Fire-Sale FDI

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Abstract

Capital flight associated with the onset of a financial crisis in a country is often accompanied by an inflow of capital associated with foreign direct investment (FDI). Our paper provides a theoretical framework for this puzzle, and draws wider conclusions on the welfare effects of foreign takeovers. When fundamentals deteriorate, the return that can be pledged to portfolio investors is limited by the incentive constraints of the managers. Only with direct control by investors can the surplus in the project be unlocked. It is precisely during crises that there is the conjunction of the loss of control by incumbent domestic managers, and the lack of domestic capital to take over failing firms. Foreign investors can take over failing firms and capture the surplus, even though they value the assets less. Our theory is consistent with FDI inflows during financial crises being associated with the acquisition of stakes that grant control, rather than simply being acquisitions of cashflow stakes, and is also consistent with the subsequent “flipping” of the FDI assets, where the asset is sold to investors with higher valuations once the crisis abates.

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1 Introduction

One characteristic feature of capital flows associated with some financial crises is the contrast between capital outflows associated with portfolio investments, and the inflows associated with foreign direct investment (FDI). Even as foreign investors and creditors run for cover as the crisis unfolds, there is an accompanying surge in direct inward investment where foreign investors take over firms in the crisis-stricken country. A recent paper by Aguiar and Gopinath (2005) documents the evidence from mergers and acquisitions data for Asian countries that underwent the 1997 Asian financial crisis. The phenomenon was also noted in an early anecdotal piece by Krugman (1998).

Table 1 reports the correlation between FDI and foreign portfolio investments (FPI) for the South East Asian countries over the period 1980-2005. In particular, it presents the correlation between FDI and FPI (and also FDI and only the debt component of FPI) for the non-crisis years of 1980-1995 and 2001-2005 and for the crisis years of 1996-2000. The pattern is striking. With the exception of Indonesia, there is a significant reversal in the sign of correlation between FDI and FPI: In non-crisis years, the two are positively correlated (and weakly negatively so for Malaysia in the case of FPI Debt), but in crisis years, they are strongly negatively correlated. This pattern is further illustrated in Figures 1 and 2 for South Korea and Philippines, respectively. Figures 1a and 2a plot the time-series of FDI and FPI flows for the two countries during 1990-2005. The sharp rise in FDI around 1996-1997 is markedly coincident with the steep drop in FPI. Figures 1b and 2b graphically illustrate the reversal of correlation between FDI and FPI Debt. The message is clear: The crisis and the non-crisis years behave as though there is some sort of a regime shift in the relationship between FDI and FPI.1

This divergent behavior of portfolio flows and FDI flows poses a puzzle for economists. On the surface, the drying up of foreign portfolio flows seems to indicate a lack of confidence in the economy of the crisis-stricken country. If so, then the same lack of confidence should also be exhibited with regard to FDI flows. The fact that FDI flows surge in the midst of a “flight to quality” strongly suggests a qualitative difference between portfolio flows and FDI flows. Our paper is an attempt to provide a theoretical framework for understanding this difference, and to explore the associated welfare questions. We begin by addressing the following pair of questions.

- Why do FDI flows surge even as portfolio flows reverse?
- Why do we observe such a juxtaposition especially during financial crises?

1Indeed, in both cases, with the significant increase in FDI, even the relevant range of the plot changes.
Finding the answers to these two questions also opens up a number of important follow-up inquiries. It turns out that by answering these two questions, we can address the frequently observed phenomenon of “flipping” by foreign investors, where the foreign acquirers who buy the assets during the crisis quickly re-sell the asset as soon as the crisis abates. Often, the acquirer is an entity that does not have the expertise or experience in running the type of business that it has acquired.

The takeover of banks by foreign acquirers in crisis-stricken countries is one example. In several Asian countries, the foreign takeover of banks has been the subject of much political controversy, leading to public debates on whether banking assets had been sold too cheaply to foreigners. The controversy is sharpened by the fact that in several high-profile cases of foreign entry into the banking sector, the acquiring entities were private equity firms with no obvious expertise or experience in the banking industry, as evidenced by the fact that the acquirers did not hold a banking license in their home country. One of our objectives in this paper is to shed light both on why such entry takes place, and on the overall welfare consequences of such entry. As we will see shortly, the welfare consequences can be quite subtle.

Our theoretical framework uses as its starting point the limits to the pledgeability of returns to investors when the stake comes without control of the firm. Without control, the incentive compatibility constraint associated with the manager’s moral hazard limits the extent to which the investor can recover the initial investment. At the ex-ante stage, this limits the external financing capacity of the firm. When fundamentals deteriorate, the tighter are the pledgeability constraints, and so even previously feasible investment in projects become infeasible. There is, therefore, an inefficiency associated with portfolio investment in that positive NPV projects are abandoned during the “flight to quality” that accompanies a deterioration in fundamentals.

However, when control can be assured, the surplus in the relationship can be unlocked by the investor, even when a portfolio investor without control would find the investment unprofitable. This is because control enables the investor to eliminate the inefficiency associated with the agency problem and thus increase the size of the cake. Indeed, this increase in the size of the cake may be so large that it overcomes whatever shortfall there is between the value that can be generated by the highest value investor and the value that is actually created by the foreign takeover. More specifically, due to the outflow of portfolio investment, assets are put up for liquidation at fire-sale prices, and, as a result, even when the foreign owner is inefficient, the takeover is profitable due to the low price at which the target is acquired. Thus, the surge of FDI is exactly what we would expect during a crisis, and why

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2 One recent case was the purchase and subsequent attempted sale of Korea Exchange Bank by the private equity firm, Carlyle Group.
FDI inflows coincide with an outflow of portfolio capital.

There are several observable implications of our model. First, FDI flows surge precisely when there is a flight to safety or an outflow of portfolio capital, and both phenomena have a common cause - namely, the aggravation of the firm-level moral hazard and resulting reduction in ability of firms to pledge future returns. The resulting fall in external financing - the outflow of portfolio capital - leads to fire sales. This, in turn, raises the shadow value of capital deployed to buy these assets, generating an inflow of FDI. Second, the FDI inflows that happen during financial crises should be associated with the acquisition of stakes that grant control, rather than simply acquisition of a cashflow stakes. There is ample evidence supporting this hypothesis, as we discuss in the Related Literature section. In this way, our framework allows us to address the key empirical feature that it is precisely during financial crises that we see the juxtaposition of the surge in FDI with the flight to quality in portfolio flows. And, finally, the “flipping” of assets acquired in fire sales once prices rebound is a direct consequence of our theory, since even inefficient foreign owners acquire assets during fire sales.

Most importantly, we are able to address the key welfare questions that are of most relevance to policy makers. The role of foreign capital in the overall resolution policy following a crisis has been a key thread in the policy discussions. We are able to provide a theoretical framework that can accommodate the competing forces. In particular, we argue that even though inflows of FDI may be associated with inefficiency of allocation, they might be the second best in a world where bailouts of firms are likely to be marred by political economy considerations.

The remainder of the paper is structured as follows. Section 2 presents the related literature and motivating evidence. Sections 3-4 present the model and its analysis. Section 5 presents extensions of the benchmark model. Section 6 provides an analysis of resolution of financial crises and Section 6 concludes. Proofs not contained in the text are contained in the Appendix.

2 Related literature and motivating evidence

We organize our discussion of related literature and motivating evidence around three key observable implications of our model: (i) FDI flows surge precisely when there is an outflow of portfolio capital; (ii) FDI inflows during financial crises are associated with the acquisition of stakes that grant control, rather than simply acquisition of a cashflow stakes; and (iii) “flipping” of assets acquired in fire sales once prices rebound.

On the first implication of our model, Krugman (1998) argues that the Asian financial
crisis, marked by massive flight of short-term capital and large-scale sell-offs of foreign equity holdings, has at the same time been accompanied by a wave of inward direct investment. While this inward investment to some extent reflected policy changes towards foreign ownership, it also reflected the perception of multinational firms that they could buy Asian companies at fire-sale prices. Krugman shows that a similar, though probably less marked, boom in inward direct investment took place in Latin America, especially in Mexico during 1995 and also for Argentina. His primary conclusion is that surging foreign direct investment resulting from fire sales has been an empirical regularity during recent financial crises.

A report prepared for the United Nations Conference on Trade and Development in October 1999 (UN (1999) from here on) provides further evidence for Krugman’s observations. The report shows that inflows into South Korea showed a big increase in 1998, five-fold compared to its average performance during the first half of the decade, followed by Thailand with an almost four-fold jump to $7 billion over the same period (see See Box 1 on page 15). The report says that when compared with foreign bank lending and foreign portfolio equity investment before and during the financial crisis, FDI flows into the crisis-stricken Asian countries had been remarkably resilient and FDI had been flowing into a wide range of industries in these countries. In Thailand, the only country for which systematic data by industry are available, significant FDI flows to financial institutions (which were about 10 times higher in 1997 than in 1996, and continued at a similar level in 1998) reflected significant buy-outs by foreign firms. During this period, the machinery and transportation equipment industry in Thailand had also witnessed increasing FDI inflows, both in absolute and in relative terms. The report argues that one of the main reasons for the resilience of FDI is that transnational corporations were taking advantage of cheaper asset prices in the crisis-stricken countries.

In a recent study, Aguiar and Gopinath (2005) provide a systematic empirical counterpart to the hypothesis raised by Krugman (1998). Given the importance of their findings for our paper, we describe them in detail. Overall, Aguiar and Gopinath show that the stability of

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3Krugman’s article provides interesting headlines from newspapers that talk about foreign entry due to fire-sale prices in crisis-stricken countries: “Korean companies are looking ripe to foreign buyers” (New York Times, Dec 27, 1997), “Some U.S. companies see fire sale in South Korea” (Los Angeles Times, Jan 25, 1998), “Some companies jump into Asia’s fire sale with both feet” (Chicago Tribune, Jan 18, 1998), “While some count their losses in Asia, Coca-Cola’s chairman sees opportunity” (Wall Street Journal, Feb 6, 1998). Krugman provides further anecdotal evidence for the fact that these sales were wide-spread across all industries, such as some related news about General Motors considering buying stakes in South Korean manufacturers of both automobiles and parts; Ford planning to increase its stake in Kia Motors; Seoul Bank and Korea First Bank being auctioned off to foreign bidders; Procter & Gamble purchasing a majority share of Ssanyong Paper Co., a producer of sanitary napkins, diapers, and kitchen towels; and Royal Dutch Shell negotiating to buy Hanwha Group’s oil refining company, the group that had already sold its half of a joint venture in chemicals to the German company BASF.
FDI inflows into emerging markets during crisis years contrasts with the sharp reversals in portfolio flow and bank lending. In particular, the investment flows into Asia following the crisis late 1990s and Mexico following the crisis in 1995 were suggestive of foreign firms taking advantage of low prices of real assets. They also document evidence that the high FDI flows into the crisis-stricken Asian countries had many of the features of fire-sales: median offer price to book ratios were substantially lower for cash-strapped firms’ purchase, especially in 1998 when national players had low liquidity, resulting in a boost in mergers and acquisitions (M&As) involving foreign players.

Specifically, they use a firm-level dataset to show that the number of foreign M&As in East Asia increased by 91% between 1996 and the crisis year of 1998 while domestic M&As declined by 27% over the same period. In regard to the price paid for an acquired firm, the median ratio of offer price to book value declined from 3.5 in 1996 to 1.3 in 1998. They also find that firm liquidity (proxied by cash flow or sales) played a significant and sizeable role in explaining both the increase in foreign acquisitions and the decline in the price of acquisitions during the crisis: While during non-crisis years high cash flow for a firm was weakly associated with the likelihood of its acquisition, in 1998 additional cash implied a lower probability of acquisition. Furthermore, in support of the hypothesis that cash-strapped firms sold at a steeper discount during the crisis, their cross-sectional regressions find that an additional dollar of cash in a firm had a larger impact on sale price in 1998 than in other years. In fact, the elasticity of price-to-book with respect to cash flow is roughly 0.7 in 1998 while negligible during the other years of the sample. Given that liquidity shocks are typically thought to be short-lived, they argue this is further support for the fire-sale hypothesis, raised by Krugman.

The second implication of our model is that as opposed to portfolio investments, FDI inflows during financial crises are associated with the acquisition of stakes that grant control, rather than simply acquisition of cashflow stakes. Acharya, Shin and Yorulmazer (2007) provide evidence in support of this by studying the M&A activity in the financial sector in the South East Asian countries during the period of 1996-2000. Like Aguiar and Gopinath (2005), they show (in their Table 2) that the crisis year of 1998 witnessed greater foreign acquisitions, but crucially that unlike non-crisis years, these acquisitions represented stakes of greater than 50 percent, and often the entire 100 percent. In contrast, the stakes during non-crisis years were far smaller and almost always lower than 50 percent.

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4 Also, UN (1999) shows that cross-border majority M&As in Asia increased by 28 percent in value in 1998.  
5 Chari, Ouimet and Tesar (2004) investigate shareholder value gains from developed-market acquisitions of emerging-market targets and show that acquirer returns increase when the cost of capital, proxied by sovereign bond spreads, increase, which is a common feature of financial crises. They show that including a dummy for whether the acquirer had the majority control after the acquisition renders the coefficient on the spread insignificant. However, combined with the evidence of Acharya, Shin and Yorulmazer (2007) and Aguiar and Gopinath (2005), we can say that it is more likely that the developed-market acquirers can get the
This ownership cum control view of FDI has also been taken by some recent studies analyzing the relative advantages of FDI and foreign portfolio investments (FPI) from the investors’ viewpoint.\(^6\) Goldstein and Razin (2006), for example, build a theoretical model where FDI investors take both ownership and control positions in the domestic firms and, hence, are in effect the managers of the firms under their control. Thus, when they invest directly through FDI, investors get more information about the fundamentals of the investment, and thereby can manage the project more efficiently, compared to their counterparts who invest indirectly through FPI. However, this generates a lemons problem in that when direct investors try to sell the investment before maturity, a low resale price results due to asymmetric information between the owner and the potential buyers. Hence, investors with high expected liquidity needs who may experience a greater extent of forced sales are more likely to choose less control, that is, they would prefer FPI over FDI. They also show that an increase in transparency between owners and managers, that is, an increase in corporate governance standards, improves the efficiency of portfolio investments and thus attracts more FPI.\(^7\) Our overall focus is different from their analysis in that we are concerned with the negative correlation of FPI and FDI (especially) during crisis, rather than on the overall composition of foreign investment.

Finally, on our third implication, there is ample evidence that during crises, outsiders (foreigners in our model) purchase assets to take advantage of fire-sale prices, but that once the economy recovers, assets change hands, going back their most efficient users. In summary, assets are “flipped.”

Using the SDC Platinum data on mergers and acquisitions, Figure 3 provides succinct evidence for such flipping in the banking and financial institutions sector during the South East Asian crisis. It defines a “flip” as the subsequent sale (2001 onwards) for an acquisition that occurred during the crisis period (1996-2000). We have employed the standard definition of a controlling acquisition as corresponding to a purchase of at least 10% of the target. The last acquirer during the crisis period is then used to classify all acquisitions into Domestic acquisitions and Foreign acquisitions.\(^8\) The figure plots the cumulative percentage of flipped deals in each class as a function of the number of years since the acquisition in the crisis period. While hardly any domestic deals get flipped in the first year, close to 2% of foreign deals get flipped, and the gap between the two only widens as more time elapses, especially

\(^6\)For an introduction to this issue, see Albuquerque (2003).

\(^7\)In a related paper, Goldstein, Razin and Tong (2007) empirically test the prediction of the theoretical model that source countries with higher probability of aggregate liquidity crises export relatively more FPI and less FDI, using data from 140 source countries for the period 1990-2004. They show that liquidity shocks have strong effects on the composition of foreign investment.

\(^8\)There are a total of 122 flips in our data, out of which 96 are by domestic acquirers and 26 by foreign acquirers. The total number of domestic and foreign acquisitions during the crisis is 884 and 98, respectively.
so after the fifth year. By ten years since acquisition, close to 14% of foreign deals get flipped as compared to less than 4% of domestic deals.

A few additional facts about the flipped deals are interesting and confirm our implications. First, on average as well as based on medians, the flip involves a sale of at least as much as the original acquisition of the target, and generally 25% greater, for both domestic and foreign flips. Second, over 60% of the flips by foreign acquirers involve sales to domestic acquirers. Third, the result on greater flipping by foreign acquirers during crisis is robust to employing 25% or 50% stakes being employed as the thresholds for identifying controlling acquisitions. And, finally, the result is much the same if the plot in Figure 3 is based on cumulative assets of targets involved in the flipped deals instead of simply the number of deals flipped.

While this evidence is quite telling, we also provide a discussion of some recent interesting anecdotes, mostly from South Korea, where foreign private equity firms acquired Korean banks during the restructuring period of the Asian financial crisis and sold them when the economy and the asset prices recovered.

Lone Star Funds, a Dallas-based buyout company, paid $1.4 billion in October 2003 for 50.5 percent of the Korea Exchange Bank (KEB). In January 2006, Lone Star announced plans to sell its controlling stake in KEB, the value of which has more than tripled since to about $4.9 billion. An article in the International Herald Tribune (January 13, 2006)\(^9\) argues that KEB shares surged to a six-year high as a recovery in consumer spending spurred economic growth and lenders cleaned up bad loans, and that rising stock markets in Asia offered buyout firms an opportunity to exit investments.\(^10\) The article also quotes Vincent Chan, a Hong Kong-based managing director at Jafco, a publicly traded Japanese venture capital firm: “It’s a good time to sell if the price is right. Private equity funds like this seek to exit whenever the market is good.” Another newspaper article in the Financial Times (April 5, 2007)\(^11\) reports Lone Star Funds’ plans to sell Kukdong Engineering & Construction and Star Lease, two South Korean companies. The article quotes John Grayken, chairman of Lone Star: “As the companies have been turned around, it is now time for them to be taken to the next level by a more strategic buyer. This is a normal step in the investment cycle of a private equity fund.”

Another interesting episode is with the experience of Newbridge Capital, a US private equity group that paid the Korean government $480m for the 49 percent shares of the Korea First Bank, South Korea’s eighth-largest bank. An article in the Financial Times (January 09, 2005)\(^12\) reveals that the private equity group agreed to sell its shares to Standard Chartered

\(^9\)International Herald Tribune, January 13, 2006, “Lone Star to sell its stake in Korea Exchange Bank”.
\(^10\)The same article points out that Lone Star had sold stakes in golf courses, a bank and a credit card company in Japan in the preceding four months.
\(^12\)Financial Times, Jan 09, 2005: “Standard Chartered to acquire Korea First Bank for $3.3bn”.
for an offer valuing the bank at about $3.3bn in cash. Newbridge Capital is reported to have made a nearly three-fold return on its initial investment.\(^{13}\) In a similar episode, the consortium of Carlyle Group, a Washington D.C. based global private equity investment firm, and J.P. Morgan Chase sold 36.6 percent of KorAm Bank, South Korea’s sixth-largest bank, to Citigroup Inc. in cash in February 2004 for a deal that valued the bank at $2.73 billion. The consortium of Carlyle and J.P. Morgan Chase has been reported to have made a return of 2.3 times its original KorAm investment of $430 million in 2000.

3 Model

The time line for our benchmark model is outlined in Figure 4.\(^{14}\) We consider an economy with three dates, indexed by \(t \in \{0, 1, 2\}\). We have a domestic economy with a measure of 1 of agents (firms). Firms are risk-neutral, and aim to maximize the sum of profit over time. Firms receive a unit of endowment at date \(t = 0\) and nothing else at other dates.

Each firm has two investment opportunities, one at date \(t = 0\) and the other at date \(t = 1\). Firms need one unit of funds to invest in a risky technology. The random return from these investments is denoted by \(\tilde{R}_t\), where \(\tilde{R}_t \in \{0, R_t\}\) with \(R_t > 1\), and \(\alpha_t\) is the probability of the high return from these investments. We assume that the returns in the two periods are independent, but leave open the possibility that \(\alpha_0 \neq \alpha_1\), and \(R_0 \neq R_1\).

There is the potential for moral hazard at the individual firm level. We assume that if the firm does not exert effort, then when the return is high, it cannot generate \(R_t\) but only \(R_t - \Delta\) and its owners enjoy a non-pecuniary benefit of \(B \in (0, \bar{\Delta})\). For the firm owners to exert effort, appropriate incentives have to be provided by giving them a minimum share of the future profits. We denote this share as \(\theta\) and get the incentive-compatibility constraint as:

\[
\alpha_t \theta R_t \geq \alpha_t \left[\theta (R_t - \bar{\Delta}) + B\right]
\]

(\text{IC})

Using this constraint, we can show that firm owners need a minimum share of \(\overline{\theta} = B/\bar{\Delta}\) to choose the good projects. Therefore, the firm can pledge at most a fraction \(\tau = (1 - \overline{\theta})\) of its future income if it is required to exert effort.\(^{15}\) We assume that at \(t = 0\), the entire share of the firm profits belongs to the firm owners, and therefore, moral hazard is not a concern.

\(^{13}\)Newbridge also exercised its rights to require the South Korean government, which controls the remaining 51 percent, to sell its shares as part of the same deal.

\(^{14}\)We use a model similar to the models in our previous work Acharya and Yorulmazer (2006) and Acharya, Shin and Yorulmazer (2007).

\(^{15}\)Note that, once the firm is left with a share that is less than \(\overline{\theta}\), it can as well pledge the entire future return of \((\alpha_t (R_t - \bar{\Delta}))\). For \(\bar{\Delta} > \sqrt{BR_t}\), this is less than \((\alpha_t (1 - \overline{\theta})R_t)\), the amount that can be pledged when the firm chooses the good project. Throughout, we assume that \(\bar{\Delta} > \sqrt{BR_t}\).
at the beginning. Hence, the expected profit for a domestic firm from the risky investment in the second period when it chooses the good project is

\[ p = [\alpha_1 R_1 - 1] \]

In addition to domestic firms, there are risk-neutral foreign investors who have funds amounting to \( w \) to purchase or finance domestic firms. Foreigners do not have the skills to generate the full value from domestic assets. This can be considered a metaphor for some form of expertise in domestic markets. It is also a simple way of introducing barriers to entry into the domestic market. To capture this formally, we assume that foreigners cannot generate \( R_t \) in the high state but only \( R_t - \Delta \).\(^{16}\)

The notion that foreigners may not be able to run the domestic assets as efficiently as the domestic firms is akin to the notion of \textit{asset-specificity}, first introduced in the corporate-finance literature by Williamson (1988) and Shleifer and Vishny (1992). In summary, this literature suggests that firms, whose assets tend to be \textit{specific}, that is, whose assets cannot be readily redeployed by firms outside of the industry (or country), are likely to experience lower liquidation values because they may suffer from “fire-sale” discounts in cash auctions for asset sales, especially when firms within an industry get simultaneously into financial or economic distress.\(^{17}\)

Finally, there is a regulator who employs policy instruments to resolve failures such as sale of assets through auctions, recapitalization of failed firms and regulation of foreign entry. Note that the second period is the last period in our model and there is no further investment opportunity. If the return from the first-period investment is high, then the firm operates one more period and makes the second-period investment using some of its return from the first investment. If the return is low, then the firm’s entire capital is wiped out. The failed firm needs to generate funds to undertake the second-period investment. Otherwise, it is put up for sale. The regulator, acting as the social planner, decides whether to let the surviving domestic firms (if any) and/or foreigners purchase failed firms or to recapitalize failed firms. If the regulator decides to recapitalize a firm, she provides it with 1 unit of funds to undertake the second-period investment at \( t = 1 \). The regulator may dilute the equity share of owners of recapitalized firms.

When domestic firms that had the high return from the first period investment want to acquire failed firms, they use some of their return from the first period investment and try

\(^{16}\)We assume that \( \alpha_t (R_t - \Delta) \geq 1 \), as otherwise the analysis is not interesting.

\(^{17}\)There is strong empirical support for this idea in the corporate-finance literature, as shown, for example, by Pulvino (1998) for the airline industry, and by Acharya, Bharath, and Srinivasan (2003) for the entire universe of defaulted firms in the US over the period 1981 to 1999 (see also Berger, Ofek, and Swary (1996) and Stromberg (2000)).
to raise funds from foreigners. However, because of moral hazard, firms cannot fully pledge their future income, but only a fraction $\tau$. Formally, a firm can have

$$l = ((R_0 - 1) + \tau \alpha_t R_t)$$

units of funds for the asset purchase since they need 1 unit of funds for their own investment.\(^{18}\)

Depending on the first period returns, some proportion $k$ of firms fail. Since firms are identical at $t = 0$, the proportion $k$ can be regarded as the state of nature at date 1.

4 Analysis

We analyze the model proceeding backwards from the second period to the first period.

Domestic firms with the high return (surviving firms, from now on) can operate for another period at $t = 1$. In particular, surviving firms use 1 unit of their return from the first investment to undertake the second-period investment. The probability of having the high return is equal to $\alpha_1$, and this probability is the same across firms. As this is the last period there is no further investment opportunity.

A firm which had the low return from the first period investment still has the second period investment ahead of it and it can pledge $\tau \alpha_1 R_1$ units of funds against its future return. Hence, if $\tau \bar{q} \geq 1$, where $\bar{q} = \alpha_1 R_1$ is the full expected return from the second period investment, that is, for $\alpha_1 \geq \alpha_1^* = 1/\tau R_1$, this domestic firm can generate the needed funds for the second period investment and does not need to be liquidated. However, for $\alpha_1 < \alpha_1^*$, the domestic firm cannot generate the necessary funds and is put up for sale.\(^{19}\) We summarize these points in terms of the following proposition.

**Proposition 1** There is a critical value of $\alpha_1$, given as $\alpha_1^* = 1/\tau R_1$, such that, if $\alpha_1 \geq \alpha_1^*$, a firm which had the low return from the first period investment can generate the needed funds for the second period investment. Otherwise, it is put up for sale.

Hence, asset sales take place only when $\alpha_1 < \alpha_1^*$.\(^{20}\) Next, we analyze asset sales and the

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\(^{18}\) Alternatively, we can allow firms to generate funds against the assets they purchase as well. This does not change our results qualitatively. See Appendix for a discussion. Furthermore, when foreigners have limited funds, due to lack of liquidity, firms may need to suffer a discount in the capital market so that they can only generate funds less than $\tau \bar{q}$ in the capital market.

\(^{19}\) We can allow for partial liquidation. In particular, the domestic firm can use $\tau \bar{q}$ units for the second period investment and liquidate the rest. This would not change our results qualitatively.

\(^{20}\) Note that for $\alpha_1 > \left(1/\bar{R}_1 - \Delta\right)$, domestic firms and foreigners are willing to pay a positive price for failed firms’ assets. Hence, for $\left(1/\bar{R}_1 - \Delta\right) < \alpha_1^*$, that is, for $\Delta < \bar{\theta} R_1$, foreigners (and surviving firms) are not willing to finance firms that had the low return, but are willing to purchase them.
resulting price function.

4.1 Sales and liquidation values

In examining the sale of failed firms’ assets, several interesting issues arise. First, surviving firms and foreigners may compete with each other to acquire failed firms. Second, unless the game for asset acquisition is specified with reasonable restrictions, an abundance of equilibria arises. Third, surviving domestic firms in fact may not have enough resources to acquire all failed firms.

To keep the analysis tractable and, at the same time, reasonable, we make the following assumptions:

(i) The regulator pools all failed firms’ assets and auctions these assets to the surviving firms and the foreigners.

(ii) Indexing the surviving firms as \( i \in [0, 1-k] \) and the foreigners as \( i = 2 \), each surviving firm and foreigners submit a schedule \( y_i(p) \) for the amount of assets they are willing to purchase as a function of the price \( p \) at which a unit of the asset is being auctioned, where \( y_i(p) \in [0, k] \).

(iii) The regulator cannot price-discriminate in the auction.

(iv) The regulator determines the auction price \( p \) so as to maximize the expected output, subject to the natural constraint that assets allocated to surviving firms and foreigners add up at most to the proportion of failed firms, that is, \( y_2(p) + \int_{i=0}^{1-k} y_i(p) \leq k \). Given the allocation inefficiency of selling assets to foreigners, it turns out that if the surviving firms and the foreigners pay the same price for the failed firms’ assets, the regulator allocates the maximum amount she can to the surviving firms.

(v) We focus on the symmetric outcome where all surviving firms submit the same schedule, that is, \( y_i(p) = y(p) \) for all \( i \in [0, 1-k] \).

First, we derive the demand schedule for surviving firms. The expected profits of a surviving firm from the asset purchase can be calculated as: \( y(p)\bar{p} - p \). Note that for each firm purchased, the acquiring firm needs 1 unit of funds to undertake the second period investment. The surviving firm wishes to maximize these profits subject to the resource constraint

\[ y(p) \cdot (1 + p) \leq l. \]  (1)

Hence, for \( p < \bar{p} \), surviving firms are willing to purchase the maximum amount of assets using...
their resources. Thus, the demand schedule for surviving firms is

\[ y(p) = \frac{l}{1 + p}. \]  

(2)

For \( p > \overline{p} \), the demand is \( y(p) = 0 \), and for \( p = \overline{p} \), \( y(p) \) is indeterminate. In words, as long as purchasing firms is profitable, a surviving firm wishes to use up all its resources to purchase assets.

We can derive the demand schedule for foreigners in a similar way. Note that, foreigners can generate only \( R_1 - \Delta \) in the high state. Let \( p = [\alpha_1(R_1 - \Delta) - 1] = [\overline{p} - \alpha_1\Delta], \) the expected profit for the foreigners from the risky asset in the second period.

For \( p < \overline{p} \), foreigners are willing to supply all their funds for the asset purchase. Thus, their demand schedule is

\[ y_2(p) = \frac{w}{1 + p}. \]

(3)

For \( p > \overline{p} \), the demand is \( y_2(p) = 0 \), and for \( p = \overline{p} \), \( y_2(p) \) is indeterminate. In the benchmark model, we assume that \( w \) is unlimited so that foreigners have enough funds to purchase all domestic firms at the price \( \overline{p} \) and take all the second period investments.\(^{21}\)

Next, we turn to the regulator’s allocation of the failed firms’ assets and the price function that results.

We know that in the absence of financial constraints, the efficient outcome is to sell the failed firms’ assets to surviving firms. However, surviving firms may not be able to pay the threshold price of \( \overline{p} \) for all assets. If prices fall further, these assets become profitable for foreigners and they participate in the auction.

The regulator cannot set \( p > \overline{p} \) since in this case we have \( y(p) = y_2(p) = 0 \). If \( p \leq \overline{p} \), and the proportion of failed firms is sufficiently small, surviving firms have enough funds to pay the full price for all failed firms’ assets. More specifically, for \( k \leq \overline{k} \), where

\[ \overline{k} = \frac{l}{l + (1 + \overline{p})} \]

(4)

the regulator sets the price at \( p^* = \overline{p} \). At this price, surviving firms are indifferent between any quantity of assets purchased. Hence, the regulator can allocate a share \( y(p^*) = \frac{k}{1-k} \) to each surviving firm.

\(^{21}\)This makes the analysis simple and does not affect any of our results. For \( w \in [1, (1 + \overline{p})] \), which we analyze in Section 5.1, we would have a fourth region where the price falls below \( \overline{p} \) and decreases as the proportion of failures increases. And for \( w < 1 \), in addition to the fourth region, we would have a fifth region where the price is 0 since there is not enough funds in the entire economy (surviving firms and foreigners) to undertake all domestic projects.
For moderate values of \( k \), surviving firms cannot pay the full price for all failed firms’ assets but can still pay at least the threshold value of \( \bar{p} \), below which foreigners have a positive demand. Formally, for \( k \in (\tilde{k}, \bar{k}] \), where

\[
\tilde{k} = \frac{l}{l + (1 + \bar{p})}
\]

the regulator sets the price at \( p^* = \frac{l}{\tilde{k}} - (1 + \bar{l}) \), and again, all assets are acquired by surviving firms. Note that, in this region, surviving firms use all available funds and the price falls as the proportion of failures increases. This effect is basically the cash-in-the-market pricing as in Allen and Gale (1994, 1998) and is also akin to the industry-equilibrium hypothesis of Shleifer and Vishny (1992) who argue that when industry peers of a firm in distress are financially constrained, the peers may not be able to pay a price for assets of the distressed firm that equals the value of these assets to them.

For \( k > \tilde{k} \), surviving firms cannot pay the threshold price of \( \bar{p} \) for all assets and profitable options emerge for foreigners. At this point, foreigners have a positive demand and are willing to supply their funds for the asset purchase. With the injection of foreigners’ funds, prices find the floor at \( \bar{p} \).

The resulting price function is formally stated in the following proposition and is illustrated in Figure 5.

**Proposition 2** The price as a function of the proportion of failed firms is

\[
p^*(k) = \begin{cases} 
\bar{p} & \text{for } k \leq \tilde{k} \\
\frac{l}{\tilde{k}} - (1 + l) & \text{for } k \in (\tilde{k}, \bar{k}] \\
\bar{p} & \text{for } k > \bar{k}
\end{cases}
\]

Note that as the probability \( \alpha_1 \) of the high return from the second period investment increases, the prices domestic firms and foreigners are willing to pay, \( \bar{p} \) and \( \bar{p} \), respectively, increase. Hence, overall, an increase in \( \alpha_1 \) increases the price \( p^*(k) \).

So far, we treated failures \( (k) \) and prospects of firms in the second period \( (\alpha_1) \) separately. However, these two are likely to be affected by a common macroeconomic factor so that when macroeconomic performance is poor, a larger proportion of firms go into distress (high \( k \)) and firms’ prospects worsen (low \( \alpha_1 \)).\textsuperscript{22} We model this in the following simple way. Let \( \phi \) be the parameter that represents the underlying macroeconomic factor such that an increase in \( \phi \)

\textsuperscript{22} It is likely that the return \( R_0 \) can be affected by the same macroeconomic factor in the same way as \( \alpha_1 \), which would only strengthen our results.
represents a better macroeconomic performance overall. Hence, we have $\frac{\partial k}{\partial \phi} < 0$ and $\frac{\partial \alpha_1}{\partial \phi} > 0$. To simplify the analysis further, let’s assume that the proportion of failed firms is the same as the probability $(1 - \alpha_1)$ for the low return from the second investment, that is, $k = (1 - \alpha_1)$. Hence, without loss of generality, we conduct the following analysis using the proportion of failures $k$ as our main parameter. In this case, we have:

$$p(k) = (1 - k)R_1 - 1 \quad \text{and} \quad p(k) = (1 - k)(R_1 - \Delta) - 1,$$

$$l(k) = (R_0 - 1) + \tau(1 - k)R_1 - 1.$$  

(7)

(8)

Note that both prices $\bar{p}(k)$ and $p(k)$ are decreasing in the proportion of failures $k$. The critical proportion of failures $\bar{k}$ and $\underline{k}$, where the actual price $p^*$ changes patterns, satisfy the following equalities:

$$(1 - \bar{k}) l = \bar{k}(1 + \bar{p}) \quad \text{and} \quad (1 - \underline{k}) l = \underline{k}(1 + p).$$

(9)

We can show that the equalities in (9) give us unique values of $\bar{k}$ and $\underline{k}$, where $\bar{k} < \underline{k}$. This gives us the following Corollary (see Figure 6).

**Corollary 1** For $k = (1 - \alpha_1)$, the price is as follows:

$$p^*(k) = \begin{cases} 
(1 - k)R_1 - 1 & \text{for} \quad k \leq \bar{k} \\
\frac{l}{k} - (1 + l) & \text{for} \quad k \in (\bar{k}, \underline{k}] \\
(1 - k)(R_1 - \Delta) - 1 & \text{for} \quad k > \underline{k}
\end{cases},$$

(10)

where $\bar{p}(k)$ and $p(k)$ are given in equations in expression (7), $\bar{k}$ and $\underline{k}$ are the unique values that satisfy equations in (9), and $l(k)$ is given in equation (8).

As the macroeconomy worsens (low $\phi$), the price of the assets fall. This occurs due to two separate reasons. First, as the macroeconomy weakens, the prospect of the second period projects worsen (low $\alpha_1$) so that the fundamental value $\bar{p}$ of the assets fall. Also, the proportion of failures $k$ increase when the macroeconomic performance is poor, and for high enough proportion of failures ($k > \bar{k}$) this leads to cash-in-the-market prices due to lack of liquidity in domestic markets.

### 4.2 Capital flow versus FDI

Krugman (1998) discusses the evidence of how the financial crises of the late 1990s were marked by the juxtaposition of massive capital flight and a wave of foreign direct investment (FDI). We will now show how our model can accommodate both features.

---

$^{23}$See Appendix for the proof.
Recall that for $\alpha_1 \geq \alpha^*_1$, even domestic firms that had the low return from the first period investment can generate the needed funds so that there are no asset sales. The more interesting case is when $\alpha_1 < \alpha^*_1$.

When $\alpha_1 < \alpha^*_1$, only surviving domestic firms can generate funds in the capital market. Hence, the total borrowing capacity of the domestic economy, denoted by $BC$, is equal to $(1-k)(\tau q)$. Note that $BC$ is decreasing in $k$, that is, the more severe the crisis, the less the borrowing capacity of the domestic economy. And, for $k \leq \bar{k}$, the price for failed firms’ assets is at least $p$ so that these assets are not profitable for foreigners. Hence, for $k \leq \bar{k}$, foreigners do not purchase any domestic assets, that is, $FDI$ is equal to 0.

Note that surviving firms may not need to utilize the entire borrowing capacity since the profits from the first period investment may be enough to keep the price at $p$ for low proportion of failures. In particular, for $k \leq \bar{k}$, where $\bar{k} = \frac{R_0-1}{p+R_0-1}$, surviving firms do not need to generate any additional funds so that the actual capital flow, denoted by $C$, is 0. For $k \in (\bar{k}, k]$, surviving firms generate funds for asset purchases which is given as $C = k(1+p) - (1-k)(R_0-1)$, which is increasing in $k$. And for $k > \bar{k}$, surviving firms use up their entire borrowing capacity so that $C = BC$.

However, for $k > \bar{k}$, all failed firms’ assets cannot be purchased by surviving firms at the price $p$ and profitable options emerge for foreigners for asset purchases. Formally, for $k > \bar{k}$, surviving firms can purchase only $\frac{(1-k)l}{p}$ units of failed firms’ assets and the rest, which is equal to $k - \frac{(1-k)l}{p}$ units, is acquired by foreigners at a price of $p$. Hence, for $k > \bar{k}$, we have $kp - (1-k)l$ units of foreign funds that enter the domestic economy in the form of FDI, that is, $FDI = k(l+p) - l$.

Note that $FDI$ is (weakly) increasing in $k$ while the borrowing capacity of the domestic economy is decreasing in $k$. Hence, as Krugman argues, there is a negative correlation between capital flows and foreign direct investment. We have the following Proposition. Also see Figure 7.

**Proposition 3** For $\alpha_1 < \alpha^*_1$, we have:

(i) $BC = (1-k)(\tau q)$ and $\frac{\partial BC}{\partial k} < 0$.

(ii) For $k \geq \bar{k}$, we have $FDI = [k(l+p) - l]$, and $\frac{\partial FDI}{\partial k} > 0$. For $k < \bar{k}$, we have $FDI = 0$.

(iii) For $k \geq \bar{k}$, we have $C = BC$, and for $k < \bar{k}$, we have $C = [k(p+R_0) - (R_0-1)]$, and $\frac{\partial C}{\partial k} > 0$. 

16
5 Extensions

5.1 Limited foreigner funds, illiquidity spillover and capital market breakdown

In the benchmark model, foreigners have funds of \( w \geq 1 + p \) so that they can purchase all domestic firms at the price \( p \) and will still have enough funds to finance all second period projects. In this extension, we relax that assumption and allow for limited funds for foreigners, that is, \( w \in (1, 1 + p) \). This allows us to derive interesting results on the costs of capital and illiquidity spillover between the asset and equity markets of domestic firms. Furthermore, we show that for low values of foreigners’ funds, during severe crises, the capital market completely breaks down and even surviving firms cannot generate funds in the capital market.

In this case, for the price of failed firms’ assets, we have a fourth region for \( k > \bar{k} \), where \( \bar{k} > \bar{k} \), and

\[
\bar{k} = \frac{(R_0 - 1) + w}{p + R_0},
\]

so that even with the injection of foreigners’ funds, the price cannot be sustained at \( p \) and the price is again strictly decreasing in \( k \).

Recall that in the benchmark model with unlimited foreigners’ funds, surviving firms issue \( \tau \) units of shares at a price \( q \) to generate funds of \( \tau q \) from foreigners. However, with limited foreigners’ funds, for \( k > \bar{k} \), the price for failed firms’ assets falls below \( p \) so that even foreigners can make positive profits by purchasing and running these assets. As a result, for \( k > \bar{k} \), foreigners would not be willing to pay the full price of \( q \) for a share of a surviving firm and surviving firms have to suffer some discount when they issue shares which leads to an increase in the cost of capital resulting from lack of liquidity. Below, we analyze this case formally.

Let \( s \) be the proportion of shares issued by a surviving firm. Because of moral hazard we have: \( s \leq \tau \). If a surviving firm issues \( s \) unit of shares at the price \( q(k) \) and purchases \( m \) units of assets at the price \( p^*(k) \), it makes an expected profit of \( m (\bar{p} - p^*(k)) - s (\bar{q} - q(k)) \).

Note that in any equilibrium, \( q(k) \) cannot exceed \( \bar{q} \). Thus, we have \( q(k) \leq \bar{q} \), and surviving firms issue equity just enough for the asset purchase, not more. Using this, we can state a surviving firm’s maximization problem as:

\[
\begin{align*}
\max_{m,s} & \quad m (\bar{p} - p^*(k)) - s (\bar{q} - q(k)) \\
\text{s.t.} & \quad s \cdot q(k) + (R_0 - 1) \geq mp^*(k) \\
& \quad s \leq \tau.
\end{align*}
\]
For $q(k) \leq (1 + p^*(k))$, surviving firms cannot make positive profits by issuing equity to purchase assets. Thus, when $q(k) \leq 1 + p^*(k)$, $s = 0$ and $m = \frac{R_0 - 1}{p^*(k)}$. And when $q(k) > 1 + p^*(k)$, surviving firms make positive profits from asset purchase using the funds they generate by issuing equity. Hence, they would like to issue as much equity as possible, that is, $s = \tau$.

We can state foreigners' maximization problem in a similar way:

$$\max_{x,y} \ x \left( p - p^*(k) \right) + y \left( q - q(k) \right)$$

s.t. $\quad xp^*(k) + yq(k) \leq w$ \hspace{1cm} (15)

where $x$ and $y$ represent the proportion of assets and the proportion of shares in surviving firms purchased by foreigners, respectively.

When the share price of surviving firms, $q(k)$, is relatively low compared to the price of failed firms' assets, $p^*(k)$, foreigners prefer to purchase shares of surviving firms. However, if $p^*(k)$ becomes low compared to $q(k)$, then foreigners may prefer to acquire the assets themselves.

When $p^*(k) > p$, foreigners do not want to purchase failed firms' assets and $x(q, p^*) = 0$. When $p^*(k) < p$, foreigners choose $x$ to maximize:

$$x \left( p - p^*(k) \right) + \left( \frac{w - xp^*(k)}{q(k)} \right) (q - q(k))$$

$$= x \left( p - p^*(k) \overline{q} \right) + w \left( \frac{\overline{q}}{q(k)} - 1 \right).$$

Thus, if $p^*(k) < p$ and $p \frac{q(k)}{p} > \overline{q} p^*(k)$, then foreigners use all their funds for the asset purchase, that is $x = \left( \frac{w}{p^*(k)} \right)$. When $p^*(k) < p$ and $p \frac{q(k)}{p} < \overline{q} p^*(k)$, foreigners use all their funds for the equity purchase, that is $y = \left( \frac{w}{q(k)} \right)$, and when $p \frac{q(k)}{p} = \overline{q} p^*(k)$, foreigners are indifferent between the equity and the asset purchase.

In equilibrium, demand for shares of surviving firms and assets of failed firms should equal their supply. Hence, we have the market clearing conditions:

$$(1 - k)s = y(q, p^*) \quad \text{(equity market)}$$

$$(1 - k)m + x(p_0, p^*) = k \quad \text{(asset market)}$$

Note that, as in the auction for assets, unless we specify conditions for allocating surviving firms’ shares to foreigners, an abundance of equilibria arises. We concentrate on the equilibrium where the participation of foreigners in the equity market is maximum, which results in the maximum price for assets. However, even in this setup, we show that for a
large proportion of failures, the share price of surviving firms falls below their fundamental value. Furthermore, for low values of foreigners’ funds, during severe crises, the capital market completely breaks down.

The price functions for failed firms’ assets and for shares of surviving firms are formally stated in the following proposition and are illustrated in Figure 8.\textsuperscript{24}

**Proposition 4** For limited foreigners’ funds, in equilibrium, we have:

\[
p^*(k) = \begin{cases} 
  \bar{p} & \text{for } k \leq \bar{k} \\
  \frac{l}{k} - (1 + l) & \text{for } k \in (\bar{k}, \bar{k}] \\
  \mu p^*(k) & \text{for } k \in (\bar{k}, \bar{k}] \\
  \frac{(R_0 - 1) + w}{k} - R_0 & \text{for } k > \bar{k} \end{cases} 
\]  \tag{20}

and

\[
q(k) = \begin{cases} 
  \bar{q} & \text{for } k \leq \bar{k} \\
  \mu p^*(k) & \text{for } k > \bar{k} \text{ and } w \geq w^* \\
  \mu p^*(k) & \text{for } k \in (\bar{k}, k^*] \text{ and } w < w^* \\
  \text{Market breaks down} & \text{for } k > k^* \text{ and } w < w^* 
\end{cases}
\]  \tag{21}

where \( \mu = \left( \frac{\bar{q}}{\bar{p}}, \frac{\bar{q}}{\bar{p}} \right), \ w^* = \left( \frac{\bar{q}}{\bar{p}} \right), \text{ and } k^* = \frac{((R_0 - 1) + w)}{\bar{p} - (\bar{p})R_0} \).

As Proposition 4 shows, the price of shares of surviving firms follow an interesting pattern. When the proportion of failures is large, cash-in-the-market pricing results in the price of assets falling below the threshold value of foreigners, \( p \). Since purchasing assets at such prices becomes profitable for foreigners, in equilibrium they need to be compensated for purchasing shares of surviving firms. As a result, share price of surviving firms falls below their fundamental value, \( q \). In other words, surviving firms can raise equity financing only at discounts. Thus, limited funds within the whole system and the resulting cash-in-the-market pricing affects not only the price of failed firms’ assets but also the price of shares of surviving firms. Furthermore, the discount surviving firms need to suffer in issuing equity is higher when the crisis is more severe (high \( k \)).

When foreigners’ wealth is low (\( w < w^* \)), the price for failed firms’ assets falls sufficiently. This, in turn, leads to high discounts in the capital market and for \( k > k^* \), the discount is so high that surviving firms cannot generate the needed funds by issuing shares, that is, \( 24 \) Proposition 4 states the results for the case \( w \geq \tau \bar{q} \). Similar results hold for \( w < \tau \bar{q} \).
\( q(k) < (1 + p^*(k)) \). Hence, the capital market breaks down completely (see Figure 9). Thus, for \( w < w^* \), at \( k = k^* \), the domestic economy experiences a structural break where foreign funds enter the domestic market only through FDI, that is, \( BC = C = 0 \). Formally, for \( k \in (\bar{k}, k^*] \), even though they need to suffer some discount, surviving firms can generate funds in the capital market and they can purchase \( \frac{(1-k)(R_0-1)+\tau q(k)}{p^*(k)} \) units of failed firms’ assets. The rest is acquired by foreigners, that is, \( FDI = k - \frac{(1-k)(R_0-1)+\tau q(k)}{p^*(k)} \). However, for \( k > k^* \), the capital market breaks down and the surviving firms are restricted to their first period profits for the asset purchase, that is, they can only purchase \( \frac{(1-k)(R_0-1)}{p^*(k)} \) units of failed firms’ assets. Hence, at \( k = k^* \), we have a structural break where \( FDI \) jumps to \( k - \frac{(1-k)(R_0-1)}{p^*(k)} \). Thus, for \( w < w^* \), we have

\[
\begin{align*}
FDI = \begin{cases} 
0 & \text{for } k \leq \bar{k} \\
\frac{(1-k)(R_0-1)+\tau q(k)}{p^*(k)} & \text{for } k \in (\bar{k}, k^*] \\
\frac{(1-k)(R_0-1)}{p^*(k)} & \text{for } k > k^*
\end{cases}
\end{align*}
\tag{22}
\]

### 5.2 Differential efficiency among foreigners

It is possible that actually some foreigners are more efficient than domestic firms but they may not be able to enter the domestic market due to barriers to entry for reasons such as protection for domestic industries and other political economy reasons. As a result, even efficient foreigners can enter these markets only when prices fall sufficiently. Here, we show that in the presence of barriers to entry, during crises, first the efficient foreigners enter, which may be beneficial for crisis-stricken countries. However, for severe crises, the price may fall so much that even inefficient foreigners may enter to take advantage of fire sales.\(^{25}\)

To model this, we introduce differential levels of efficiency among foreigners and a fixed cost of entry to the domestic markets. Suppose that foreigners have funds of \( 1 + p \), uniformly distributed among themselves, so that they can purchase all domestic firms at a price of \( p \) and can take all second period investments using their funds. Suppose that a proportion \( z < 1 \) of foreigners are of efficient type with total funds of \( w_e = z(1 + p) \). Efficient foreigners can generate a return of \( R_1 + \rho \), where \( \rho > 0 \), from the second period investment when the return is high. The remaining foreigners, a proportion \( 1 - z \), are inefficient and can only generate \( R_1 - \epsilon \), where \( \epsilon > 0 \). Hence, in the absence of entry costs, efficient foreigners are willing to pay a price of \( \bar{p} \) for failed firms, where

\[
\bar{p} = \alpha_1 (R_1 + \rho) - 1 > p.
\tag{23}
\]

\(^{25}\)See Krugman (1998) and Loungani and Razin (2001) for a discussion.
Suppose that there is a fixed cost $\gamma$ of entry to the domestic market, where $\gamma > \bar{p} - \bar{p}$. Hence, even efficient foreigners can enter only when prices fall below the price $\bar{p} = \bar{p} - \gamma$.

To keep the notation simple and aligned with the benchmark model, we assume that

$$\bar{p} = [\alpha_1 (R_1 - \rho) - 1] - \gamma,$$

so that inefficient foreigners enter the domestic market only when price is below $\bar{p}$.

As in the benchmark case, for $k \leq \tilde{k}$, the regulator sets the auction price at $p^* = \bar{p}$ and only domestic firms purchase failed firms. For moderate values of $k$, surviving firms cannot pay the full price for all failed firms’ assets but can still pay at least the threshold value of $\tilde{p}$, below which efficient foreigners have a positive demand. Formally, for $k \in (\tilde{k}, \hat{k}]$, where

$$\tilde{k} = \frac{l}{l + (1 + \tilde{p})},$$

the regulator sets the price at $p^* = \frac{l}{k} - (1 + l)$, and again, all assets are acquired by surviving firms.

For $k > \tilde{k}$, surviving firms cannot pay the threshold price of $\tilde{p}$ for all assets and profitable options emerge for efficient foreigners. At this point, efficient foreigners have a positive demand and are willing to supply their funds for the asset purchase. With the injection of efficient foreigners’ funds, prices can be sustained at $\tilde{p}$ for a while. In particular, for $k \in (\tilde{k}, \hat{k}]$, where

$$\tilde{k} = \frac{l + w_e}{l + (1 + \hat{p})},$$

the price stays at $\tilde{p}$. However, for $k > \tilde{k}$, the injection of efficient foreigners’ funds is not enough to keep the price at $\tilde{p}$ and the price starts to fall again. In particular, for $k \in (\tilde{k}, \hat{k}]$, where

$$\hat{k} = \frac{l + w_e}{l + (1 + \hat{p})},$$

the price is again strictly decreasing in $k$ and is given by $p^* = \frac{l + w_e}{k} - (1 + l)$.

For $k > \hat{k}$, surviving firms and efficient foreigners cannot pay the threshold price of $\hat{p}$ for all assets, inefficient foreigners have a positive demand and are willing to supply their funds for asset purchase. With the injection of inefficient foreigners’ funds, price is sustained at $\hat{p}$.

This price function is stated below and is illustrated in Figure 10.
Proposition 5  The price as a function of the proportion of failed firms is as follows:

\[
p^*(k) = \begin{cases} 
    \bar{p} & \text{for } k \leq \tilde{k} \\
    \frac{l}{k} - (1 + l) & \text{for } k \in (\tilde{k}, \hat{k}] \\
    \tilde{p} & \text{for } k \in (\tilde{k}, \hat{k}] \\
    \frac{l + \mu}{k} - (1 + l) & \text{for } k \in (\tilde{k}, \hat{k}] \\
    p & \text{for } k > \hat{k} 
\end{cases}
\]  

(28)

An interesting observation is that when the crisis is not very severe, that is, for \( k \in (\tilde{k}, \hat{k}] \), the crisis is efficient in the sense that it helps remove barriers for efficient foreigners to enter domestic markets. However, for very severe crises, while efficient foreigners enter these markets, also, inefficient foreigners enter to take advantage of fire sale prices, which results in a misallocation of domestic assets leading to welfare losses for domestic economies.

5.3 Recovery and flipping of assets

A common observation in many crises episodes is that during crises outsiders (foreigners in our model) purchase assets because of fire sale prices but once the economy recovers and insiders (domestic firms in our model) restore their financial health, assets change hands, going back to their most efficient users. We model this using a simple extension of our benchmark model. Suppose that we have another period, that is, we have date \( t = 3 \). Firms can take a risky investment at \( t = 2 \), similar to the two investments in the benchmark model. In particular, firms invest one unit in a risky technology at \( t = 2 \), where the return is realized at \( t = 3 \). The random return from these investments is denoted by \( \tilde{R}_2 \), where \( \tilde{R}_2 \in \{0, R_2\} \), and \( \alpha_2 \) is the probability of the high return from the investment. And, foreigners cannot generate \( R_2 \) in the high state but only \( (R_2 - \Delta_2) \).

Hence, insiders are willing to pay a price of \( p_2 = \alpha_2 R_2 - 1 \), whereas outsiders value these assets at \( p_2^* = \alpha_2(R_2 - \Delta_2) - 1 \), that is, outsiders are willing to sell these assets when price is such that \( p_2^* \geq p_2 \).

Suppose that a proportion \( \sigma \) of assets were purchased by outsiders at \( t = 1 \). Hence, insiders run a proportion \( (1 - \sigma) \) of assets. Also, suppose that a fraction \( k_1 \) of insiders have the low return from their investment taken at \( t = 1 \). An insider that had the high return has funds of \( l_1 = (R_1 - 1) + \tau \alpha_2 R_2 \) to be used for asset purchase. If a high proportion of insiders have the high return, then insiders have enough funds to pay the full price of \( \bar{p}_2 \) for failed

\[26\text{Note that outsiders have operated these assets for one period so they may learn how to run these assets efficiently. Therefore, we allow for } \Delta_2, \text{ possibly } \Delta_2 < \Delta.\]
firms as well as the firms that have been acquired by outsiders at \( t = 1 \), and assets change hands back to the efficient users. In particular, for \( k_1 \leq \bar{k}_1 \), where

\[
k_1 = \frac{l_1 - \sigma(l_1 + \bar{p}_2)}{(1 - \sigma)(l_1 + \bar{p}_2)},
\]

insiders purchase all failed firms and also buy back the assets that have been purchased by outsiders, at the fundamental price \( \bar{p}_2 \). This is associated with a full recovery from the crisis. Note that, \( \frac{\partial k_1}{\partial \sigma} > 0 \) so that full recovery is more difficult after a severe crisis.

For moderate values of \( k_1 \), surviving firms cannot pay the full price for all failed firms’ and outsiders’ assets but can still pay at least the threshold value of \( \bar{p}_2 \). So, for \( k \in (k_1, \bar{k}_1] \)

\[
\bar{k}_1 = \frac{l_1 - \sigma(l_1 + \bar{p}_2)}{(1 - \sigma)(l_1 + \bar{p}_2)},
\]

the regulator sets the price at \( p_2^* = \frac{(1-\sigma)(1-k_1)l}{(1-\sigma)k_1+\sigma} - 1 \), and again, all assets are acquired by insiders.\(^{27}\)

6 Resolution

To summarize the result from the previous analysis, for \( \alpha_1 \geq \alpha_1^* \), domestic firms that had the low return from the first period investment can generate the needed funds for the second period investment, in which case, there are no failures and no asset sales. For \( \alpha_1 < \alpha_1^* \), as a result of moral hazard at the individual firm level, domestic firms with the low return cannot generate the needed funds and they are put up for sale. In this case, when the proportion of failures is sufficiently small, \( k \leq \bar{k} \), all failed firms are purchased by surviving domestic firms. Since this allocation entails no welfare losses, the regulator does not have any incentive to intervene. In contrast, if \( k > \bar{k} \), then some of these firms are purchased by foreigners who are not the most efficient users of domestic assets. Hence, it may be optimal to recapitalize some domestic firms. In particular, the regulator compares the misallocation cost resulting from sales to foreigners with the cost of recapitalizing the failed firms. The regulator recapitalizes failed domestic firms as long as the marginal cost of recapitalization is less than the misallocation cost of \( (\alpha_1 \Delta) \).

To derive interesting results on the resolution of financial crisis, we slightly modify the way we model moral hazard, which helps us analyze the inefficiencies that may arise at the resolution stage, without affecting our previous results. In particular, the effort firm owners...

---

\(^{27}\)For slightly higher values of \( k_1 \), insiders can buy back only a fraction of the assets, that is, the recovery is partial. For higher values of \( k_1 \), more assets may be sold to outsiders, resulting in a deepening of the crises.
exert and, in turn, the return from the investments is decreasing in owners’ share of future profits in a continuous fashion. In particular, when owners have a share of $\theta$ of future profits, they generate a return of $R_t(\theta)$, where $R'_t > 0$, and $R_t(1) = R_t$ and $R_t(0) > \frac{1}{\alpha_t}$.\footnote{One way of providing a micro foundation for this is through the level of effort $e$ managers put into these projects, where the high return from the project increases in $e$, that is, $\frac{dR}{de} > 0$. Let the cost of effort be given by $\gamma e^2$. Hence the firm chooses the effort level that maximizes the net profit, that is, the firm’s problem is}

In order to analyze the regulator’s decision, we make the following assumptions:

(i) The regulator incurs a fiscal cost of $f(z)$ when it injects $z$ units of funds into these firms, where $f(0) = 0$. We assume this cost function is strictly increasing and convex: $f' > 0$ and $f'' > 0$. We do not model this cost for which we have in mind fiscal and opportunity costs to the regulator from providing funds with immediacy.\footnote{The provision of immediate funds to recapitalize firms entails fiscal costs for the regulator (assumed to be exogeneous to the model). These fiscal costs can be linked to a variety of sources: (i) distortionary effects of tax increases required to fund recapitalizations; and, (ii) the likely effect of huge government deficits on the country’s exchange rate, manifested in the fact that banking crises and currency crises have often occurred as “twins” in many countries (especially, in emerging market countries). Ultimately, the fiscal cost we have in mind is one of immediacy: Government expenditures and inflows during the regular course of events are smooth, relative to the potentially rapid growth of liabilities during crisis periods.}

(ii) If the regulator decides not to recapitalize a failed firm, the firm is sold at the market-clearing price. Thus, when the regulator recapitalizes $b$ of the $k$ failed firms, the fiscal cost incurred is $f(b)$.

The crucial difference between recapitalization and sales is that recapitalization entails an opportunity cost to the regulator in fiscal terms.

(iii) The regulator can take an equity share $\beta$ in the recapitalized firm(s). If the recapitalized firm has a high return from the second investment (which has a probability of $\alpha_1$), then the regulator gets back $\beta(R(\theta))$, where $\theta = (1 - \beta)$, at $t = 2$. Ex post, such dilution of a recapitalized firm’s equity is merely a transfer from the firm owners to the regulator. However, as argued before, if the regulator takes a share $\beta$, only a share of $\theta = (1 - \beta)$ is left for firm owners and the firm generates a return of $R_1(1 - \beta)$, which is decreasing in $\beta$.\footnote{The provision of immediate funds to recapitalize firms entails fiscal costs for the regulator (assumed to be exogeneous to the model). These fiscal costs can be linked to a variety of sources: (i) distortionary effects of tax increases required to fund recapitalizations; and, (ii) the likely effect of huge government deficits on the country’s exchange rate, manifested in the fact that banking crises and currency crises have often occurred as “twins” in many countries (especially, in emerging market countries). Ultimately, the fiscal cost we have in mind is one of immediacy: Government expenditures and inflows during the regular course of events are smooth, relative to the potentially rapid growth of liabilities during crisis periods.}

$$\max_e V = \theta \alpha R(e) - \frac{\gamma e^2}{2}.$$ For $R''(e) < 0$, the first-order condition (FOC) gives the level of effort $e^*$ that maximizes the expected profit, where $e^* = \left(\frac{\theta \alpha}{\gamma}\right) R'(e^*)$. We have

$$\text{sign} \left( \frac{\partial V}{\partial e} \right) = \text{sign} \left( \frac{\partial^2 V}{\partial e \partial e} \right) = \text{sign} \left( R'(e) \right).$$

Hence, we have $\frac{\partial V}{\partial e} > 0$ when $R'(e) > 0$.\footnote{The provision of immediate funds to recapitalize firms entails fiscal costs for the regulator (assumed to be exogeneous to the model). These fiscal costs can be linked to a variety of sources: (i) distortionary effects of tax increases required to fund recapitalizations; and, (ii) the likely effect of huge government deficits on the country’s exchange rate, manifested in the fact that banking crises and currency crises have often occurred as “twins” in many countries (especially, in emerging market countries). Ultimately, the fiscal cost we have in mind is one of immediacy: Government expenditures and inflows during the regular course of events are smooth, relative to the potentially rapid growth of liabilities during crisis periods.}
We characterize the optimal policy under these assumptions. The regulator’s objective is to maximize the total expected output of the economy net of any recapitalization or liquidation costs, denoted by $E(\Pi)$. As argued before, the regulator never intervenes when $k \leq \overline{k}$. For $k > \overline{k}$, the regulator’s problem is to choose $b$ to maximize\textsuperscript{30}:

\[ E(\Pi(b)) = \alpha_1 R_1 - f(b) - \left( k - \frac{(1 - k)y}{1 + p} - b \right) (\alpha_1 \Delta), \tag{31} \]

where $f(b)$ is the fiscal cost of recapitalizing $b$ firms and $\left( k - \frac{(1 - k)y}{1 + p} - b \right) (\alpha_1 \Delta)$ is the misallocation cost resulting from sales to foreigners. The FOC for the regulator’s problem can be written as $f'(b) = (\alpha_1 \Delta)$.

Note that the marginal cost of recapitalizing the $b^{th}$ firm, denoted by $f'(b)$, is increasing in $b$. Hence, there is a maximum proportion of firms, denoted by $\overline{b}$, up to which the recapitalization costs are smaller than misallocation costs. Formally, $\overline{b}$ satisfies the FOC condition: $f'(\overline{b}) = (\alpha_1 \Delta)$.

The maximum proportion of firms that can be acquired by the surviving domestic firms is $(1 - k)y(p)$, where $y(p) = \frac{1}{1 + p}$. Thus, the regulator recapitalizes $b^*(k)$ firms, where

\[ b^*(k) = \min \{ \overline{b}, [k - (1 - k)y(p)] \}. \tag{32} \]

Firms are chosen randomly between the three options of being sold to surviving domestic firms, recapitalized, or sold to foreigners. We state the optimal regulatory policy formally in a proposition:

**Proposition 6** For $\alpha_1 \geq \alpha_1^*$, the regulator does not intervene. For $\alpha_1 < \alpha_1^*$, the optimal regulatory policy is as follows:

(i) When $k \leq \overline{k}$, surviving domestic firms purchase all failed firms and the regulator does not intervene.

(ii) When $k > \overline{k}$, the regulator recapitalizes $b^*(k)$ of the $k$ failed firms, where $b^*(k)$ is given by (32) and does not take any share in recapitalized firms ($\beta^* = 0$). The firms to be recapitalized are chosen randomly with equal probability.

The optimal policy has the intuitive property that in states with a large number of failures, the regulator is forced to recapitalize some of the failed firms and/or sell some of the domestic firms to foreigners (Figure 11).

\textsuperscript{30}Note that the return $R_t$ is decreasing in the share $\beta$ the regulator takes in a recapitalized firm. Hence, the regulator does not take any share in the recapitalized firms. See Section 6.1 we analyze the effect of regulatory capture in the share the regulator takes in recapitalized firms.
6.1 Resolution with regulatory capture

Note that the return from the risky investment is highest when owners have the entire share of future profits, since \( \frac{dR_t}{d\theta} > 0 \). However, the regulator may enjoy some private benefit from having a stake in these firms such as providing jobs to their cronies in these firms.

In our model foreigners are inefficient in running domestic firms, when domestic owners run these firms efficiently. However, due to the private benefits the regulator (government, politician) enjoys, the resolution of failures may result in an outcome that is worse than the outcome when foreigners acquire these firms. We model this in the following simple way.

Suppose that the regulator gets some utility from his capture in a recapitalized firm, which can be written as \( \beta(R_t(\beta)) \).\(^{31}\) We assume that the regulator’s utility is a convex combination of the net expected total output and his capture in recapitalized firms. In particular, the regulator’s problem is to choose \( b \) and \( \beta \) to maximize:

\[
E(\Pi(b, \beta)) = \lambda \left[ (1 - b)(\alpha_1 R_1) + b(1 - \beta)(\alpha_1 R_1(\beta)) - f(b) - \left( k - \frac{(1 - k)l}{(1 + p)} - b \right) \alpha_1 \Delta \right] + (1 - \lambda) b \beta(\alpha_1 R_1(\beta)),
\]

where \( \lambda \in [0, 1/2] \).

The regulator recapitalizes \( b \) of the \( k \) failed firms, taking a share of \( \beta \) in each recapitalized firm, incurring a fiscal cost of \( f(b) \), where the total output generated by the recapitalized firms is \( b(1 - \beta)(\alpha_1 R_1(\beta)) \).\(^{32}\) The misallocation cost from sales to foreigners is given as \( \left( k - \frac{(1 - k)l}{(1 + p)} - b \right) (\alpha_1 \Delta) \).

Note that for \( \lambda = 1/2 \), the regulator does not care about his capture and maximizes the net expected total output. For \( \lambda < 1/2 \), the regulator has some concern for his capture, where this concern increases as \( \lambda \) decreases.

The FOCs for the regulator’s maximization problem can be written as:

\[
\Pi_b : \lambda \left[ -\alpha_1 R_1 + (1 - \beta)(\alpha_1 R_1(\beta)) - f'(b) + (\alpha_1 \Delta) \right] + (1 - \lambda) (\beta(\alpha_1 R_1(\beta))) = 0 \tag{34}
\]

\[
\Pi_\beta : \lambda \left[ -b(\alpha_1 R_1(\beta)) + b(1 - \beta)(\alpha_1 R_1(\beta)) \right] + (1 - \lambda) b [\alpha_1 R_1(\beta) + \beta(\alpha_1 R_1'(\beta))] = 0 \tag{35}
\]

We have the following formal proposition.

**Proposition 7.** The resolution policy with regulatory capture is as follows:

\(^{31}\)To simplify notation, we use \( R_t(\beta) \) rather than \( R_t(\theta) \), where \( \theta = (1 - \beta) \). Hence, \( R_t' < 0 \) and \( R_t(0) = R_t \), from now on.

\(^{32}\)Note that as a result of regulatory capture, the regulator may choose to recapitalize firms even when \( k \leq \bar{k} \). For simplicity, we rule out this option and restrict the regulator to intervene only when \( k > \bar{k} \).
(i) When $k \leq \overline{k}$, surviving domestic firms purchase all failed firms and the regulator does not intervene.

(ii) When $k > \overline{k}$, the regulator recapitalizes $\hat{b}^* (\lambda, k)$ failed firms, where

$$\hat{b}^* (\lambda, k) = \min \left\{ \hat{b}(\lambda), [k - (1 - k)y(p)] \right\},$$

and takes a share of $\hat{\beta}(\lambda)$ in each recapitalized firm, where $\hat{b}(\lambda)$ and $\hat{\beta}(\lambda)$ satisfy the FOCs given by equations (34) and (35). The firms to be recapitalized are chosen randomly with equal probability. We have $\frac{\partial \hat{b}}{\partial \lambda} < 0$ and $\frac{\partial \hat{\beta}}{\partial \lambda} < 0$. Furthermore, \(\lim_{\lambda \to 0} \hat{b} = \infty\) and \(\lim_{\lambda \to 0} \hat{\beta} = -\frac{R_t(\beta)}{R_t'(\beta)} > 0\).

Note that as the regulator’s concern for her capture increases, that is, as $\lambda$ decreases, she takes larger shares in recapitalized firms, that is, her share $\hat{\beta}(\lambda)$ is decreasing in $\lambda$. And, as $\lambda$ decreases, she prefers to recapitalize a larger proportion of failed firms, that is, $\hat{b}(\lambda)$ is decreasing in $\lambda$ (see Figures 12 and 13).

Furthermore, as $\lambda$ approaches 0, the regulator becomes concerned only about her capture. As a result, she takes a share $\hat{\beta} = -\left(\frac{R_t(\beta)}{R_t'(\beta)}\right)$ in each recapitalized firm that maximizes her capture in a recapitalized firm, and to maximize her overall capture, she is willing to recapitalize all failed firms (that cannot be purchased by surviving firms).

### 6.2 Welfare analysis

In this section, we compare welfare with regulatory capture and welfare with no regulatory intervention and show that for a robust set of parameter values, a policy of no regulatory intervention results in a higher welfare compared to the welfare under the resolution policy with regulatory capture.

Without any regulatory intervention, all failed firms that cannot be purchased by surviving firms are sold to foreigners. This results in an expected welfare of $E(\Pi^f)$ for $k > \overline{k}$, which is given as

$$E(\Pi^f(k)) = \alpha_1 R_1 - \left( k - \frac{(1 - k)y(p)}{(1 + p)} \right) (\alpha_1 \Delta).$$

(37)

With regulatory capture, the regulator recapitalizes $\hat{b}^* (\lambda, k)$ firms and takes a share of $\hat{\beta}(\lambda)$ in each of them, where $\hat{b}^* (\lambda, k)$ and $\hat{\beta}(\lambda)$ are as given in Proposition 7. This gives us

$$E(\Pi^c(k)) = (1 - \hat{b}^*) (\alpha_1 R_1) + \hat{b}^* \left( \alpha_1 R_1(\hat{\beta}) \right) - f(\hat{b}^*) - \left( k - \frac{(1 - k)y(p)}{(1 + p)} - \hat{b}^* \right) (\alpha_1 \Delta).$$

(38)

We have

$$E(\Pi^c) - E(\Pi^f) = -\hat{b}^* \left( \alpha_1 \left( R_1 - R_1(\hat{\beta}) \right) \right) - \left[ f(\hat{b}^*) - \hat{b}^* (\alpha_1 \Delta) \right].$$

(39)
Note that the first expression is negative. Hence a sufficient condition for \( E(\Pi^c) < E(\Pi^f) \) is

\[
\frac{f(\hat{b}^*)}{b^*} \geq (\alpha_1 \Delta),
\]

(40)

that is, the average fiscal cost of a recapitalization being higher than the misallocation cost. We have following formal Proposition.

**Proposition 8** For \( \left( \frac{f(\hat{b}^*)}{b^*} \right) \geq (\alpha_1 \Delta) \), where \( \hat{b}^*(\lambda, k) \) is defined as in equation (36), we have \( E(\Pi^f) > E(\Pi^c) \). For \( f(1) > (\alpha_1 \Delta) \), there is a critical \( \tilde{b} < 1 \) such that \( \left( \frac{f(\tilde{b})}{b} \right) = (\alpha_1 \Delta) \). Let \( \tilde{k} = \left( \frac{\tilde{b} + y(p)}{1 + y(p)} \right) < 1 \), and let \( \tilde{\lambda} \) be such that \( \hat{b}(\tilde{\lambda}) = \tilde{b} \). For \( f(1) > (\alpha_1 \Delta) \), we have the following result: for \( k > \tilde{k} \) and \( \lambda < \tilde{\lambda} \), we have \( \left( \frac{f(\hat{b}^*)}{b^*} \right) > (\alpha_1 \Delta) \), and, therefore, \( E(\Pi^f) > E(\Pi^c) \).

While sales to foreigners result in misallocation costs, recapitalization by a regulator that is concerned about her capture results in inefficiencies. Hence, if the regulator is sufficiently concerned about her capture (for \( \lambda < \tilde{\lambda} \)), the regulator resorts to excessive recapitalization and recapitalizes more than a proportion \( \tilde{b} \) of failed firms (see Figure 14).\(^{33}\) This, in turn, results in a worse outcome compared to sales to foreigners from a social welfare standpoint.

## 7 Concluding Remarks

Our theoretical framework focuses attention on the key difference between portfolio capital flows and FDI arising from the difference in terms of their implications for control. The recognition of the role for control has important implications for our understanding of financial flows in economic development. For instance, one of the key predictions of our model would be that the FDI inflows that happen during financial crises should be associated with the acquisition of stakes that grant control, rather than simply acquisition of a cashflow stakes. Indeed, there is considerable evidence that FDI inflows at the time of the Asian financial crisis were associated with equity stakes that went over the 50% threshold, thereby crossing the control threshold. The theoretical framework also highlights the negative relationship between the two types of flows. FDI flows take over precisely when portfolio flows dry up.

After the Asian financial crisis, the evils of short term debt financing were much decried, and stable FDI financing was held up as the model for how development can be financed. Our results suggest that the prescription to use FDI as a matter of course has limited usefulness.

\(^{33}\)Note that recapitalizing a proportion of firms that is greater than \( \tilde{b} \) is only possible for a sufficiently large proportion of failures, that is, for \( k > \tilde{k} \).
as a general policy dictum. Ironically, it is only when matters are very bad that FDI really comes into its own. The role of foreign takeovers has generated much controversy in policy circles as well as in the media. Our paper is a small step in trying to come to grips with the underlying economics.

References


Appendix

Generating funds against purchased assets: A surviving firm has $R_0$ units of funds from the first period investment. If this firm purchases $m$ units of assets, it can pledge a total of $[(1 + m)(\tau_1 R_1)]$ units of funds. The firm needs $(1 + (1 + p)m)$ units of funds for the asset purchase and the financing of its own as well as the purchased projects. Hence, we have the financial constraint of the firm as

$$R_0 + (1 + m)(\tau q) \geq 1 + (1 + p)m. \quad (41)$$

Thus, the firm can purchased at most $m^*$ units of failed firms’ assets at the price $p$, where

$$m^* = \left( \frac{l}{1 + p - \tau q} \right), \text{ and } l = (R_0 - 1) + (\tau q). \quad (42)$$

Proof of uniqueness of $k$ and $\bar{k}$: From equation (9), at $k = k$, we have:

$$(1 - k) l = k(1 + \bar{p}). \quad (43)$$

For $k = (1 - \alpha_1)$, we can write this as

$$(R_0 - 1) + \tau (1 - k) R_1 = k R_1. \quad (44)$$

Note that the left hand side is decreasing in $k$ whereas the right-hand side is increasing in $k$. Thus, there exists a unique $k$ that satisfies equation (9).\(^{34}\) The same analysis can be used to show the existence of a unique $\bar{k}$. \(\Box\)

Proof of Proposition 4:

The steps of the proof are organized in a way that lays down the results for different regions of the proportion ($k$) of failed firms.

Note that because of moral hazard, maximum units of equity that can be issued by a surviving firm is $\tau$. Thus, for $w \geq \tau q$, the funds within the foreigners is sufficient to keep the share price $q(k)$ at $\bar{q}$, had they decided to use their funds for the purchase of these shares.

1. For $k \leq k$, liquidity within the surviving firms and the liquidity they can raise by issuing shares to foreigners is sufficient to sustain the price for the failed firms’ assets at $\bar{p}$, that is, $(1 - k) l \geq k(1 + \bar{p})$.

\(^{34}\)Note that we need $(R_0 - 1) \leq R_1$ for $k < k$.  
31
Since \( p^*(k) = \bar{p} > p \), we have \( x = 0 \) and \( m = \left( \frac{k}{1-k} \right) \). Each surviving firm issues enough equity, at \( q(k) = \overline{q} \), to purchase \( \left( \frac{k}{1-k} \right) \) units of failed firms’ assets at \( p^*(k) = \bar{p} \). Thus, we have

\[
(R_0 - 1) + s\overline{q} = \left( \frac{k}{1-k} \right) (1 + \bar{p}),
\]

which gives us:

\[
s = \left( \frac{k(p + R_0) - (R_0 - 1)}{(1-k)\overline{q}} \right) \quad \text{and} \quad y = \left( \frac{k(p + R_0) - (R_0 - 1)}{\overline{q}} \right).
\]

(2) For \( k < k \leq \overline{k} \), liquidity within the surviving firms and the liquidity they can raise through equity issuance from foreigners is sufficient to sustain \( p^*(k) \) at least at \( \bar{p} \), that is, \((1 - k)l \geq k(1 + p)\).

Since \( p^*(k) \geq \bar{p} \), we have \( x = 0 \) and \( m = \left( \frac{k}{1-k} \right) \). Each surviving firm issues enough equity, at \( q(k) = \overline{q} \), to purchase \( \left( \frac{k}{1-k} \right) \) units of failed firms’ assets at \( p^*(k) = (\frac{1}{k} - (1 + l)) \), that is,

\[
(R_0 - 1) + s\overline{q} = \left( \frac{k}{1-k} \right) (1 + p^*(k)),
\]

which gives us

\[
s = \tau \quad \text{and} \quad y = (1 - k)\tau.
\]

(3) For \( \overline{k} < k \leq \overline{k} \), liquidity within the surviving firms and the liquidity they can raise through equity issuance from foreigners plus the liquidity left with the foreigners (since \( w > \tau\overline{q} \)), which add up to \([(1 - k)R_0 + w] \), is sufficient to sustain \( p^*(k) \) at least at \( \bar{p} \). Each surviving firm issues the maximum possible equity, at \( q(k) = \overline{q} \), which gives us \( s = \tau \) and \( y = (1 - k)\tau \). Note that each surviving firm can acquire \( m = \left( \frac{l}{1+p} \right) \) units of failed firms’ assets and the rest is acquired by foreigners, that is, \( x = \left( k - \frac{(1-k)l}{1+\bar{p}} \right) \).

(4) For \( k > \overline{k} \), total liquidity within the surviving firms and the liquidity they can raise through equity issuance from foreigners plus any liquidity left with foreigners is no longer sufficient to sustain \( p^*(k) \) at \( \bar{p} \). Since \( p^*(k) < \bar{p} \), foreigners may prefer to participate in the market for failed firms’ assets.

If \( p^*(k) < \bar{p} \) and \( \frac{p}{q}(k) > \overline{q} \) \( p^*(k) \), then foreigners use all their funds for the asset purchase, that is \( x = \left( \frac{w}{p^*(k)} \right) \).

If \( p^*(k) < \bar{p} \) and \( \frac{p}{q}(k) < \overline{q} \) \( p^*(k) \), then foreigners use all their funds for the equity purchase, that is \( y = \left( \frac{w}{q^*(k)} \right) \), and if \( \frac{p}{q}(k) = \overline{q} \) \( p^*(k) \), foreigners are indifferent between the purchase of surviving firms’ shares and the failed firms’ assets.

Now, let \( \mu = \left( \frac{\overline{q}}{\bar{p}} \right) \). Whether foreigners buy shares of the surviving firms or the assets of the failed firms, their entire funds \( w \) eventually end up in the asset market. Hence, for \( k > \overline{k} \),
the price for failed firms’ assets is given as:

\[
p^*(k) = \left( \frac{(1-k)(R_0 - 1) + w}{k} \right) - 1. \tag{45}
\]

If the price \( q(k) \) of a share is higher than \( \mu p^*(k) \), then foreigners are better off buying the assets of failed firms, rather than buying shares of the surviving firms, that is, \( y = 0 \) and \( x = \left( \frac{w}{p^*(k)} \right) \). Hence, we cannot have an equilibrium where \( q(k) > \mu p^*(k) \) and \( y = 0 \).

First, we look at the equilibrium where surviving firms can generate some funds in the capital market and show that they need to suffer some discount. Foreigners are willing to purchase shares of surviving firms, that is, \( y > 0 \), only when \( q(k) \leq \mu p^*(k) \) and surviving firms are willing to issue equity, that is, \( s > 0 \), only when \( q(k) \geq (1 + p^*(k)) \). For \( \mu p^*(k) \geq (1 + p^*(k)) \), there exists such an equilibrium. Note that \( \mu p^*(k) \geq (1 + p^*(k)) \) if and only if

\[
\left( \frac{q}{p} - 1 \right) p^*(k) \geq 1. \tag{46}
\]

Note that \( p^*(k) \) is decreasing in \( k \) and assumes its minimum value of \( (w - 1) \) at \( k = 1 \). Hence, for \( w \geq w^* \), where \( w^* = \left( \frac{q}{q} \right) \), we can have an equilibrium where surviving firms can generate funds in the capital market.

Note that, depending on the relative bargaining power of surviving firms and foreigners, \( q(k) \) may vary. Under our assumption that the participation of foreigners in the equity market is maximum, we get \( q(k) = \mu p^*(k) < \bar{q} \). Note that as \( k \) increases, both the price of assets \( p^*(k) \) and the price of shares \( q(k) \) decrease and move hand-in-hand. As a result of limited liquidity and fire-sale prices in the asset market, surviving firms can generate capital only at a discount, where the discount is higher when the crisis is more severe (high \( k \)).

Next, we analyze the equilibrium where the capital market completely shuts down. For \( q(k) > \mu p^*(k) \), we have \( y = 0 \). For the equity market to clear in this case, we need \( s = 0 \). This is possible when \( q(k) < (1 + p^*(k)) \). Hence, we can have an equilibrium where the capital market completely shuts down when \( \mu p^*(k) < (1 + p^*(k)) \). Note that \( \mu p^*(k) < (1 + p^*(k)) \) if and only if

\[
\left( \frac{\bar{q}}{p} - 1 \right) p^*(k) < 1. \tag{47}
\]

Recall that \( p^*(k) \) is decreasing in \( k \). Hence, for \( w < w^* \), there exists a critical proportion of failures \( k^* \), where

\[
k^* = \left( \frac{(\bar{q} - p)}{p + (\bar{q} - p) R_0} \right), \tag{48}
\]
such that, for \( k > k^* \), the capital market completely shuts down, that is, \( y = 0 \) and \( s = 0 \).

**Proof of Proposition 7:** From the FOC for \( b \) in equation (34), we have

\[
(\alpha_1 \Delta) - f'(b) = -\alpha_1 \left[ \left( \frac{\beta + \lambda - 2\lambda\beta}{\lambda} \right) R_1(\beta) - R_1 \right] \tag{49}
\]

Using the Envelope Theorem we get:

\[
\text{sign} \left( \frac{\partial \hat{b}}{\partial \lambda} \right) = \text{sign} \left( \frac{\partial^2 \Pi}{\partial b \partial \lambda} \right). \tag{50}
\]

We have

\[
\frac{\partial^2 \Pi}{\partial b \partial \lambda} = \left[ -\alpha_1 R_1 + (1 - \beta) (\alpha_1 R_1(\beta)) - f'(b) + (\alpha_1 \Delta) \right] - \beta (\alpha_1 R_1(\beta)). \tag{51}
\]

Plugging in the expression for \([(\alpha_1 \Delta) - f'(b)]\) from the FOC in equation (49), we get

\[
\frac{\partial^2 \Pi}{\partial b \partial \lambda} = -\alpha_1 R_1 + (1 - 2\beta) (\alpha_1 R_1(\beta)) - \alpha_1 \left[ \left( \frac{\beta + \lambda - 2\lambda\beta}{\lambda} \right) R_1(\beta) - R_1 \right] \tag{52}
\]

\[
= -\alpha_1 R_1(\beta) \left( \frac{\beta}{\lambda} \right) < 0. \tag{53}
\]

Hence, we have \( \frac{\partial \hat{b}}{\partial \lambda} < 0 \). That is, as \( \lambda \) decreases, the regulator’s concern for her capture increases and this results in the regulator recapitalizing more failed firms.

As \( \lambda \) approaches 0, the regulator cares only about her capture and chooses to bail out all failed firms.

From the FOC for \( \beta \) given in equation (35), we have

\[
R_t(\beta) = - \left[ \frac{\lambda + \beta - 2\lambda\beta}{1 - 2\lambda} \right] R'_t(\beta) \tag{54}
\]

Using the Envelope Theorem we get:

\[
\text{sign} \left( \frac{\partial \hat{\beta}}{\partial \lambda} \right) = \text{sign} \left( \frac{\partial^2 \Pi}{\partial \beta \partial \lambda} \right). \tag{55}
\]

We have

\[
\frac{\partial^2 \Pi}{\partial \beta \partial \lambda} = b\alpha_1 \left[ -2 R_1(\beta) + (1 - 2\beta) (R'_t(\beta)) \right]. \tag{56}
\]
Plugging in the expression for $R_1(\beta)$ from the FOC in equation (54), we get

$$\frac{\partial^2 \Pi}{\partial \beta \partial \lambda} = b\alpha_1 \left[ \left( \frac{2[\lambda + \beta - 2\lambda\beta] + (1 - 2\beta)(1 - 2\lambda)}{1 - 2\lambda} \right) (R_1'(\beta)) \right] = \left( \frac{b\alpha_1}{1 - 2\lambda} \right) R_1'(\beta) < 0. \quad (57)$$

Hence, we have $\frac{\partial b}{\partial \lambda} < 0$. That is, as $\lambda$ decreases, the regulator’s concern for her capture increases and this results in the regulator taking a larger share in recapitalized firms.

For $\lambda = 1/2$, the regulator does not care about her capture. In that case, we have the FOC as $R_1'(\beta) = 0$ and the regulator takes a share of $\beta^* = 0$ (Proposition 6). And as $\lambda$ approaches $0$, the regulator cares only about her capture and the FOC becomes $R_1'(\beta) = -\beta R_1''(\beta)$, where $\beta = -\frac{R_1'(\beta)}{R_1''(\beta)} > 0$. ♦

**Proof of Proposition 8:** Let $g(b) = \left( \frac{f(b)}{b} \right)$, where $g(b)$ is the average fiscal cost of recapitalizing $b$ firms. We have

$$\frac{dg}{db} = \frac{f'(b)b - f(b)}{b^2} > 0,$$

since $f$ is convex and $f(0) = 0$. Hence, if $f(1) > (\alpha_1 \Delta)$, then there is a critical value of $b$, denoted by $\hat{b}$, such that $g(\hat{b}) = (\alpha_1 \Delta)$, and $g(b) > (\alpha_1 \Delta)$ for all $b > \hat{b}$. Hence, if the regulator recapitalizes $b > \hat{b}$ firms, we have $E(\Pi^f) > E(\Pi^c)$.

Note that the regulator is restricted to capitalize firms that cannot be purchased by domestic firms, that is,

$$\hat{b}^*(\lambda, k) \leq [k - (1 - k)y(p)]. \quad (59)$$

Note that $[k - (1 - k)y(p)] > \tilde{b}$, only if $k > \tilde{k}$, where

$$\tilde{k} = \left( \frac{\tilde{b} + y(p)}{1 + y(p)} \right). \quad (60)$$

Recall that $\hat{b}(\lambda)$ is decreasing in $\lambda$ from Proposition 7. Hence, $\hat{b}(\lambda) > \hat{b}$, only if $\lambda < \tilde{\lambda}$, where $\hat{b}(\tilde{\lambda}) = \hat{b}$.

Thus, for $f(1) > (\alpha_1 \Delta)$, combining these two results, we get: for $k > \tilde{k}$ and $\lambda < \tilde{\lambda}$, $\left( \frac{f(\hat{b}^*)}{\hat{b}^*} \right) > (\alpha_1 \Delta)$, and, therefore, $E(\Pi^f) > E(\Pi^c)$. ♦
Table 1: Correlation between Foreign Direct Investment (FDI) and Foreign Portfolio Investment (FPI) in South East Asia during crisis (1996-2000) and non-crisis years

<table>
<thead>
<tr>
<th>COUNTRYNAME</th>
<th>THAILAND</th>
<th>PHILIPPINES</th>
<th>MALAYSIA</th>
<th>KOREA</th>
<th>INDONESIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correl(FDI,FPI)</td>
<td>0.51</td>
<td>0.66</td>
<td>0.00</td>
<td>0.74</td>
<td>0.72</td>
</tr>
<tr>
<td>Correl(FDI,FPI Debt)</td>
<td>0.05</td>
<td>0.73</td>
<td>-0.20</td>
<td>0.68</td>
<td>0.78</td>
</tr>
<tr>
<td><strong>1996-2000</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Correl(FDI,FPI)</td>
<td>-0.52</td>
<td>-0.61</td>
<td>-0.11</td>
<td>-0.43</td>
<td>0.59</td>
</tr>
<tr>
<td>Correl(FDI,FPI Debt)</td>
<td>-0.45</td>
<td>-0.75</td>
<td>-1.00</td>
<td>-0.85</td>
<td>0.85</td>
</tr>
</tbody>
</table>

Source: IMF International Financial Statistics

FDI is line 78bed (Direct investment in the Reporting Economy), which represents flows of direct investment capital into the country. This includes equity capital, reinvested earnings, other capital, and financial derivatives associated with various intercompany transactions between affiliated enterprises. Excluded are flows of direct investment capital for exceptional financing, such as debt-for-equity swaps.

FPI is line 78bgd (Portfolio Investment Liabilities), which include transactions with nonresidents in financial securities of any maturity (such as corporate securities, bonds, notes, and money market instruments) other than those included in direct investment, exceptional financing, and reserve assets. Under this we have:

Debt securities liabilities (line 78bnd) cover (i) bonds, debentures, notes, etc. and (ii) money market or negotiable debt instruments.
Figure 1a: FDI and FPI for S Korea (1990-2005)

Figure 1b: FPI Debt vs FDI for S Korea: Crisis (1996-2000) and Other (1991-1995, 2001-2005)
Figure 2a: FDI and FPI for Philippines (1990-2005)

Figure 2b: FPI Debt vs FDI for Philippines: Crisis (1996-2000) and Other (1991-1995, 2001-2005)
Figure 3: Evidence on flipping (subsequent sale) of acquisitions in South East Asia during 1996-2000

Cumulative % of Deals Flipped

- Domestic acquirer
- Foreign acquirer

Time Since Original Acquisition (years)
Figure 4: Timeline of the model.

$t = 0$

- Returns from the risky investments are realized.
- Domestic firms invest in risky projects using their own capital.
- Failed firms are auctioned to surviving firms and foreigners.

$t = 1$

- A proportion of $k$ domestic firms fail.

States

- $k \leq k$
  - Price is the full price, $\bar{p}$.
  - All assets are purchased by surviving firms.
  - No misallocation cost, no regulatory intervention.

- $k < k \leq \bar{k}$
  - Price is decreasing as a function of $k$ but is still above the threshold value of foreigners, $p$.
  - All assets are purchased by surviving firms.
  - No misallocation cost, no regulatory intervention.

- $k > \bar{k}$
  - Price is the threshold value of outsiders, $p$.
  - Potential misallocation cost.
  - Regulatory intervention in the form of recapitalization.
Figure 5: Price in Proposition 2.

Figure 6: Price as a function of $k$ (Corollary 1).
Figure 7: Capital flight and FDI (Proposition 3).

Figure 8: Prices with limited outsider funds.
**Figure 9:** Capital flight and FDI (Proposition 4).

**Figure 10:** Price with differential efficiency levels of foreigners.
Figure 11: Regulator’s recapitalization strategy (no capture).

Figure 12: Regulator’s share as a function of $\lambda$. 
Figure 13: Regulator’s recapitalization strategy (for $k$ such that $k - (1-k)y(p) > \bar{b}$).

Figure 14: Regulator’s recapitalization strategy (for $k > \tilde{k}$).