2} \cdot \frac{1}{V_{NC}} \cdot \left[1 - \left(\frac{\beta V_{NC}}{\Omega} \right)^2 \right] + p_H R \cdot \frac{1}{V_F} \cdot K_F(\gamma) \end{aligned}$$

using the equilibrium relationship on the credit market:

$$\frac{\beta V_{NC}}{\Omega} = \frac{1}{2} \cdot \frac{\Lambda_{NC}}{\beta V_{NC}} \cdot \left[1 - \left(\frac{\beta V_{NC}}{\Omega} \right)^2 \right] + \frac{\Lambda_F}{\beta V_F} \cdot K_F$$

output in the noncorruption regime is:

$$Q_{FDI,NC} = p_H R \cdot \frac{1}{\Lambda_{NC}} \cdot \beta_{FDI}(\gamma) \cdot K_{B,NC}^F(\gamma) + p_H R \cdot \left(1 - \frac{\Lambda_F}{\Lambda_{NC}} \right) \cdot \frac{K_F(\gamma)}{V_F(\gamma)}$$

Recall that, in absence of FDI, aggregate output in the noncorruption regime is simply:

$$Q_{NC} = p_H R \cdot \frac{1}{\Lambda_{NC}} \cdot \beta_{NC}(\gamma) \cdot K_{B,NC}(\gamma)$$

We have shown that, in presence of FDI, for any γ, both the domestic return on bank loans β and the stock of bank capital K_B are larger than in the autarky equilibrium. Based on the two expressions above, and given that $\Lambda_F < \Lambda_{NC}$, one can check that these are sufficient conditions for output to be larger in presence of FDI than in autarky.

Similarly, in the corruption equilibrium, output is given by:

$$Q_{FDI,C} = \widetilde{p} R \cdot \frac{1}{\Lambda_C} \cdot \beta_{FDI}(\gamma) \cdot K_{B,C}^F(\gamma) + p_H R \cdot \left(1 - \frac{\widetilde{p}}{p_H} \frac{\Lambda_F}{\Lambda_C} \right) \cdot \frac{K_F(\gamma)}{V_F(\gamma)}$$

while output in autarky is:

$$Q_{FDI,C} = \widetilde{p} R \cdot \frac{1}{\Lambda_C} \cdot \beta_C(\gamma) \cdot K_{B,C}(\gamma)$$

As above, and given that $\Lambda_F < \Lambda_C$, output is larger in presence of FDI.

(2) Impact on aggregate output if $\gamma \in \left[\underline{\gamma}, \overline{\gamma}_{FDI} \right]$**:**

Let us focus on cases in which $\gamma \in \left[\underline{\gamma}_{FDI}, \overline{\gamma} \right]$, e.g. the economy is initially in the mixed regime in absence of FDI. In such a case, allowing FDI to flow in will not change the return on bank capital since the economy will remain in the mixed regime. Indeed, as long as the economy is in the mixed regime, domestic firms are, at the margin, indifferent between the collusion-proof contract and the contract allowing partial collusion $(\beta = \gamma \cdot \Psi(q))$. However, the entry of foreign direct investment, by crowding-out domestic firms on the credit market, will increase the proportion of domestic firms choosing contract with partial collusion. Since, by definition, the equilibrium return on bank capital remains unchanged for $\gamma \in \left[\underline{\gamma}_{FDI}, \overline{\gamma}\right]$, this implies that the increase in the demand for domestic loans from foreign firms is exactly compensated by a reduction in the demand for bank loans from domestic firms. Put differently, foreign capital crowds-out domestic entrepreneurial capital one for one over this interval, so the aggregate demand for bank capital does not change. Intuitively, the aggregate supply of bank capital will remain unchanged. Indeed, from the occupational decision between domestic banking and entrepreneurship, we know that $K_{B,j} = 1 - \overline{a}_j = \dfrac{\beta \cdot V_j(\beta,\gamma)}{\Omega}$ (recall that $V_{NC} = V_C$ in the mixed regime), so, as β remains unchanged, the size of the domestic banking system also remains unchanged as FDI is allowed to flow in freely. Thus, the only allocation effect of FDI is to induce a shift of domestic entrepreneurs towards financial contracts allowing partial collusion.

Define v_1 the share of entrepreneurs choosing the collusion-proof contract in absence of FDI, and v_2 the share of domestic entrepreneurs choosing the collusion-proof contract in presence of FDI. In equilibrium, the aggregate demand for bank capital must be the same in the two cases. Hence, the following relation must hold:

$$(v_1 I_{m,NC} + (1 - v_1) I_{m,C}) \bullet \int_0^{\overline{a}} (1-u)du$$
$$= (v_2 I_{m,NC} + (1 - v_2) I_{m,C}) \bullet \int_0^{\overline{a}} (1-u)du + I_{m,F} \bullet K_F$$

Moreover, from the equilibrium relation on the credit market in absence of FDI, we know that:

$$K_B^2 = \frac{1}{2} \cdot \frac{\widetilde{\Lambda}(v_1)}{\Omega} \cdot \left(1 - K_B^2\right)$$

By combining these two relationships, one obtains the following relationship between the relative size of the domestic banking system and FDI capital and the equilibrium proportions of collusion-proof contracts between domestic banks and domestic entrepreneurs:

$$\frac{K_B}{K_F} = \frac{\Lambda_F}{V_F(\gamma)} \bullet \frac{\widetilde{\Lambda}(v_1)}{(v_1 - v_2) \bullet (\Lambda_{NC} - \Lambda_C)} \qquad (1)$$

Aggregate output in absence of FDI is given by:

$$Q_1 = (v_1 p_H I_{NC} + (1-v_1)\widetilde{p} I_C) \cdot R \cdot \int_0^{\bar{a}} (1-u)du$$
$$= (v_1 p_H + (1-v_1)\widetilde{p}) \cdot R \cdot \frac{1}{V(\beta,\gamma)} \cdot \frac{1}{2} \cdot \left[1-(K_B)^2\right]$$

with $\frac{1}{V(\beta,\gamma)} = \frac{1}{V_{NC}(\beta,\gamma)} = \frac{1}{V_C(\beta,\gamma)}$. Combining with the equilibrium condition on the credit market, aggregate output can be written as:

$$Q_1 = (v_1 p_H + (1-v_1)\widetilde{p}) \cdot R \cdot \frac{1}{V(\beta,\gamma)} \cdot \left[\frac{\Omega K_B^2}{\widetilde{\Lambda}(v_1)}\right]$$

Similarly, output with free entry of direct foreign investment is given by:

$$Q_2 = (v_2 p_H + (1-v_2)\widetilde{p}) \cdot \frac{1}{V(\beta,\gamma)} \cdot R \cdot \int_0^{\bar{a}} (1-u)du + p_H R \cdot \frac{1}{V_F} \cdot K_F$$

which again simplifies into:

$$Q_2 = (v_2 p_H + (1-v_2)\widetilde{p}) \cdot R \cdot \frac{1}{V(\beta,\gamma)} \cdot \left[\frac{\Omega K_B^2}{\widetilde{\Lambda}(v_1)}\right] + p_H R \cdot \frac{1}{V_F} \cdot K_F$$

Define the expected equilibrium probability of success of projects in each case $i = 1, 2$:

$$p(v_i) = (v_i p_H + (1-v_i)\widetilde{p})$$

The change in aggregate output following the liberalization of FDI is given by:

$$\Delta Q = Q_2 - Q_1 = \underbrace{\underbrace{[p(v_2)-p(v_1)]}_{<0} \cdot \frac{R}{V(\beta,\gamma)} \cdot \left[\frac{\Omega K_B^2}{\widetilde{\Lambda}(v_1)}\right]}_{\text{indirect output loss due to an increase in collusion}} + \underbrace{p_H R \cdot \frac{1}{V_F} \cdot K_F}_{\text{direct output gain due to FDI}}$$

Combining with condition (A), and the fact that, $p(v_2) - p(v_1) = (v_2 - v_1)\cdot(p_H - \widetilde{p})$ we obtain the following simplified formula for the change in output:

$$\Delta Q = p_H R \cdot \frac{K_F}{V_F} \cdot \left[1 - \left(1 - \frac{\widetilde{p}}{p_H}\right) \cdot \left(\frac{\Omega K_B \Lambda_F}{\Lambda_{NC} - \Lambda_C}\right)\right]$$

Hence, aggregate output falls if and only if:

$$\Delta Q < 0 \Leftrightarrow 1 - \frac{\widetilde{p}}{p_H} > \frac{\Lambda_{NC} - \Lambda_C}{\Omega K_B \Lambda_F}$$

or equivalently:

$$1 - \frac{\widetilde{p}(q)}{p_H} > \frac{\frac{\Delta k \Delta B}{\Delta p} \cdot \widetilde{p}(q)}{\Omega \cdot \Lambda_F \cdot K_B(\Omega, \Phi_F, \Lambda_F, \Phi_{NC}, \Lambda_{NC}, \gamma)}$$

Therefore, a loss of aggregate output is more likely, the higher the risk of collusion (q small) and the lower the dispersion of collusion costs (Δk small: if $\Delta k \to 0^+$, the condition always holds).

Proof of Lemma 12 and Proposition 13:

in the noncorruption regime, firms prefer to borrow from a foreign bank if and only if: $V_{F(\gamma) \leq V_{NC}(\beta,\gamma)}$, where V_F is given by:

$$V_F = 1 - \tfrac{1}{\gamma}\Phi_F - \tfrac{1}{\gamma}\Lambda_F$$

with $\Phi_F = P_H\left(R - \dfrac{b + c_{FB}}{\Delta p}\right)$ and $\Lambda_F = \dfrac{p_L c_F B}{\Delta p}$.

This is equivalent to:

$$\tfrac{\beta}{\gamma} \geq \chi_{NC}$$

with

$$\chi_{NC} = \frac{\Lambda_{NC}}{p_H\left(\frac{c+k_H\Delta B}{\Delta p}\right) - c_F}$$

One can check that $\chi_{NC} > 1 \Leftrightarrow c_{FB} > c$.

Similarly, in the corruption regime, firms prefer to borrow from a foreign bank if and only if $V_F(\gamma) \leq V_C(\beta,\gamma)$, which is equivalent to:

$$\tfrac{\beta}{\gamma} \geq \chi_C$$

with

$$\chi_C = \frac{\Lambda_C}{\Delta p(1-q)\left(R - \frac{b}{\Delta p}\right) + \tilde{p}\left(\frac{c+k_L\Delta B}{\Delta p}\right) - c_F}$$

Note: $\Delta p(1-q)\left(R - \dfrac{b}{\Delta p}\right) + \tilde{p}\left(\dfrac{c + k_L \Delta B}{\Delta p}\right) - c_F > 0$ may not be met. In this case, foreign banks never enter corrupt banking systems (this simplifies the analysis).

Finally, one can easily check that

$$\chi_{NC} > \chi_C \Leftrightarrow \Delta p(1-q) \cdot \left(R - \frac{b+c+k_H\Delta B}{\Delta p}\right) < \tilde{p} \cdot \frac{\Delta k \Delta B}{\Delta p}$$

which is by definition the case for $q > \bar{q}$.

Proof of Proposition 14:

Equilibrium on the domestic credit market in regime $j \in \{NC, C\}$ is given by:

$$K_{B,j} = \lambda \cdot \int_0^{\bar{a}} I_{m,j}(\beta)(1-u)du$$

with $K_{B,j} = \int_{\bar{a}}^{1} du = 1-\bar{a}$, and $\bar{a}$ given by the occupational decision equation in regime *j*:

$$(1-\bar{a}) \cdot \Omega \cdot \left[\frac{\lambda}{V_j(\beta,\gamma)} + \frac{1-\lambda}{V_F(\gamma)} \right] = \beta$$

The equilibrium interest rate β is the solution of the following equation, obtained by combining the two previous ones:

$$F_j[\beta,\gamma,\lambda] = 0$$

where:

$$F_j[\beta,\gamma,\lambda] = \frac{\beta}{\Omega} \cdot \frac{1}{\frac{\lambda}{V_j(\beta,\gamma)} + \frac{1-\lambda}{V_F(\gamma)}} - \frac{\lambda\Lambda_j}{2\beta V_j(\beta,\gamma)} \cdot \left[1 - \left(\frac{\beta}{\Omega}\right)^2 \cdot \frac{1}{\left(\frac{\lambda}{V_j(\beta,\gamma)} + \frac{1-\lambda}{V_F(\gamma)}\right)^2} \right]$$

One can show that the equilibrium interest rate β has the same properties, relative to γ, as before. Moreover, one can show that:

$$\begin{cases} (\lambda \to 0) \Rightarrow \left(\beta \to 0 \text{ and } K_B \to 0\right) \\ (\lambda \to 1) \Rightarrow \left(\beta \to \beta^{aut} \text{ and } K_B \to K_B^{aut}\right) \end{cases}$$

where β^{aut} and K_B^{aut} are respectively the equilibrium interest rate and bank capital when all firms are homogenous and in absence of foreign banks.

A sufficient condition for the equilibrium interest rate β to rise following the entry of foreign banks is $\frac{\partial \beta}{\partial \lambda}\Big|_{\lambda \to 1} < 0$ (see chart).

Moreover,

$$\frac{\partial F}{\partial \lambda} = \frac{\Omega\beta\left(\frac{1}{V_F} - \frac{1}{V_j}\right)}{\left[\frac{\lambda\Omega}{V_j} + \frac{(1-\lambda)\Omega}{V_F}\right]^2} \cdot \left[1 + \frac{\lambda\Lambda_j}{\beta V_F} \cdot \frac{\beta}{\frac{\lambda\Omega}{V_j} + \frac{(1-\lambda)\Omega}{V_F}} \right]$$

if $\lambda \to 1, \frac{\partial F}{\partial \lambda} > 0$ if and only if: $\frac{1}{V_F} > \mu_j \frac{1}{V_j}$, with $\mu_j = 1 + \frac{\Omega}{1 + \frac{\Lambda_j}{\Omega}} > 1$.

Next,

$$\frac{\partial F}{\partial \beta} = \frac{(1-\lambda)\Omega\left(\frac{1}{V_F}-\frac{1}{V_j}\right)+\Omega\left(1-\frac{\Phi_j}{\gamma}\right)}{\left[\frac{\lambda\Omega}{V_j}+\frac{(1-\lambda)\Omega}{V_F}\right]^2} \cdot \left[1+\frac{\lambda\Lambda_j}{\beta V_j}\cdot\frac{\beta}{\frac{\lambda\Omega}{V_j}+\frac{(1-\lambda)\Omega}{V_F}}\right]$$
$$+\frac{\lambda\Lambda_j}{2\left(1-\frac{\Phi_j}{\gamma}\right)}\left[1-\left(\frac{\beta}{\Omega}\right)^2\cdot\frac{1}{\left(\frac{\lambda}{V_j(\beta,\gamma)}+\frac{1-\lambda}{V_F(\gamma)}\right)^2}\right]$$

hence,

$$\frac{\partial F}{\partial \beta} > 0 \text{ if } \frac{1}{V_F} > \frac{1}{V_j}$$

Finally,

$$\left(\frac{1}{V_F} > \mu_j\frac{1}{V_j}\right) \Leftrightarrow \beta \geq \eta_j\left(\overset{+}{\gamma}\right)$$

where: $\eta_j(\gamma) = \dfrac{\Lambda_j}{(1-\mu_j)+\frac{1}{\gamma}\left[\mu_j(\Phi_{FD}+\Lambda_{FB})-\Phi_j\right]}$

Proof of Lemma 15

The two multiplier functions are given by:

$$V_{NC}(\theta) = 1-\frac{p_H(\theta)}{\gamma}\cdot\left[R-\frac{b(1-\theta)+c+k_H\Delta B}{\Delta p(\theta)}\right]$$
$$-\frac{1}{\beta}\cdot\left[\frac{p_L(\theta)\cdot c+p_H(\theta)\cdot k_H\Delta B}{\Delta p(\theta)}\right]$$
$$= 1-\frac{\Phi_{NC}(\theta)}{\gamma}-\frac{\Lambda_{NC}(\theta)}{\beta}$$
$$V_C(\theta) = 1-\frac{\widetilde{p}(\theta)}{\gamma}\cdot\left[R-\frac{b(1-\theta)+c+k_L\Delta B}{\Delta p(\theta)}\right]$$
$$-\frac{1}{\beta}\cdot\left[\frac{p_L(\theta)\cdot c+p_H(\theta)\cdot k_H\Delta B-\widetilde{p}(\theta)\Delta k\Delta B}{\Delta p(\theta)}\right]$$
$$= 1-\frac{\Phi_C(\theta)}{\gamma}-\frac{\Lambda_C(\theta)}{\beta}$$

and:

$$\begin{cases} \overline{q}(\theta) = 1-\frac{p_H(\theta)}{\Delta p(\theta)}\cdot\frac{\Delta k\frac{\Delta B}{\Delta p(\theta)}}{\Delta k\frac{\Delta B}{\Delta p(\theta)}+R-\frac{c+b+k_H\Delta B}{\Delta p(\theta)}} \\ \Psi(q,\theta) = \frac{1}{1-\frac{(1-q)\cdot\Delta p(\theta)\cdot\left(R-\frac{c+b+k_H\Delta B}{\Delta p(\theta)}\right)}{\widetilde{p}(\theta)\Delta k\frac{\Delta B}{\Delta p(\theta)}}} \end{cases}$$

It is straightforward that. $\widetilde{p}'_H(\theta) > 0$ and $\Delta p(\theta) < 0$.

Next,

$$\frac{\partial}{\partial\theta}\left(\frac{\widetilde{p}(\theta)}{\Delta p(\theta)}\right) = \frac{qp_H(\theta)+(1-q)p_L(\theta)}{p_H(\theta)-p_L(\theta)} = q + \frac{1}{\frac{p_H(\theta)}{p_L(\theta)}-1}.$$

But:

$$\frac{\partial}{\partial\theta}\left(\frac{p_H(\theta)}{p_L(\theta)}\right) = \frac{(1-p_H)\cdot p_L(\theta)-p_H(\theta)(1-p_L)}{p_L(\theta)^2} = -\frac{\Delta p}{p_L(\theta)^2} < 0.$$

Therefore, $\frac{\partial}{\partial\theta}\left(\frac{\tilde{p}(\theta)}{\Delta p(\theta)}\right) > 0$. This implies that $\frac{\partial}{\partial\theta}\Psi(\theta,q) < 0$.

The proof of the second part can be derived in the following way. One simply needs to show that $\theta'(q) < 0$ where θ is given by:

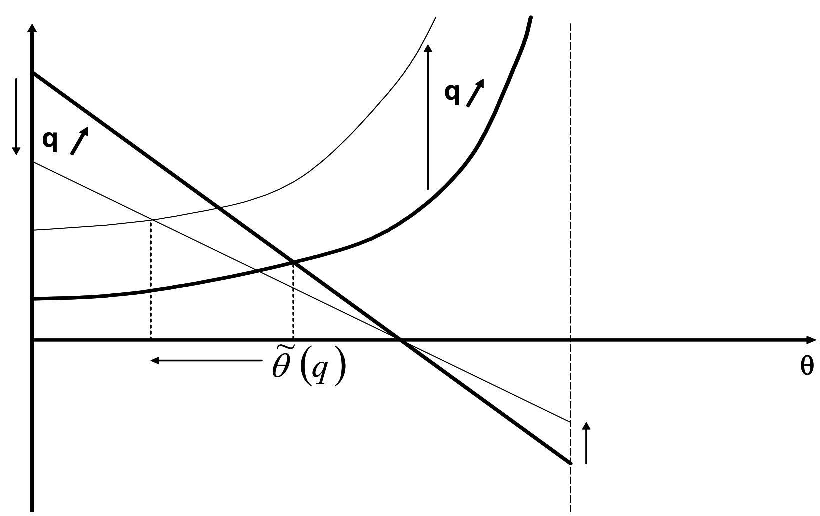
$$\frac{\widetilde{p}(\theta)}{\Delta p(\theta)}\Delta k\Delta B = (1-q)\cdot\Delta p(\theta)\cdot\left(R - \frac{c+b(1-\theta)+k_H\Delta B}{\Delta p(\theta)}\right)$$

or:

$$(1-q)\left[(1-\theta)\Delta p\left(R-\frac{b}{\Delta p}\right)-(c+k_H\Delta B)\right] = \left(q+\frac{p_L+(1-p_L)\theta}{\Delta p(1-\theta)}\right)\cdot\Delta k\Delta B$$

which can be represented graphically in the following way:

Chart A.3



Finally, $\theta'(q) < 0$ implies that $q'(\theta) < 0$ as well.

Proof of Lemma 16 and Proposition 17:

We know that in equilibrium,

$$\beta_C = \frac{\Omega K_{B,C}(\theta)+\Lambda_C(\theta)}{1-\frac{\Phi_C(\theta)}{\gamma}}$$

First, we can easily show that $\Lambda'_C(\theta) > 0$ Indeed,

$$\Lambda_C(\theta) = \frac{\tilde{p}(\theta)}{\Delta p(\theta)} \cdot (c + k_L \Delta B) - qc + (1-q) k_H \Delta B$$

and we have shown that $\frac{\tilde{p}(\theta)}{\Delta p(\theta)}$ is an increasing function of θ. This implies that, for all β, γ the demand for bank capital increases with θ. This results in a larger stock of bank capital in equilibrium (this can easily be shown from the proof of proposition 5). The impact on β is however ambiguous. Indeed, given the equilibrium value of β_C, a sufficient condition for $\beta_C'(\theta) > 0$ is therefore that $\Phi_C'(\theta) > 0$, with:

$$\Phi_C(\theta) = \tilde{p}(\theta) \cdot \left[R - \frac{b(1-\theta) + c + k_L \Delta B}{\Delta p(\theta)} \right]$$

This implies that:

$$\Phi_C'(\theta) = (1-\tilde{p}) \cdot \left[R - \frac{b(1-\theta)+c+k_L \Delta B}{\Delta p(\theta)} \right] - \tilde{p}(\theta) \cdot \frac{1}{(1-\theta)^2} \cdot \frac{c+k_L \Delta B}{\Delta p}$$

Therefore, after simplifications

$$\Phi_C'(\theta) > 0 \Leftrightarrow \theta \leq 1 - \sqrt{\frac{c+k_L \Delta B}{(1-\tilde{p}) \cdot (\Delta p R - b)}} = \bar{\theta}$$

References

Aitken, Brian, and Ann E. Harrison, (1999), "Do Domestic Firms Benefit from Foreign Direct Investment? Evidence from Venezuela," *American Economic Review* No. 89, pp. 605-18.

Aghion, Philippe, Bacchetta, Philippe, and Abhijit Banerjee, 2003, "*Financial Development and the Instability of Open Economies,*" Mimeo Harvard.

Alessandria, George, and Jun Qian, 2005, "Endogenous Financial Intermediation and Real Effects of Capital Account Liberalization," *Journal of International Economics*, No. 67, pp. 97-128.

Allen, Franklin and Douglas Gale, 2000, "Optimal Currency Crisis," Canerjee-Rochester Conference Series on Public Policy No. 53, pp. 177-230.

Bekaert, Geert, Campbell R. Harvey, and Christian Lundblad, 2005, "Does Financial Liberalization Spur Growth?" *Journal of Financial Economics*, No. 77, pp. 3-55.

Caballero, Ricardo J., and Arvind Krishnamurthy, 2001, "International and Domestic Collateral Constraints in a Model of Emerging Market Crises," *Journal of Monetary Economics,* No. 48, pp. 513-5

Calvo, Guillermo, 1998, "The Simple Economics of Sudden Stops," *Journal of Applied Economics*, No. 1 Vol. 1, pp. 35-54.

Chang, Roberto, and Andres Velasco, 2001, "A Model of Financial Crisis in Emerging Markets," *Quarterly Journal of Economics,* No. 116 Vol. 2, pp. 489-517.

Cho, Yoon Je, 2002, "Financial Repression, Liberalization, Crisis, and Restructuring: Lessons of Korea's Financial Sector Policies," Asian Development Bank Institute, Research Paper No.47.

Dell' Ariccia, Giovanni, and Robert Marquez, 2004, "Information and Bank Credit Allocation," *Journal of Financial Economics*, No. 71, pp.185-214.

Demirguc-Kunt, Asli and Enrica Detragiache, 2005, "Cross-Country Empirical Studies of Systemic Bank Distress: A Survey," IMF Working Paper 05/96 (Washington: International Monetary Fund).

Detragiache, Enrica, Tressel, Thierry, and Poonam Gupta, 2006, "Foreign Banks in Poor Countries: Theory and Evidence," IMF Working Paper 06/18 (Washington: International Monetary Fund).

Diamond, Douglas, 1984, "Financial Intermediation and Delegated Monitoring," *Review of Economic Studies* No. 51, pp. 393-414.

Dessi, Roberta, 2005, "Start-up Finance, Monitoring and Collusion," *The Rand Journal of Economics*, Vol.36, No. 2, pp. 255-274.

Fischer, Stanley, 1998, "Capital Account Liberalization and the Role of the IMF," Princeton Essays on International Finance No.207.

Fisman, Raymond, 2001, "Estimating the Value of Political Connections," *The American Economic Review*, No.4 Vol. 91 pp. 1095-1102.

Friedman, Eric, Simon Johnson and Todd Mitton, 2002, "Corporate Governance and Corporate Debt in Asian Crisis Countries," in: *Korean Crisis and Recovery*, Ed. David T. Coe and Se-Jik Kim, International Monetary Fund and Korea Institute for International Economic Policy.

Gormley, Todd, 2006a, "Open Capital Markets in Emerging Economies: The Social Costs and Benefits of Cream-Skimming," mimeo, (Saint Louis: Washington University, Olin School of Business).

———, 2006b,"Banking Competition in Developing Countries: Does Foreign Bank Entry Improve Credit Access?" mimeo, (Saint Louis: Washington University, Olin School of Business).

Harrison, Ann, and Margaret McMillan, 2003, "Does Direct Foreign Investment Affect Domestic Credit Constraints?" *Journal of International Economics*, No. 61, pp. 73-100.

Hellmann, T., Murdoch, K, and Joseph Stiglitz, 2000, "Liberalization, Moral Hazard in Banking, and Prudential Regulation: Are Capital Requirements Enough?" *American Economic Review,* No. 90 Vol. 1, pp. 147-65.

Holmstrom, Bengt, and Jean Tirole, 1997, "Financial Intermediation, Loanable Funds and the Real Sector," *Quarterly Journal of Economics,* No. 112 Vol. 3, pp. 663-91.

International Monetary Fund, 1999, "Financial Sector Crisis and Restructuring—Lessons from Asia," IMF *Occasional Paper* No. 188.

Johnson, S., Kochhar, K., Mitton, T., and N. Tamirisa, 2006, "Malaysian Capital Controls: Macroeconomics and Institutions," IMF Working Paper 06/51 (Washington: International Monetary Fund).

———, T. Mitton, 2003, "Cronyism and Capital Controls: Evidence from Malaysia," *Journal of Financial Economics*, No. 67, pp. 351-82.

———, Boone, P., Breach, A., and E. Friedman, 2000, "Corporate Governance in the Asian Financial Crisis," *Journal of Financial Economics*, No. 58, pp. 141-86.

Kaminsky, Graciela, and Carmen Reinhart, 1999, "The Twin Crises: The Causes of Banking and Balance-Of-Payments Problems," *The American Economic Review*, June, Vol.89, No. 3, pp. 473-500.

Khwaja, Asim Ijaz, and Atif Mian, 2005, "Do Lenders Favor Politically Connected Firms? Rent Provision in an Emerging Financial Market," *The Quarterly Journal of Economics*, No. 120 Vol. 4, pp. 1371-411.

Kose, M. Ayhan, Eswar Prasad, Kenneth Rogoff, and Shang-Jin Wei, 2006, "Financial Globalization: A Reappraisal," IMF Working Paper 06/189 (Washington: International Monetary Fund).

Laffont, Jean-Jacques, and Rochet, Jean-Charles, 1997, "Collusion in Organizations," *Scandinavian Journal of Economics*, Vol. 99, pp. 485-95.

Levine, Ross, 2005, "Law, Endowments and Property Rights," *Journal of Economic Perspectives*, No. 19 Vol. 3, pp.61-88.

———, 1997, "Financial Development and Economic Growth: Views and Agenda," *Journal of Economic Literature*, No. 35 Vol. 2, pp.688-726.

La Porta, Rafael, Lopez-de-Silanes, Florencio, Guillermo Zamarripa, 2003, "Related Lending," *Quarterly Journal of Economics*, pp. 231-68.

Maurer, Noel, and Stephen Haber, 2005, "Related Lending and Economic Performance: Evidence from Mexico," manuscript, Stanford University.

Mendoza, Enrique, 2006, "Lessons from the Debt-Deflation Theory of Sudden Stops," American Economic Review Papers & Proceedings, May 2006.

Mian, Atif, 2006, "Distance Constraints: The Limits of Foreign Lending in Poor Countries," *Journal of Finance*, No. 61, pp. 1465-1505.

Mendoza, Enrique, 2005, "Lessons from the Debt-Deflation Theory of Sudden Stops," mimeo IMF, (Washington: International Monetary Fund).

Prasad, Eswar, Kenneth Rogoff, Shang-Jin Wei, and M. Ayan Kose, 2003, "Effects of Financial Globalization on Developing Countries: Some Empirical Evidence," IMF *Occasional Paper* No. 220, (Washington: International Monetary Fund.)

Rajan, Raghuram and Luigi Zingales, 2003, "The Great Reversals: The Politics of Financial Development in the 20th Century," *Journal of Financial Economics*, Vol.69, Issue 1, pp. 5-50.

———, 1994, "Why Bank Credit Policies Fluctuate: A Theory and Some Evidence," *The Quarterly Journal of Economics*, Vol. 109, No. 2, pp. 399-441.

Rajan, Raghuram, 1992, "Insiders and Outsiders: The Choice Between Informed and Arm's-Length Debt," *Journal of Finance*, XLVII, pp. 393-410.

Ranciere, Romain, Tornell, Aaron and Frank Westermann, 2005, "Systemic Crises and Growth," mimeo IMF.

Rey, Helene and Philippe Martin, 2005, "Globalization and Emerging Markets: With or Without Crash?" forthcoming *American Economic Review*.

Schneider, Martin, and Aaron Tornell, 2004, "Balance Sheet Effects, Bailout Guarantees and Financial Crises," *Review of Economic Studies*, No. 71, pp. 883-913.

Tirole, Jean, 1992, "Collusion and the Theory of Organizations," in: Advances in Economic Theory Sixth World Congress Vol. II, Ed. Jean-Jacques Laffont, Cambridge University Press.

———, 1986, "Hierarchies and Bureaucracies: On the Role of Collusion in Organizations," *Journal of Law, Economics and Organization*, Vol. 2, pp. 181-214.

Tornell, A., and Westerman, F., 2002, "Boom-Bust Cycles in Middle Income Countries: Facts and Explanation," NBER Working Paper No. 9219 (Cambridge, Massachusetts: MIT Press).