

Fire-Sale FDI¹

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Abstract

Financial crises in countries are often accompanied by an outflow of foreign portfolio investment and an inflow of foreign direct investment (FDI). We provide an agency-theoretic framework that explains this phenomenon. During crises, agency problems affecting domestic firms are exacerbated, and, in turn, external financing constrained. Direct ownership can circumvent these problems, but during crises, efficient owners (e.g. other domestic firms) face similar financing constraints. The result is a transfer of ownership to foreign firms, including inefficient ones, at fire-sale prices. Such fire-sale FDI is associated with a flipping of acquired firms back to domestic owners once the crisis abates.

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1 Introduction

One characteristic feature of capital flows during some financial crises is the contrast between capital *outflows* associated with portfolio investments, and the simultaneous *inflows* in the form of 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 evidence for inflow of such FDI using data on mergers and acquisitions for Asian countries that underwent the 1997 Asian financial crisis. The phenomenon was also noted in an early anecdotal piece by Krugman (1998).

Consider Table 1 which reports the correlation between FDI and foreign portfolio investment (FPI) over the period 1980-2005 for the countries hit by the Asian financial crisis. 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 1996-1998 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 a regime shift in the relationship between FDI and FPI.

This divergent behavior of portfolio 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 an outflow of portfolio investments 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 during financial crises?

We build a model wherein the cash-in-the-market pricing of domestic assets, the capital outflows associated with portfolio investments (FPI) and the entry of inefficient outsiders

(foreigners) into domestic markets through acquisition of domestic assets (fire-sale FDI) are endogenously derived. We consider a two-period model with a measure 1 of domestic firms, foreign investors, and a regulator. Two central assumptions drive our results: (i) domestic firms are more efficient users of domestic assets than foreigners as long as domestic firms take good projects; and (ii) there is a possibility of moral hazard in that domestic firm owners derive private benefits from bad projects; hence, domestic owners take good projects only if they retain a large enough share of future profits.

Domestic firms have two risky investment opportunities with maturity of one period, one at $t = 0$ and one at $t = 1$. Domestic firms start with one unit of capital, which they use to undertake the risky investment at $t = 0$. The entire capital of the firms with the low return from the first-period investment is wiped out. Failed firms can pledge a fraction of their expected return from the second investment. When the prospects for the second investment is favorable, expected return is high and the failed firms can generate the needed funds, even if they can pledge only a fraction due to moral hazard. However, for weaker prospects, even though the second investment can be a positive NPV project, the amount that can be pledged may not be enough to generate the one unit of capital needed to undertake the second period project. In that case, a failed firm cannot undertake the second period investment and is put up for sale. Surviving firms, if any, and foreign investors use their funds to purchase failed firms' assets.

Surviving domestic firms use some of the return from the first investment to undertake the second period investment. The remaining funds and the funds they can pledge against the second period investment constitute the liquidity surviving firms use for asset purchases. Up to a critical proportion of failures, surviving firms' liquidity is enough to purchase all failed firms' assets at the "fundamental" price: surviving firms compete for these assets and the price stays at the fundamental price. Beyond this critical proportion of failures, additional assets cannot be absorbed by the available liquidity of surviving firms at the fundamental price. Thus, the market-clearing price declines with further failures.

Hence, for weaker prospects only surviving firms can generate funds against their future returns. As the proportion of failures increases, the proportion of surviving firms decreases. This, in turn, results in the total borrowing capacity of the domestic economy and FPI to decrease. Furthermore, as the proportion of failures increase, the domestic assets acquired by foreign investors increase, resulting in an increase in fire-sale FDI. Hence, during crisis periods, we see the seemingly puzzling negative correlational between FDI and FPI.

We have three extensions of our benchmark model. First, we show that foreign investors flip the domestic assets acquired at fire-sale prices once the crisis abates and prices rebound. Since, during crises, even inefficient users acquire assets at fire-sales prices, when the domestic economy recovers and industry insiders restore their financial health, industry outsiders and

foreigners flip assets back to their more natural users.

Second, with limited outsider funds, once the proportion of failures is sufficiently large, total liquidity of surviving firms and foreigners is not enough to clear the market for sales at the threshold value of foreigners. Thus, there is a further decline in the market-clearing price as the proportion of failures increases. 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, the share price of surviving firms falls below their fundamental value and surviving firms have to suffer some discount when they issue shares, that is, surviving firms can raise equity financing only at discounts. Furthermore, when the foreign capital that can enter the domestic economy is low, the discount in the capital market can be so high that surviving firms cannot generate the needed funds to undertake the second period investments. This, in turn, leads to a complete breakdown of the capital market, and the domestic economy experiences a structural break where foreign funds enter the domestic market only through FDI.

Third, it is possible to extend our model to allow for efficient foreigners. In particular, some foreigners can be more efficient than domestic firms but they may not be able to enter the domestic market due to barriers to entry. Hence, in the presence of barriers to entry, crisis can allow efficient foreigners to enter, which may be beneficial for crisis-stricken countries. However, for severe crises, the price may fall so low that even inefficient foreigners may enter.

There are three important empirical implications of our model. First, as explained above, FDI flows surge precisely when there is an outflow of portfolio capital. This pattern was illustrated in Figures 1 and 2 for South Korea and Philippines, respectively, and will be discussed further in the text.

Second, the FDI inflows during financial crises should be associated with the acquisition of stakes that grant control, rather than simply acquisition of cash-flow stakes. There is ample evidence supporting this hypothesis. Acharya, Shin and Yorulmazer (2007), studying M&A activity in the financial sector in the countries hit by the Asian crisis during the period 1996-2000 show (in their Table 2) that the crisis year of 1998 witnessed greater foreign acquisitions, but crucially, 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. Additional evidence from UN (1999), Chari, Ouimet and Tesar (2004), and Aguiar and Gopinath (2005) is discussed in Section 5.

Finally, and perhaps most distinctively compared to the previous literature, our theory predicts the “flipping” of assets acquired at fire sales once the crisis abates and prices rebound. For example, in Aguiar and Gopinath (2005), foreigners have an advantage in both financing and technology, that is, foreigners have the financial resources to acquire domestic assets, as well as superior technology to run these assets efficiently. However, in our model, some

foreigners have comparative advantage in financing but not in technology. Hence, flipping is a direct consequence of our theory, since even inefficient acquirers from outside the industry of the failed firm or bidders from abroad acquire assets during fire sales.

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 (also see Figure 4). It defines a “flip” as the subsequent sale (2001 onwards) of an acquisition that occurred during the crisis period (1996-2000). Employing the standard definition of FDI as corresponding to a purchase of at least 10% of the target, 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.¹ 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 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.

We conclude by illustrating that our theoretical framework also holds the potential to address welfare questions concerning the desirability of foreign takeovers. In particular, the role of foreign capital in the overall resolution policy following a crisis has been a key thread in the policy discussions. We present some normative implications in this regard.

The remainder of the paper is structured as follows. Sections 2 and 3 present the theoretical model and its analysis. Section 4 presents extensions of the benchmark model. Before turning to normative analysis, in Section 5, we present in detail existing and new evidence supporting the three key implications of our model. Section 6 provides an analysis of resolution of financial crises and Section 7 concludes. Proofs not contained in the text are contained in the Appendix.

2 Model

The timeline of our benchmark model is outlined in Figure 5. We have an economy with three dates, indexed by $t \in \{0, 1, 2\}$. We have a domestic economy with a measure 1 of ex-ante identical firms. Firms are risk-neutral and have the objective of maximizing the sum of expected profit over time. Firms have a unit of endowment at date $t = 0$ and nothing else at other dates.

Each firm has two consecutive investment opportunities, one at date $t = 0$ and the other at date $t = 1$. Each date t project, requires one unit of input at date t , and yields a random outcome at date $t + 1$. Provided that a firm exerts effort, the random return on its date t

¹The convention for distinguishing between FPI and FDI is whether the ownership stake is above or below the 10% threshold, where a stake higher (lower) than 10% is classified as FDI (FPI).

project is given by

$$\tilde{R}_t = \begin{cases} R_t & \text{with prob. } \alpha_t \\ 0 & \text{with prob. } (1 - \alpha_t) \end{cases}, \quad (1)$$

where $R_t > 1$ is a constant. The returns across firms are independent, so that by law of large numbers, exactly a proportion α_t of the firms have return R_t , and a proportion $(1 - \alpha_t)$ have the low return 0. We assume that the returns in the two periods are independent and leave the possibility that $\alpha_0 \neq \alpha_1$ and $R_0 \neq R_1$.²

There is potential for moral hazard at the individual firm level. If the firm does not exert effort, then when the return is high, it cannot generate R_t but only $(R_t - \bar{\Delta})$ 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 θ and get the incentive compatibility constraint as:

$$\alpha_t \theta R_t \geq \alpha_t (\theta (R_t - \bar{\Delta}) + B). \quad (\text{IC})$$

Hence, firm owners need a minimum share of $\bar{\theta} = (B/\bar{\Delta})$ to exert effort.³ Therefore, the firm can pledge at most a fraction $\tau = (1 - \bar{\theta})$ of its future income if it is required to exert effort.⁴ We assume that at date 0, the entire share of the firm profits belongs to the firm owners, and therefore, moral hazard is not a concern at the beginning. Hence, the net present value for a domestic firm from the risky investment when it exerts effort is

$$\bar{p} = \alpha_1 R_1 - 1. \quad (2)$$

In addition to domestic firms, there is a group of risk-neutral foreign investors who have

²We could relax this assumption and introduce intertemporal dependence between the returns in each period. This would not change any of our results qualitatively but the independence assumption simplifies the analysis substantially. See Corollary 1 for the case with perfect autocorrelation between the returns in the two periods.

³Alternatively, we could have assumed that when the firm does not exert effort, the value of the high return is R_t^L , but the probability of having the high return is lower, say $\alpha_t^L < \alpha_t$, and its owners enjoy a non-pecuniary benefit of B , with $(\alpha_t - \alpha_t^L) R_t > B$. In that case, the incentive compatibility constraint can be written as $\alpha_t \theta R_t \geq \alpha_t^L [\theta R_t + B]$. Hence, firm owners need a minimum share of $\bar{\theta} = \left(\frac{\alpha_t^L B}{(\alpha_t - \alpha_t^L) R_t} \right)$ to exert effort. Therefore, the firm can pledge at most a fraction $\tau = (1 - \bar{\theta})$ of its future income if it is required to exert effort. For simplicity, we model moral hazard using returns, rather than probabilities, and assume that the returns are not verifiable. While this does not change any of our results, it simplifies our expressions considerably.

⁴Note that, once the firm is left with a share that is less than $\bar{\theta}$, it can as well pledge the entire future return of $(\alpha_t (R_t - \bar{\Delta}))$. For $\bar{\Delta} > \sqrt{B R_t}$, this is less than $(\alpha_t (1 - \bar{\theta}) R_t)$, the amount that can be pledged when the firm exerts effort. Throughout, we assume that $\bar{\Delta} > \sqrt{B R_t}$.

total funds of w that can be used to purchase or finance domestic firms.⁵ Foreigners do not have the skills to generate the full value from domestic assets.⁶ 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_1 but only $(R_1 - \Delta)$, for some constant $\Delta > 0$.⁷

The notion that foreigners may not be able to run domestic assets as efficiently as the domestic firms is akin to the notion of *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 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, especially when firms within an industry get simultaneously into financial or economic distress.⁸

Finally, there is a regulator who employs policy measures such as assets sales, recapitalization of failed firms and/or regulation of foreign entry to resolve failures.

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 proceeds from the first investment. If the return is low, then the firm’s entire capital is wiped out. In that case, if the firm cannot raise financing for the second investment, then it is put up for sale.⁹ The regulator decides whether to let the surviving domestic firms (if any) and/or foreigners purchase failed firms.¹⁰

Domestic firms that had the high return from the first period investment are potential acquirers of failed firms’ assets. Because of moral hazard, the surviving domestic firms cannot pledge all their future income, but only a fraction τ . Hence, the total resources available to

⁵In the benchmark model, we assume that w is unlimited so that foreign investors have sufficient funds to acquire and finance domestic firms. See Section 4.2 for an analysis of the case with limited foreigner funds and the results that emerge.

⁶In Section 4.3, we allow for differential efficiency among foreigners where we have foreigners that are both more and less efficient than domestic firms.

⁷We assume that $\alpha_t (R - \Delta) \geq 1$, as otherwise the analysis would be uninteresting.

⁸There 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 (2007) 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)).

⁹Here, we do not model the bankruptcy of the firm. One can assume some fixed costs for staying in business such as overhead costs like rent for office space, labor costs etc. A firm needs to cover these costs to stay in business, otherwise, it needs to be sold.

¹⁰The regulator can also 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 $t = 1$. See Section 6 for a discussion.

a surviving domestic firm at date 1 to purchase failed firm assets is

$$\ell = (R_0 - 1) + \tau\bar{q}, \quad (3)$$

where $\bar{q} = (\alpha_1 R_1)$ is the expected return from the second period investment.¹¹ The firm has R_0 from the first period investment but needs to set aside the cost of investment of 1, and can raise $\tau\bar{q}$ units of funds from outside investors.¹²

3 Analysis

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

We denote the proportion of firms that fail at $t = 1$ by k . Since firms are identical at date 0, the proportion k can be regarded as the state variable at date 1.

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 $\tau\bar{q}$ units of funds against its future return. For $\tau\bar{q} \geq 1$, that is, for $\alpha_1 \geq \alpha_1^* = \left(\frac{1}{\tau R_1}\right)$, 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 with the low return from the first project cannot generate the necessary funds and is put up for sale.¹³ Hence, asset sales take place only when $\alpha_1 < \alpha_1^*$.¹⁴ We summarize these points in terms of the following proposition.

Proposition 1 *There is a critical value of α_1 , given as $\alpha_1^* = \left(\frac{1}{\tau R_1}\right)$, 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.*

Next, we analyze the sale of failed firms' assets and the resulting price function.

¹¹In this paper, our focus is on the ex-post resolution of crisis, in particular, the sale of distressed firms' assets. Hence, we refrain from an ex-ante analysis of the portfolio choice of firms. In a separate paper (Acharya, Shin and Yorulmazer (2007)), we analyze the endogenous level of bank liquidity where banks choose a portfolio of liquidity and risky assets in anticipation of crisis. We show that banks in general choose risky portfolios where the level of the liquid asset in their portfolio is not enough to totally insure them against failures. Furthermore, banks choose to hold less liquidity during boom periods and the liquidity in their portfolio is less than the socially optimal level of liquidity when the pledgeability of risky assets is high.

¹²Alternatively, we can allow firms to generate funds against the assets they purchase as well. This does not change our results qualitatively. See footnote 22 in Section 4.2 for a discussion.

¹³We 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.

¹⁴Note that for $\alpha_1 > \left(\frac{1}{R_1 - \Delta}\right)$, domestic firms and foreigners are willing to pay a positive price for failed firms' assets. Hence, for $\left(\frac{1}{R_1 - \Delta}\right) < \alpha_1^*$, 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.

3.1 Sales and liquidation values

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

To keep the analysis tractable 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) Denoting 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 profit of a surviving firm from the asset purchase can be calculated as: $y(p)[\bar{p} - p]$. Note that for each unit of asset 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

$$y(p) \cdot (1 + p) \leq \ell. \tag{4}$$

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

$$y(p) = \frac{\ell}{1 + p}. \tag{5}$$

For $p > \bar{p}$, the demand is $y(p) = 0$, and for $p = \bar{p}$, surviving firms are indifferent between any value of $y(p)$.

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 $\underline{p} = [\alpha_1(R_1 - \Delta) - 1] = [\bar{p} - \alpha_1\Delta]$, the expected profit for the foreigners from the risky asset in the second period.

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

$$y_2(p) = \frac{w}{1+p}. \quad (6)$$

For $p > \underline{p}$, the demand is $y_2(p) = 0$, and for $p = \underline{p}$, foreigners are indifferent between any value of $y_2(p)$. Note that, in the benchmark model, we assume that w is unlimited so that foreigners always have enough funds to purchase all domestic firms at the price \underline{p} and take all the second period investments.

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 failed firms' assets to surviving firms. However, surviving firms may not be able to pay the threshold price of \underline{p} for all assets. If prices fall further, these assets become profitable for foreigners and they participate in the auction.

The regulator cannot set $p > \bar{p}$ since in this case $y(p) = y_2(p) = 0$ and the market for failed firms' assets does not clear. If $p \leq \bar{p}$, and the proportion of failed firms is sufficiently small, surviving firms have enough funds to pay the full price for all failed firms' assets. Hence, for $k \leq \underline{k}$, where

$$\underline{k} = \frac{\ell}{\ell + (1 + \bar{p})}, \quad (7)$$

the regulator sets the price at $p^* = \bar{p}$.¹⁵ At this price, surviving firms are indifferent between any quantity of assets purchased and the regulator allocates a share $y(p^*) = \left(\frac{k}{1-k}\right)$ to each surviving firm.

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 \underline{p} , below which foreigners have a positive demand. Formally, for $k \in (\underline{k}, \bar{k}]$, where

$$\bar{k} = \frac{\ell}{\ell + (1 + \underline{p})}, \quad (8)$$

the regulator sets the price at $p^* = \left(\frac{\ell}{k} - (1 + \ell)\right)$, and again, all assets are acquired by surviving firms. Note that, in this region, surviving firms use all available funds and the

¹⁵Note that, the surviving firms as a whole have just enough resources to purchase (and finance) all failed firms at a price of p when $\left(\frac{k}{1-k}\right)(1+p) = \ell$. Using this, we can derive the threshold \underline{k} in equation (7).

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 $k > \bar{k}$, surviving firms cannot pay the threshold price of \underline{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 \underline{p} .

The resulting price function is formally stated in the following proposition and is illustrated in Figure 6.

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

$$p^*(k) = \begin{cases} \bar{p} & \text{for } k \leq \underline{k} \\ \frac{\ell}{k} - (1 + \ell) & \text{for } k \in (\underline{k}, \bar{k}] \\ \underline{p} & \text{for } k > \bar{k} \end{cases} . \quad (9)$$

Note that as the probability α_1 of the high return from the second period investment increases, the prices domestic firms and foreigners are willing to pay, \bar{p} and \underline{p} , respectively, increase. Hence, overall, an increase in α_1 increases the price $p^*(k)$.

So far, we treated failures in the first period (k) and prospects of firms in the second period (α_1) independently. 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 deteriorate (low α_1).¹⁶ We model this in the following way. Let ϕ be the parameter that represents the underlying macroeconomic factor such that an increase in ϕ 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 in the first period is equal to the probability for the low return from the second investment, that is, $k = (1 - \alpha_1)$. In this case, we have:

$$\bar{p} = (1 - k)R_1 - 1 \quad \text{and} \quad \underline{p} = (1 - k)(R_1 - \Delta) - 1, \quad (10)$$

$$\ell = R_0 + \tau(1 - k)R_1 - 1. \quad (11)$$

¹⁶It is likely that the return R_0 can be affected by the same macroeconomic factor in the same way as α_1 , which would only strengthen our results.

Note that both \bar{p} and \underline{p} are decreasing in the proportion of failures k . The thresholds \underline{k} and \bar{k} satisfy:

$$(1 - \underline{k})\ell = \underline{k}(1 + \bar{p}) \quad \text{and} \quad (1 - \bar{k})\ell = \bar{k}(1 + \underline{p}) \quad (12)$$

We can show that the equalities in (12) give us unique values of \underline{k} and \bar{k} , where $\underline{k} < \bar{k}$.¹⁷ This gives us the following Corollary (see Figure 7).¹⁸

Corollary 1 *For $k = (1 - \alpha_0)$, the price is as follows:*

$$p^*(k) = \begin{cases} (1 - k)R_1 - 1 & \text{for } k \leq \underline{k}' \\ \frac{\ell}{k} - (1 + \ell) & \text{for } k \in (\underline{k}', \bar{k}'] \\ (1 - k)(R_1 - \Delta) - 1 & \text{for } k > \bar{k}' \end{cases}, \quad (13)$$

where \bar{p} and \underline{p} are given in equations in expression (10), \underline{k} and \bar{k} are the unique values that satisfy equations in (12), ℓ is given in equation (11), $\underline{k}' = \max\{\underline{k}, (1 - \alpha_1^*)\}$, and $\bar{k}' = \max\{\bar{k}, (1 - \alpha_1^*)\}$.

As the macroeconomy worsens (low ϕ), the price of assets fall because of two separate reasons. First, as the macroeconomy weakens, the prospects for the second period project worsen (low α_1) so that the fundamental value \bar{p} of the assets fall. Second, the proportion of failures (k) increases when the economy is weak, and for high enough proportion of failures ($k > \underline{k}$) this leads to cash-in-the-market prices due to lack of liquidity in domestic markets.

3.2 FPI versus FDI

In this section, we present our main theoretical result where we examine how foreign portfolio investment into domestic firms interacts with foreign direct investment, and in particular the inverse relation between these two forms of foreign financing during crisis periods.

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

¹⁷From equation (12), at $k = \underline{k}$, we have: $(1 - k)\ell = k(1 + \bar{p})$. For $k = (1 - \alpha_1)$, we can write this as $(R_0 - 1) + \tau(1 - k)R_1 = kR_1$. Note that the left hand side is decreasing in k whereas the right-hand side is increasing in k . Thus, there exists a unique \underline{k} that satisfies equation (12). The same analysis can be used to show the existence of a unique \bar{k} .

¹⁸Note that Figure 7 illustrates the case with $\underline{k} \geq (1 - \alpha^*)$.

$[(1 - k)(\tau\bar{q})]$. Note that BC is decreasing in k , that is, the more severe the crisis, the lower the borrowing capacity of the domestic economy. And, for $k < \bar{k}$, the price for failed firms' assets is higher than \underline{p} so that foreigners do not purchase any domestic assets, that is, FDI is equal to 0.¹⁹

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

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

Note that FDI is (weakly) increasing in k while the borrowing capacity BC of the domestic economy is decreasing in k , resulting in a negative correlation between capital flows and foreign direct investment. We have the following Proposition. Also see Figure 8.

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

- (i) $BC = (1 - k)(\tau\bar{q})$ and $\frac{\partial BC}{\partial k} < 0$.
- (ii) For $k \geq \bar{k}$, we have $FDI = [k(1 + \underline{p} + \ell) - \ell]$, 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 $C = [k(\bar{p} + R_0) - (R_0 - 1)]$, and $\frac{\partial C}{\partial k} > 0$.

Proposition 3 states our key theoretical result: In the midst of a crisis, we have the juxtaposition of decreased portfolio investment into domestic firms and increased FDI. During crisis periods the borrowing capacity of surviving domestic firms as a whole diminishes,

¹⁹Note that our model can easily be extended to allow for differential efficiency among foreigners where efficient foreigners always enter domestic markets, resulting in a positive level of FDI for all values of k . See Section 4.3 for such an extension. Since our focus in this paper is FDI flows during crisis periods, we refrain from such an extension to keep the model simple.

resulting in a decrease in FPI. In addition, during these periods, the supply of failed firms' assets searching for buyers surges. This, in turn, results in cash-in-the-market prices for domestic assets and makes domestic assets profitable for foreigners even though their ability to manage these assets is limited. Hence, we observe an increase in FDI during crisis periods.

4 Extensions

In this section, we provide three interesting extensions of our benchmark model. In the first extension, we analyze the recovery of the domestic economy and the subsequent flipping of assets acquired by foreigners during the crisis back to their more natural users. In the second extension, we analyze how illiquidity can lead to spillover effects from the real to the financial side of the economy, which can eventually lead to a complete shutdown of the domestic capital market. Finally, in the third extension, we allow for differential levels of efficiency among foreigners and analyze effects of financial crisis and barriers of entry on foreign entry.

4.1 Recovery and flipping of assets

A common observation in many crises episodes is that during crises outsiders (foreigners in our model) purchase assets at 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 natural users. We model this using a simple extension of our benchmark model. Suppose that we have a third 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 α_2 is the probability of the high return from the investment at date 2. Foreigners cannot generate R_2 in the high state but only $(R_2 - \Delta_2)$.²⁰ Hence, insiders are willing to pay a price of $\bar{p}_2 = (\alpha_2 R_2 - 1)$, whereas outsiders value these assets at $\underline{p}_2 = \alpha_2(R_2 - \Delta_2) - 1$.

Suppose that a proportion σ of assets were purchased by outsiders at $t = 1$. Hence, insiders manage 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 $\ell_1 = [(R_1 - 1) + \tau\alpha_2 R_2]$ 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 firms as well as the firms that have been acquired by outsiders at $t = 1$, and assets

²⁰Note that outsiders have operated these assets for one period so they may learn how to run these assets efficiently. Therefore, we allow for Δ_2 , possibly $\Delta_2 < \Delta$.

change hands back to the efficient users. In particular, for $k_1 \leq \underline{k}_1$, where

$$\underline{k}_1 = \frac{\ell_1 - \sigma(\ell_1 + \bar{p}_2)}{(1 - \sigma)(\ell_1 + \bar{p}_2)}, \quad (14)$$

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, $\left(\frac{\partial \underline{k}_1}{\partial \sigma}\right) > 0$ 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 \underline{p}_2 . So, for $k \in (\underline{k}_1, \bar{k}_1]$, where

$$\bar{k}_1 = \frac{\ell_1 - \sigma(\ell_1 + \underline{p}_2)}{(1 - \sigma)(\ell_1 + \underline{p}_2)}, \quad (15)$$

the regulator sets the price at $p_2^* = \left(\frac{(1-\sigma)(1-k_1)\ell}{(1-\sigma)k_1+\sigma} - 1\right)$, and again, all assets are acquired by insiders.²¹

4.2 Illiquidity and capital market breakdown

So far, we have examined the case where foreigners have unlimited funds so that they can purchase all domestic firms at the price \underline{p} and will still have enough funds to finance all second period projects. We relax this assumption and allow for limited funds for foreigners, that is, $w \in (1, 1 + \underline{p})$. This allows us to examine the relationship between the cost of capital and illiquidity spillover between the asset and equity markets of domestic firms.

When foreigner funds are limited, we have a fourth region for $k > \bar{\bar{k}}$, where $\bar{\bar{k}} > \bar{k}$, and

$$\bar{\bar{k}} = \frac{(R_0 - 1) + w}{\underline{p} + R_0}, \quad (16)$$

so that even with the injection of foreigners' funds, the price cannot be sustained at \underline{p} and is again strictly decreasing in k (see Figure 9).

The intuition for why this fourth region arises is as follows. When the proportion of failures is large, because of aggregate shortage of liquidity, that is, shortage of liquidity within the surviving domestic firms and the foreigners, the price of assets falls below the threshold value of foreigners, \underline{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, the share price of surviving firms falls below their fundamental value \bar{q} . The aggregate

²¹For 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.

shortage of liquidity affects not only the price of failed firms' assets but also the price of shares of surviving firms.

To put this argument more formally, recall that in the benchmark model with unlimited foreigners' funds, surviving firms issue τ units of shares at a price \bar{q} to generate funds of $(\tau\bar{q})$ from foreigners. However, with limited foreigners' funds, for $k > \bar{k}$, the price for failed firms' assets falls below \underline{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 \bar{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 formally.

Let s be the proportion of shares issued by a surviving firm. Because of moral hazard we have: $s \leq \tau$.²² If a surviving firm issues s unit of shares at the price q and purchases m units of assets at the price p , it makes an expected profit of $[m(\bar{p} - p) - s(\bar{q} - q)]$.

Note that in any equilibrium, q cannot exceed \bar{q} . Thus, we have $q \leq \bar{q}$, 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:

$$\max_{m,s} m(\bar{p} - p) - s(\bar{q} - q) \quad (17)$$

$$\text{s.t.} \quad s \cdot q + R_0 - 1 \geq mp \quad (18)$$

$$s \leq \tau. \quad (19)$$

For $q \leq (1 + p)$, surviving firms cannot make positive profits by issuing equity to purchase assets. Thus, when $q \leq (1 + p)$, we have $s = 0$ and $m = \left(\frac{R_0 - 1}{p}\right)$. When $q > 1 + p$, 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:

$$\max_{x,y} x(\underline{p} - p) + y(\bar{q} - q) \quad (20)$$

$$\text{s.t.} \quad xp + yq \leq w$$

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

²²We can also allow firms to generate funds against the assets they acquire, which does not change any of our results qualitatively. In that case, the analysis is as follows. A surviving firm has R_0 units of funds from the first investment. If this firm purchases m units of assets, it can pledge a total of $[(1 + m)(\tau\bar{q})]$ units of funds. The firm needs $[1 + (1 + p)m]$ units 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 $R_0 + (1 + m)(\tau\bar{q}) \geq 1 + (1 + p)m$. Thus, the firm can purchase at most $m^* = \left(\frac{\ell}{1 + p - \tau\bar{q}}\right)$ units of failed firms' assets at the price p .

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

When $p > \underline{p}$, foreigners do not want to purchase failed firms' assets and $x(q, p) = 0$. When $p < \underline{p}$, foreigners choose x to maximize:

$$x(\underline{p} - p) + \left(\frac{w - xp}{q}\right)(\bar{q} - q) \quad (21)$$

$$= x\left(\underline{p} - \frac{p\bar{q}}{q}\right) + w\left(\frac{\bar{q}}{q} - 1\right). \quad (22)$$

Thus, if $p < \underline{p}$ and $\underline{p}q > \bar{q}p$, then foreigners use all their funds for the asset purchase, that is $x = \frac{w}{p}$. When $p < \underline{p}$ and $\underline{p}q < \bar{q}p$, foreigners use all their funds for the equity purchase, that is $y = \left(\frac{w}{q}\right)$, and when $\underline{p}q = \bar{q}p$, 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:

$$(1 - k)s = y(q, p) \quad (\text{equity market}) \quad (23)$$

$$(1 - k)m + x(p_0, p) = k \quad (\text{asset market}) \quad (24)$$

We focus on the outcome where the participation of foreigners in the equity market is maximum, which results in the maximum price for assets. However, even in this case, 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 ($p^*(k)$) and for shares of surviving firms ($q^*(k)$) are formally stated in the following proposition and are illustrated in Figure 9.²³

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

$$p^*(k) = \begin{cases} \bar{p} & \text{for } k \leq \underline{k} \\ \frac{\ell}{k} - (1 + \ell) & \text{for } k \in (\underline{k}, \bar{k}] \\ \underline{p} & \text{for } k \in (\bar{k}, \bar{\bar{k}}] \\ \frac{(R_0 - 1) + w}{k} - R_0 & \text{for } k > \bar{\bar{k}} \end{cases} \quad (25)$$

²³Proposition 4 states the results for the case $w \geq \tau\bar{q}$. Similar results hold for $w < \tau\bar{q}$.

and

$$q^*(k) = \begin{cases} \bar{q} & \text{for } k \leq \bar{k} \\ \mu p^*(k) & \text{for } k > \bar{k} \text{ and } w \geq w^* \\ \mu p^*(k) & \text{for } k \in (\bar{k}, k^*] \text{ and } w < w^* \\ \text{Market breaks down} & \text{for } k > k^* \text{ and } w < w^* \end{cases}, \quad (26)$$

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

As Proposition 4 shows, when the proportion of failures is large, cash-in-the-market pricing creates profitable options for foreigners for asset purchases. Hence, in equilibrium, share price of surviving firms falls below their fundamental value \bar{q} to compensate foreigners for purchasing shares. In other words, surviving firms can raise equity financing only at discounts. Thus, limited funds within the whole system 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, $q^*(k) < (1 + p^*(k))$. Hence, the capital market breaks down completely (see Figure 10). 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 surviving firms need to suffer some discount, they can generate funds in the capital market and can purchase $\left(\frac{(1-k)[(R_0-1)+\tau q^*(k)]}{1+p^*(k)}\right)$ units of failed firms' assets. The rest is acquired by foreigners, that is, $FDI = (k(1 + p^*(k)) - (1 - k)[(R_0 - 1) + \tau q^*(k)])$. 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 $\left(\frac{(1-k)(R_0-1)}{1+p^*(k)}\right)$ units of failed firms' assets. Hence, at $k = k^*$, we have a structural break and FDI jumps to w since for $k > k^*$, all foreign funds enter the domestic economy in the form of FDI. Using the prices $p^*(k)$ and $q^*(k)$ in Proposition 4, for $w < w^*$, we get

$$FDI = \begin{cases} 0 & \text{for } k \leq \bar{k} \\ k(1 + \underline{p}) - (1 - k)\ell & \text{for } k \in (\bar{k}, \bar{k}] \\ w - (1 - k)[\tau q^*(k)] & \text{for } k \in (\bar{k}, k^*] \\ w & \text{for } k > k^* \end{cases}. \quad (27)$$

4.3 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 low that even inefficient foreigners may enter to take advantage of fire sales.²⁴

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 $(1 + \underline{p})$, uniformly distributed among themselves, so that they can purchase all domestic firms at a price of \underline{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 $w_e = z(1 + \underline{p})$. 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 $\bar{\bar{p}}$ for failed firms, where

$$\bar{\bar{p}} = \alpha_1 (R_1 + \rho) - 1 > \bar{p}. \quad (28)$$

Suppose that there is a fixed cost γ of entry to the domestic market, where $\gamma > (\bar{\bar{p}} - \bar{p})$. Hence, even efficient foreigners can enter only when prices fall below the price $\tilde{p} = (\bar{\bar{p}} - \gamma)$.

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

$$\underline{p} = (\alpha_1 (R_1 - \rho) - 1) - \gamma, \quad (29)$$

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

As in the benchmark case, for $k \leq \underline{k}$, 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 $k \in (\underline{k}, \tilde{k}]$, where

$$\tilde{k} = \frac{\ell}{\ell + (1 + \tilde{p})}, \quad (30)$$

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

²⁴See Krugman (1998) and Loungani and Razin (2001) for a discussion.

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 $k \in (\tilde{k}, \tilde{k}]$, where

$$\tilde{k} = \frac{\ell + w_e}{\ell + 1 + \tilde{p}}, \quad (31)$$

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

$$\hat{k} = \frac{\ell + w_e}{\ell + 1 + \underline{p}}, \quad (32)$$

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

For $k > \hat{k}$, surviving firms and efficient foreigners cannot pay the threshold price of \underline{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 \underline{p} .

This price function is stated below and is illustrated in Figure 11.

Proposition 5 *The price as a function of the proportion of failed firms is as follows:*

$$p^*(k) = \begin{cases} \bar{p} & \text{for } k \leq \underline{k} \\ \frac{\ell}{k} - (1 + \ell) & \text{for } k \in (\underline{k}, \tilde{k}] \\ \tilde{p} & \text{for } k \in (\tilde{k}, \tilde{k}] \\ \frac{\ell + w_e}{k} - (1 + \ell) & \text{for } k \in (\tilde{k}, \hat{k}] \\ \underline{p} & \text{for } k > \hat{k} \end{cases}. \quad (33)$$

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 Empirical 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 cash-flow stakes; and (iii) “flipping” of assets acquired in fire sales once prices rebound.

5.1 FDI vs. FPI during crises

On the first implication of our model, we have already discussed briefly Table 1 and Figures 1 and 2 in the introductory remarks. Here, we relate Figures 1b and 2b showing the switch in the sign of the correlation between FPI and FDI to our theoretical analysis, captured in Figures 8 and 10. Consider, for example, Figure 8. This figure shows that in normal times (low values of k), FPI, characterized by C , and FDI will be positively correlated, even if weakly so. However, during crises (high values of k), FPI and FDI become negatively correlated. Also, relative to normal times, crises are associated with higher levels of FDI, implying that the negative correlation between FDI and FPI should be coincident with higher levels of FDI. Figure 10, in addition, shows that when foreign capital that can fly into the domestic economy is limited, during severe crises, FPI may dry up completely but FDI will be significant.

Figures 1b and 2b showing the correlation between FPI and FDI for South Korea and Philippines, respectively, capture these patterns. There is not only a switching of the sign of the correlation between normal and crisis periods, but more of the crises data points correspond to higher levels of FDI.

In existing empirical evidence, 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.²⁵ Krugman shows that a similar, though probably less marked, boom in

²⁵Krugman’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

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 (Box 1 on page 15 of the report). The report also 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. 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 FDI inflows into emerging markets during crisis years contrasts with the sharp reversals in portfolio flows and bank lending. In particular, investment flows into Asia following the crisis of 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

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.

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.²⁶

5.2 Majority stakes

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 cash-flow 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.²⁷

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, increases, which is a common feature of financial crises. While they show that including a dummy for whether the acquirer had the majority control after the acquisition renders the coefficient on the spread insignificant, it should be noted that it is more likely that the developed-market acquirers can get the majority control during crisis periods, as evidence provided by Acharya, Shin and Yorulmazer (2007) and Aguiar and Gopinath (2005) suggests. Hence, combined with the evidence of

²⁶Our conclusions would be further strengthened if the exchange rate of a country is also hit by the financial crisis. This is because the dollar price of the target firm will fall as the price of the target firm falls in local currency terms and also as the exchange rate moves in favor of the foreign acquirers paying dollars. Indeed, the exchange rate effect on FDI has been observed for the FDI flows into the United States. Froot and Stein (1991) show that FDI flows into the U.S. are negatively correlated with the value of the US dollar, while FPI in the same period is positively correlated with the value of the US dollar (though insignificant). The exchange rate movements associated with the Asian financial crisis were much sharper, and so we may expect the exchange rate effects to have been significant.

²⁷Also, UN (1999) shows that cross-border majority M&As in Asia increased by 28 percent in value in 1998.

Acharya, Shin and Yorulmazer (2007) and Aguiar and Gopinath (2005), we can interpret their findings as further evidence for our results.

This ownership with 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.²⁸ 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 lemon's 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.²⁹ 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.

5.3 Flipping

We now turn to perhaps the most distinctive prediction of our theory as compared to the previous literature on FDI - namely that assets acquired during a crisis are subsequently re-sold, or "flipped", once the crisis abates and prices rebound to the reservation price of the high-value owner of the assets. We provide evidence of such flipping from data on the purchase and re-sale of firms associated with the Asian financial crisis.

From the SDC Platinum database on mergers and acquisitions, we compiled the list of those financial firms that were first sold during the five year period from 1996 to 2000, which were then subsequently re-sold to a second acquirer. Our search yielded 89 such firms which changed hands twice or more after 1996. The sub-industry classification of these target firms at the time of first acquisition is given as follows.

Figure 3 provides a summary graph for succinct evidence for such flipping in the aftermath

²⁸For an introduction to this issue, see Albuquerque (2003).

²⁹In 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.

of the Asian financial crisis. To be precise, it defines a “flip” as the subsequent sale (2001 onwards) for an acquisition that occurred during the crisis period (1996-2000). We employ the standard definition of a controlling acquisition as corresponding to a purchase of at least 10% of the target, but also a variant which requires the controlling acquisition to be at least 25% of the target. The identity of the first acquirer during the crisis period is then used to classify all acquisitions into Domestic acquisitions and Foreign acquisitions. 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.

There is clear evidence of greater flipping for targets acquired by foreign firms during the crisis period. For example, in Figure 3, while hardly any domestic deals get flipped in the first year, close to 1% of foreign deals get flipped, and the gap between the two only widens as more time elapses, especially so after the fifth year. By ten years since acquisition, close to 11% of foreign deals get flipped as compared to less than 4% of domestic deals.

Figure 4 presents the evidence on flipping in a slightly different way. It plots the incidence of flipping within the 1996 - 2000 period as well as those re-sales that happened from 2001 onwards. The plots are again sub-divided into those cases where the acquirer’s stake exceeded 10% from those cases where the acquirer’s stake exceeded 25%. The evidence of Figure 3 appears overall robust in Figure 4, that is, robust to whether re-sales within the crisis period are considered as flips or not.

A few additional facts about the flipped deals are interesting and are consistent with the mechanism outlined in our theory. 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, conditional on there being a flip, over 75% of the flips by foreign acquirers involve sales to domestic acquirers (Tables 3a and 3b). Specifically, in our sample, out of 18 flips where the first (during the crises) acquirer is a foreign firm, in 14 cases the second acquirer is a non-foreign firm, that is, a domestic firm. In contrast, out of 66 flips where the first acquirer is a domestic firm, only 11 cases get flipped to a foreign firm (16.7% of the flips by domestic acquirers). Third, the result on greater flipping by foreign acquirers during crisis is also robust to employing a majority stake of 50% being employed as the threshold for identifying controlling acquisitions.

As well as the evidence drawn from the number of deals flipped, we can also glean important clues on the motivation for the acquisition from the industry classifications of the first acquirer. Although our sample of target firms are in the financial and related sectors, the acquiring firm in the first acquisition do not all come from the financial sector. In our database are instances of financial firms being acquired by manufacturing firms - some in apparently unrelated sectors such as food processing. We summarize such evidence in terms of the following transition matrix, where we track how many of the first and second acquirers

were from outside the financial sector.

Table 4 classifies each instance of purchase and subsequent re-sale in terms of the identity of the two acquiring firms. In one instance, the identity of the second acquirer is not disclosed, so that the grand total sums only to 88, rather than 89. In the first row of Table 4, we note that in 26 cases, the first acquirer was a non-financial firm, in spite of the fact that our sample consists of financial and related sector firms. On the other hand, the second acquiring firm is overwhelmingly drawn from the financial sector. Of the 26 firms taken over initially by non-financial firms, 20 firms were subsequently flipped to financial firms. This pattern of reversion to owners in the financial sector is indicative of fire sales in which distressed firms in the financial sector are picked up by firms with stronger balance sheets in other sectors, but then are subsequently re-sold back into the financial sector.

While the quantitative evidence is quite telling, the anecdotal evidence from foreign takeovers in the banking sector brings home some of the points more forcefully. In South Korea, the activities of foreign private equity firms in the Korean banking sector has been a contentious issue. 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)³⁰ 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.³¹ 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)³² 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 9, 2005)³³ reveals that the private equity group agreed to sell its shares to Standard Chartered

³⁰International Herald Tribune, January 13, 2006, “Lone Star to sell its stake in Korea Exchange Bank”.

³¹The 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.

³²Financial Times, April 5, 2007, “Lone Star looks at sale of S. Korean companies”.

³³Financial Times, January 9, 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.³⁴ 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.

Most recently, an article in the Wall Street Journal (October 4, 2007)³⁵ reveals that two New York private equity firms, J.C. Flowers & Co. and Cerberus Capital Management, both with long track records for snapping up troubled banks around the world, are discussing potential bids for Northern Rock, the fifth-largest mortgage lender in the UK that experienced bank runs in September 2007. The article says that: “A deal, like many distressed sales of banks, would mean they invest some money to prop up the bank, and when the market returns to normal levels, they could profit from selling the bank again.”

While such anecdotal evidence cannot be fully conclusive, when combined with our empirical evidence from the SDC database, they reinforce the main message of our paper, and to highlight the importance of financial distress as a determinant of FDI.

6 Resolution

We conclude our analysis with an examination of the welfare issues associated with regulatory intervention in the form of re-capitalization of failed domestic firms during the resolution stage of financial crisis.³⁶

To summarize the result from the previous analysis, for $\alpha_1 < \alpha_1^*$ 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, for $k > \bar{k}$, some of these assets are purchased by foreigners who are not the most efficient users. Hence, it may be optimal to recapitalize some of the domestic firms to prevent misallocation of domestic assets. In particular, the

³⁴Newbridge 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.

³⁵Wall Street Journal, October 4, 2007: “U.S. firms circle Northern Rock”.

³⁶In practice, the role of the governments in the resolution of financial crises has been significant. Examples include the establishment of institutions such as Resolution Trust Corporation (RTC) in the U.S. following the Savings and Loans crisis, the Bank Support Authority (BSA) in Sweden following the 1992 financial crisis, and the Korea Asset Management Company (KAMCO) following the Asian crisis of 1997.

regulator compares the misallocation cost resulting from sales to foreigners with the cost of recapitalizing the failed firms. The regulator recapitalizes failed firms as long as the marginal cost of recapitalization is less than the misallocation cost of $(\alpha_1 \Delta)$.³⁷

We proceed to analyze the regulator's decision by making the following assumption: The government incurs a fiscal cost of $f(a)$ when it injects a units of funds into these firms, with $f(0) = 0$. We assume this cost function is strictly increasing and convex: $f' > 0$ and $f'' > 0$.³⁸

If the government 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.

The government's objective is to maximize the total expected output of the economy net of any recapitalization or liquidation costs. The government does not intervene when $k \leq \bar{k}$. For $k > \bar{k}$, the government's problem is to choose b to maximize:³⁹

$$E(\Pi(b)) = \alpha_1 R_1 - f(b) - \left(k - \frac{(1-k)\ell}{(1+p)} - b \right) \alpha_1 \Delta, \quad (34)$$

where $\left[\left(k - \frac{(1-k)\ell}{(1+p)} - b \right) \alpha_1 \Delta \right]$ is the misallocation cost resulting from sales to foreigners. The first order condition for the government's problem is:

$$f'(b) = \alpha_1 \Delta. \quad (35)$$

Since the marginal cost $f'(b)$ is increasing in b , there is an upper bound, denoted by \bar{b} , up to which recapitalization costs are smaller than misallocation costs. Formally, \bar{b} is obtained as

$$\bar{b} = g(\alpha_1 \Delta), \quad (36)$$

³⁷In this section, we only model the fiscal costs of intervention. There is also a question of incentives for the incumbent management. If the government takes ownership of the failed firm, the existing management may not have incentives to exert effort. Thus, the optimal resolution strategy should also include the incentive costs created by government ownership. A detailed analysis that involves these incentive costs is available from the authors.

³⁸The provision of immediate funds to recapitalize firms entails fiscal costs for the regulator (assumed to be exogenous 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.

³⁹Note that the return R_t is decreasing in the share β the regulator takes in a recapitalized firm. Hence, the regulator does not take any share in the recapitalized firms.

where g is the inverse of f' . Since the maximum proportion of firms that can be acquired by the surviving domestic firms is $\left[(1 - k) \left(\frac{\ell}{1+p} \right) \right]$, the regulator recapitalizes $b^*(k)$ firms, where

$$b^*(k) = \min \left\{ \bar{b}, \left(k - (1 - k) \left(\frac{\ell}{1+p} \right) \right) \right\}. \quad (37)$$

We summarize the optimal resolution policy as follows.

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

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

(ii) *When $k > \bar{k}$, the regulator recapitalizes $b^*(k)$ of the k failed firms, where $b^*(k)$ is given by (37).*

7 Concluding Remarks

Our theoretical framework focuses attention on the key difference between portfolio capital flows and FDI in terms of their implications for control. This leads to important implications for our understanding of financial flows. For instance, a key prediction of our model is that the FDI inflows that happen during financial crises should be associated with the acquisition of stakes that grant control, rather than simply being acquisition of cash-flow stakes. The theoretical framework also highlights the negative relationship between capital flows and FDI: 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 as a general policy dictum. Ironically, it is only when matters are very bad that FDI really comes into its own and the latter is in fact a manifestation of deteriorating fundamentals. The role of such 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, and in the process, documenting the interesting finding that foreign acquisitions are flipped back quickly to domestic firms when crisis abates and fundamentals improve.

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Appendix

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 τ . Thus, for $w \geq \tau \bar{q}$, 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 $k \leq \underline{k}$, 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, $(1 - k)\ell \geq k(1 + \bar{p})$.

Since $p^*(k) = \bar{p} > \underline{p}$, we have $x = 0$ and $m = \left(\frac{k}{1-k}\right)$. Each surviving firm issues enough equity, at $q(k) = \bar{q}$, to purchase $\left(\frac{k}{1-k}\right)$ units of failed firms' assets at $p^*(k) = \bar{p}$. Thus, we have

$$(R_0 - 1) + s\bar{q} = \left(\frac{k}{1-k}\right)(1 + \bar{p}), \text{ which gives us:}$$

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

(2) For $\underline{k} < k \leq \bar{k}$, 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 \underline{p} , that is, $(1 - k)\ell \geq k(1 + \underline{p})$.

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

$$(R_0 - 1) + s\bar{q} = \left(\frac{k}{1-k}\right)(1 + p^*(k)), \text{ which gives us}$$

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

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

(4) For $k > \bar{\bar{k}}$, 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 \underline{p} . Since $p^*(k) < \underline{p}$, foreigners may prefer to participate in the market for failed firms' assets.

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

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

Now, let $\mu = \left(\frac{\bar{q}}{\underline{p}}\right)$. 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 $k > \bar{\bar{k}}$, the price for failed firms' assets is given as:

$$p^*(k) = \left(\frac{(1-k)(R_0-1) + w}{k}\right) - 1. \quad (38)$$

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

$$\left(\frac{\bar{q}}{\underline{p}} - 1\right) p^*(k) \geq 1. \quad (39)$$

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 $w^* = \left(\frac{\bar{q}}{\bar{q}-\underline{p}}\right)$, 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

$$\left(\frac{\bar{q}}{\underline{p}} - 1\right) p^*(k) < 1. \quad (40)$$

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

$$k^* = \left(\frac{(\bar{q} - \underline{p}) ((R_0 - 1) + w)}{\underline{p} + (\bar{q} - \underline{p}) R_0}\right), \quad (41)$$

such that, for $k > k^*$, the capital market completely shuts down, that is, $y = 0$ and $s = 0$.

◇

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

Country	Thailand	Philippines	Malaysia	Korea	Indonesia
1980-1995, 2001-2005					
Correl(FDI,FPI)	0.51	0.66	0.00	0.74	0.72
Correl(FDI,FPI Debt)	0.05	0.73	-0.20	0.68	0.78
1996-2000					
Correl(FDI,FPI)	-0.52	-0.61	-0.11	-0.43	0.59
Correl(FDI,FPI Debt)	-0.45	-0.75	-1.00	-0.85	0.85

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.

Table 2: Industry sectors of target firms at the time of first acquisition

Industry of target firm	Frequency
Commercial Banks, Bank Holding	16
Credit Institutions	5
Insurance	7
Investment and Commodity	41
Real Estate and Mortgage Brokers	20
Total	89

Table 3a: Purchase and subsequent re-sale in terms of the origin of the acquirers

		2 nd Acquirer		
		Domestic	Foreign	Subtotal
1 st Acquirer	Domestic	55	11	66
	Foreign	14	4	18
	Subtotal	69	15	84

Table 3b: Purchase and subsequent re-sale in terms of the origin of the acquirers (%)

		2 nd Acquirer	
		Domestic	Foreign
1 st Acquirer	Domestic	83.3%	16.7%
	Foreign	77.7%	22.2%

Table 4: Purchase and subsequent re-sale in terms of the identity of the acquirers

		2 nd Acquirer		
1 st Acquirer	Non-Financial	Financial	Total	
Non-Financial	6	20	26	
Financial	4	58	62	
Total	10	78	88	

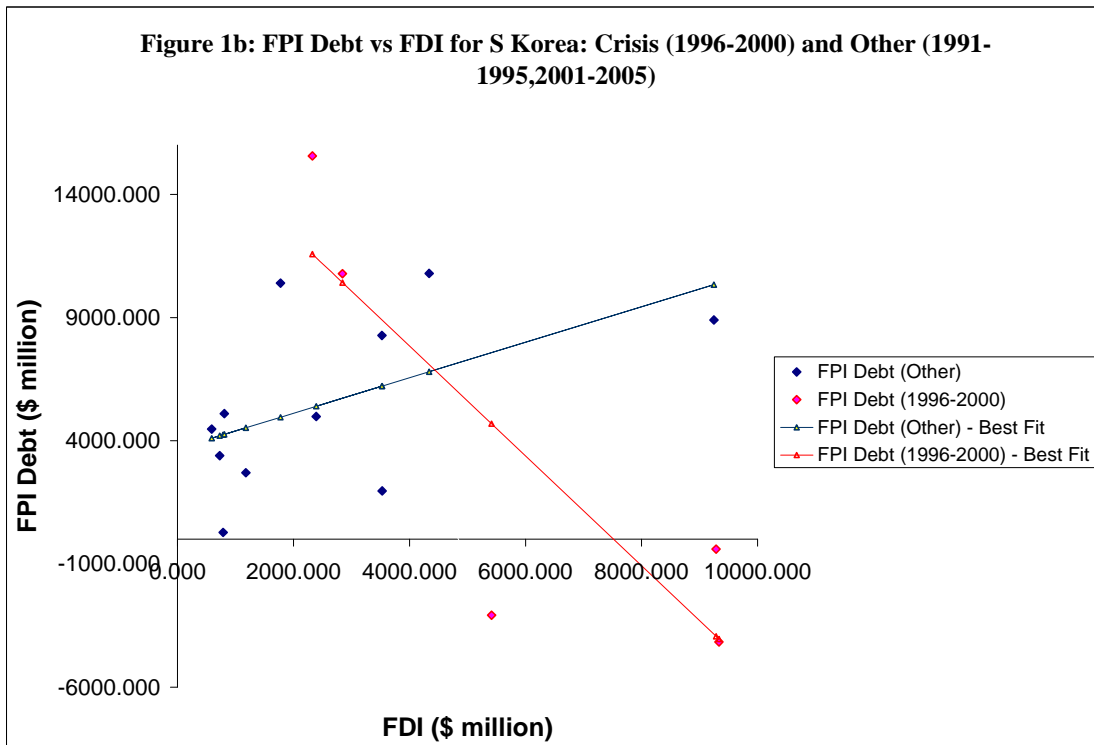
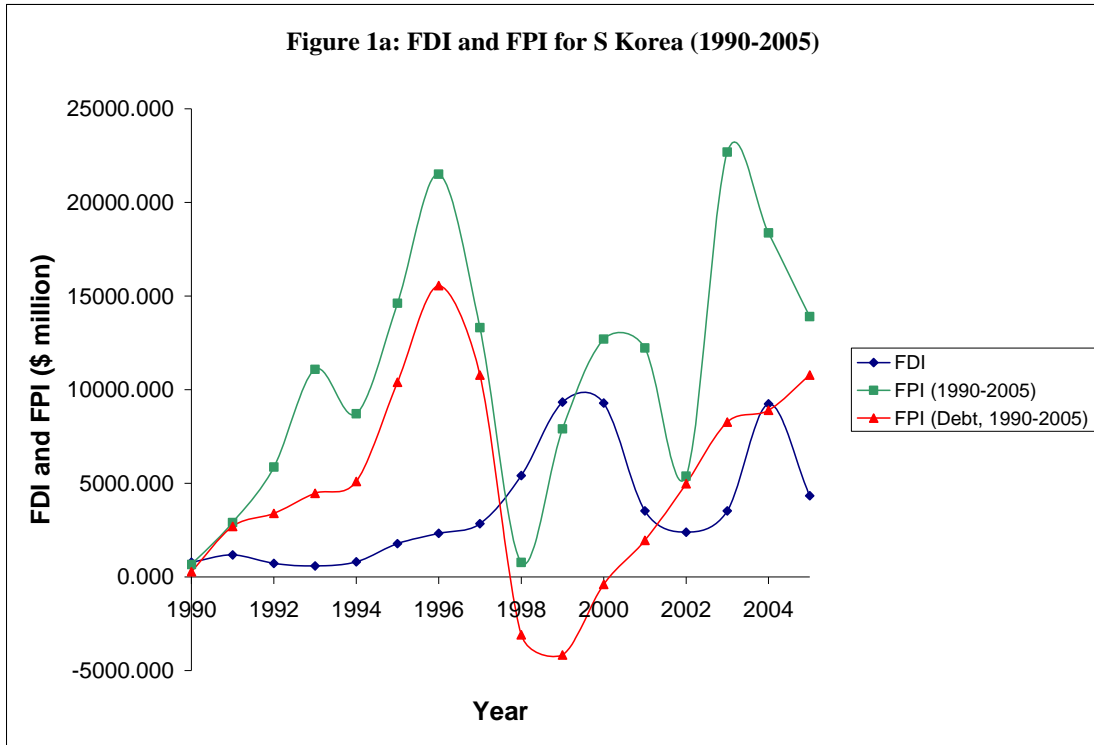


Figure 2a: FDI and FPI for Philippines (1990-2005)

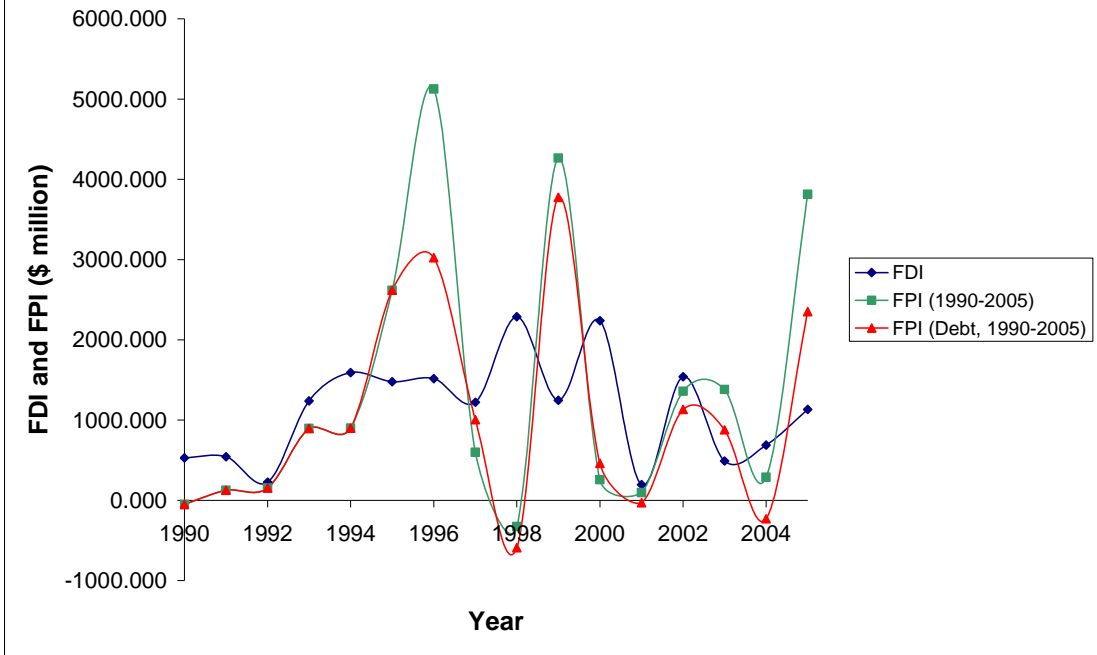
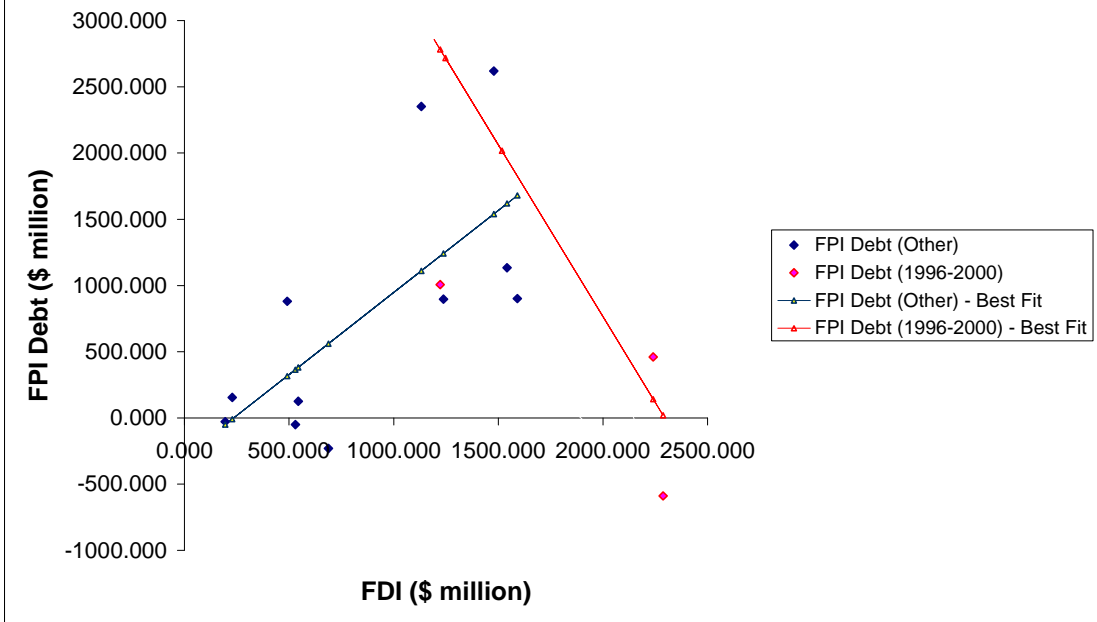
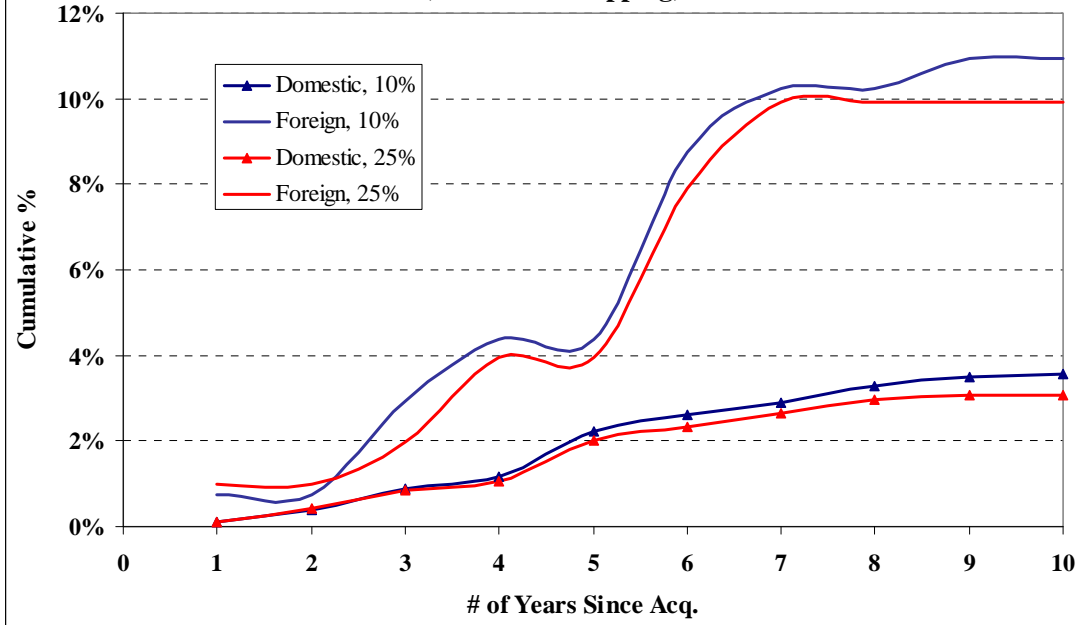


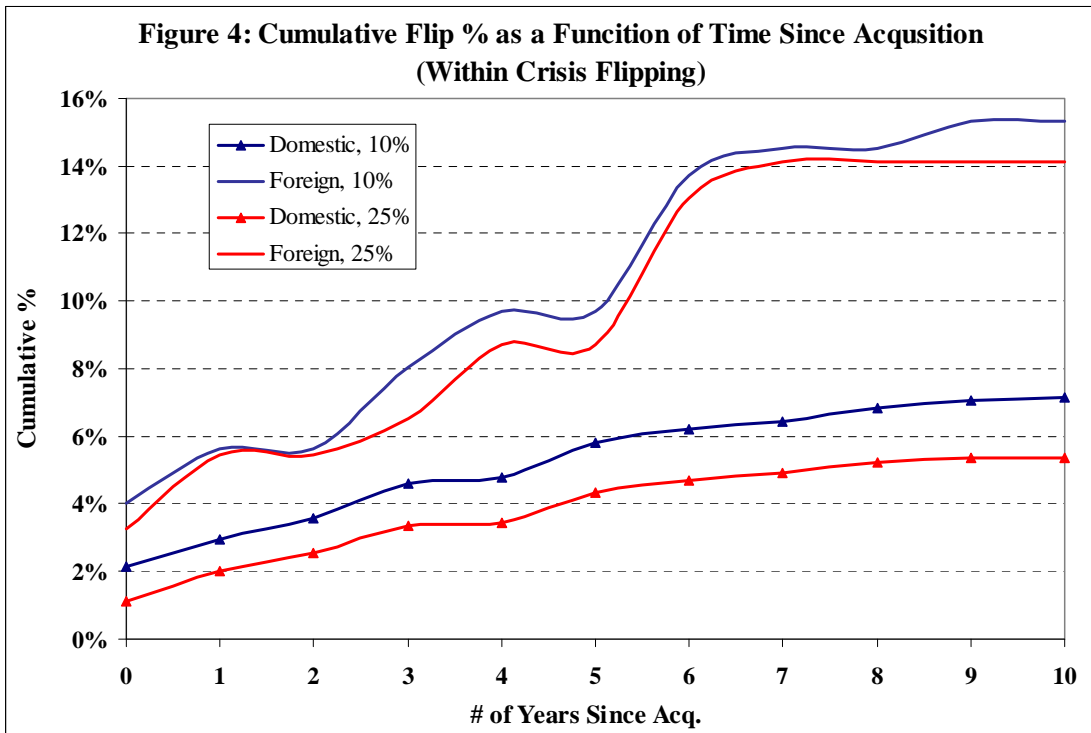
Figure 2b: FPI Debt vs FDI for Philippines: Crisis (1996-2000) and Other (1991-1995, 2001-2005)



**Figure 3: Cumulative Flip % as a Function of Time Since Acquisition
(Post Crisis Flipping)**



**Figure 4: Cumulative Flip % as a Function of Time Since Acquisition
(Within Crisis Flipping)**



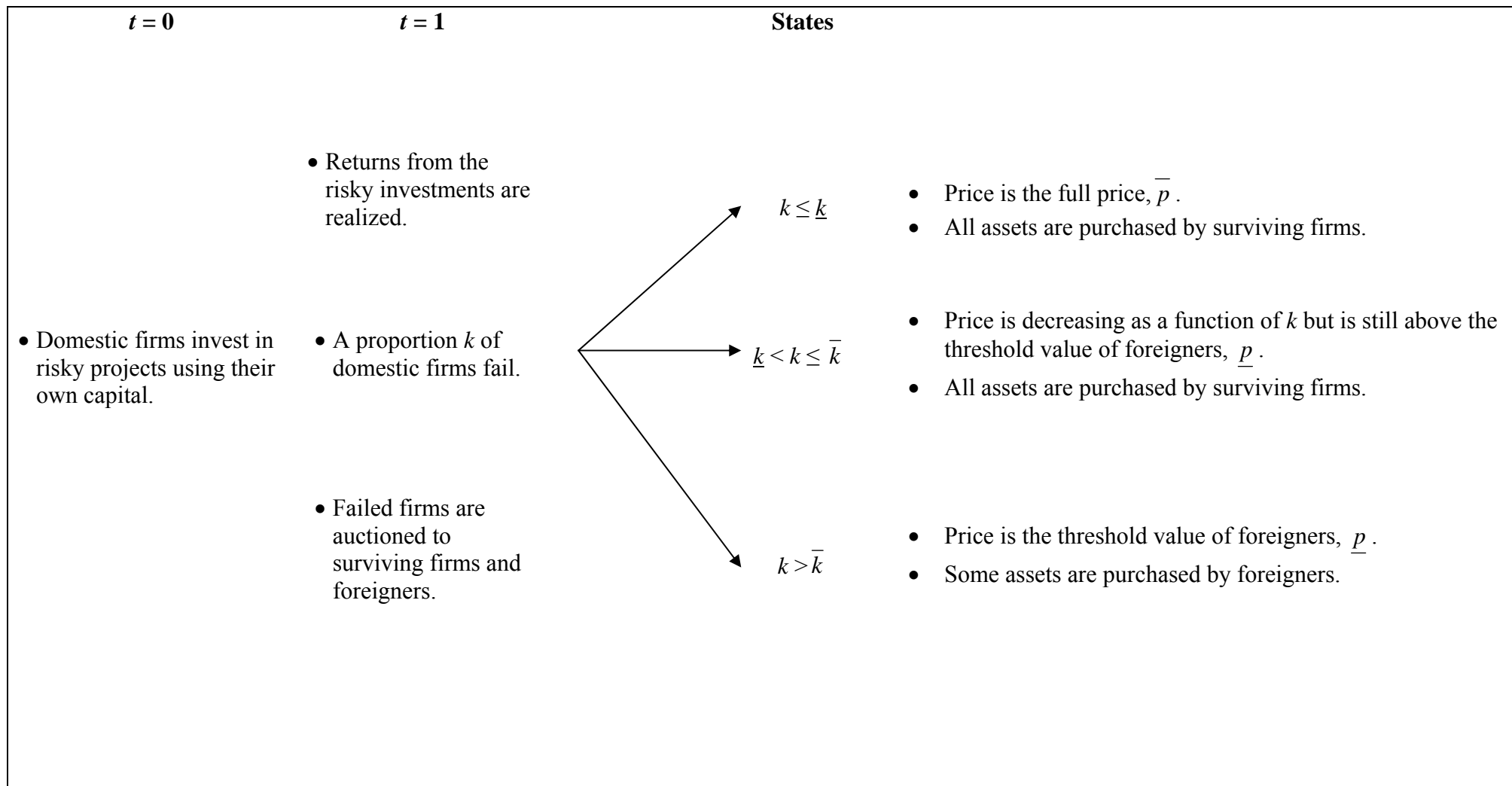


Figure 5: Timeline of the benchmark model.

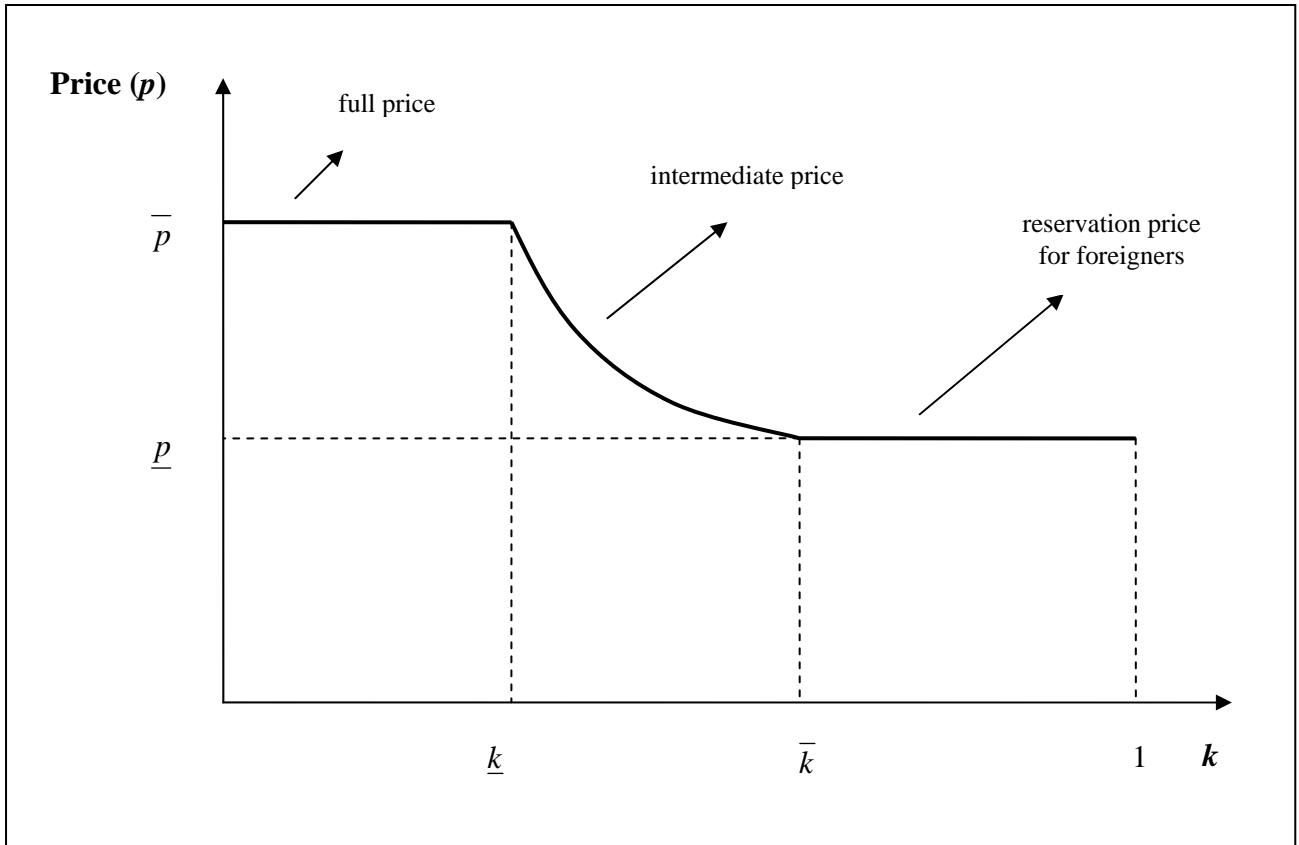


Figure 6: Price in Proposition 2.

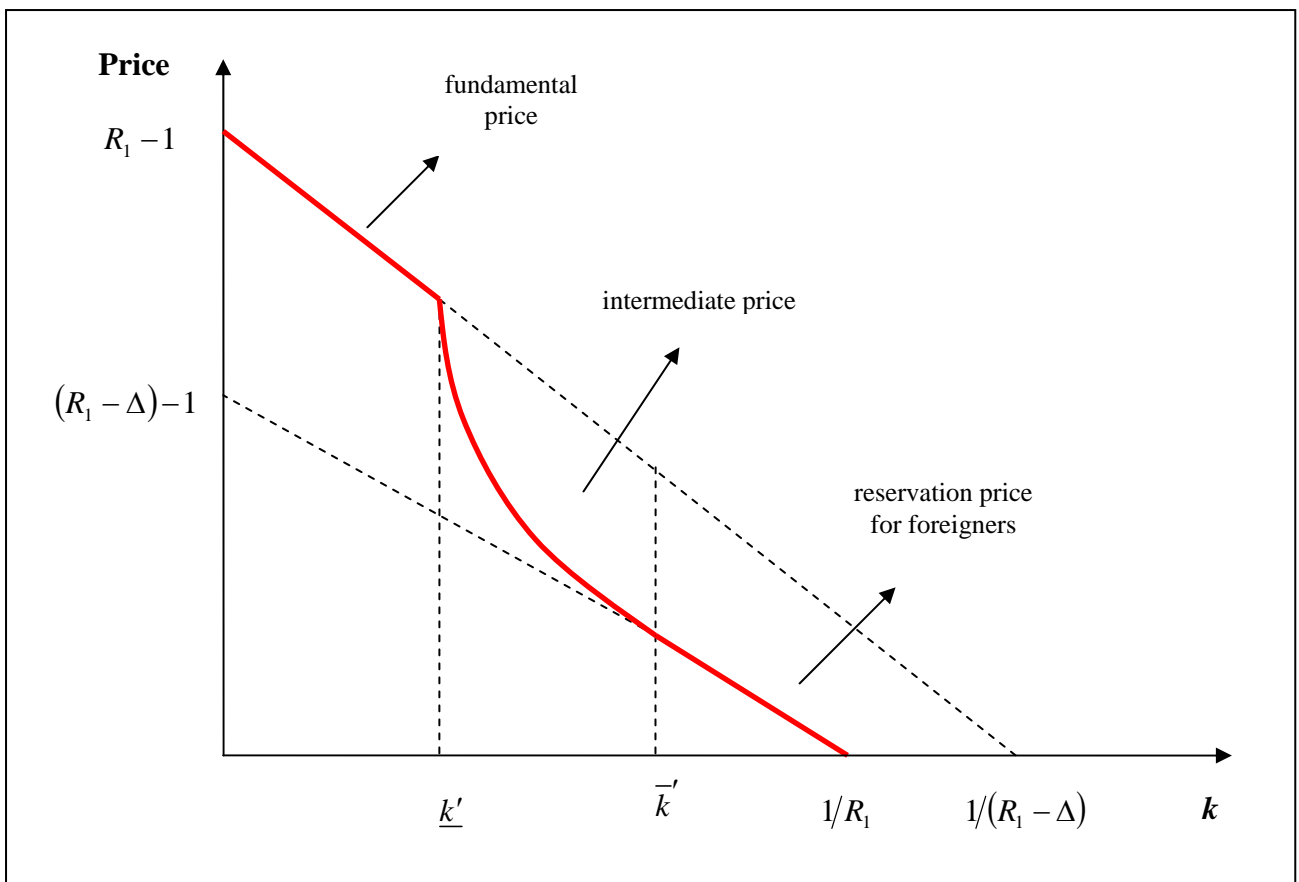


Figure 7: Price as a function of k (Corollary 1).

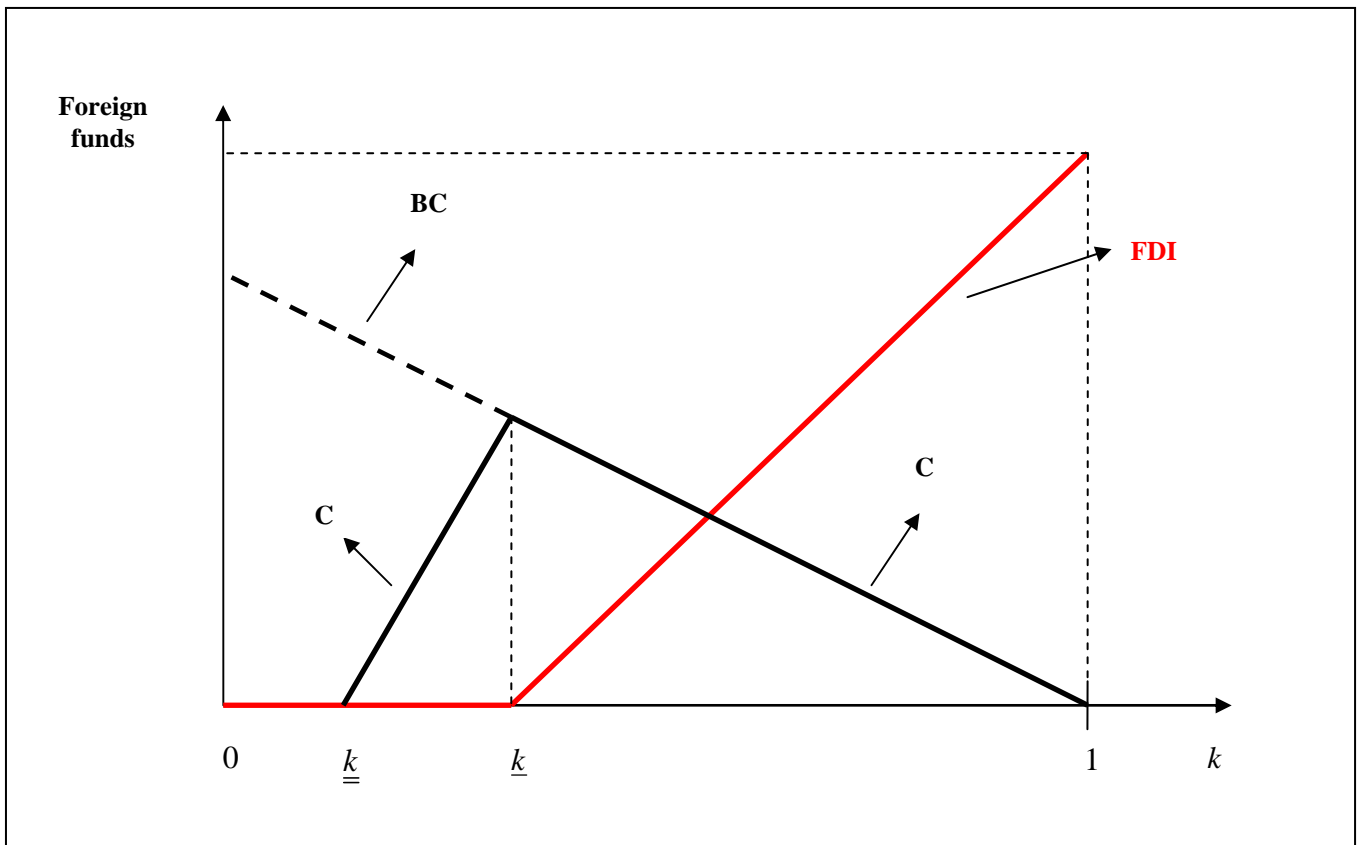


Figure 8: Capital flight and FDI (Proposition 3).

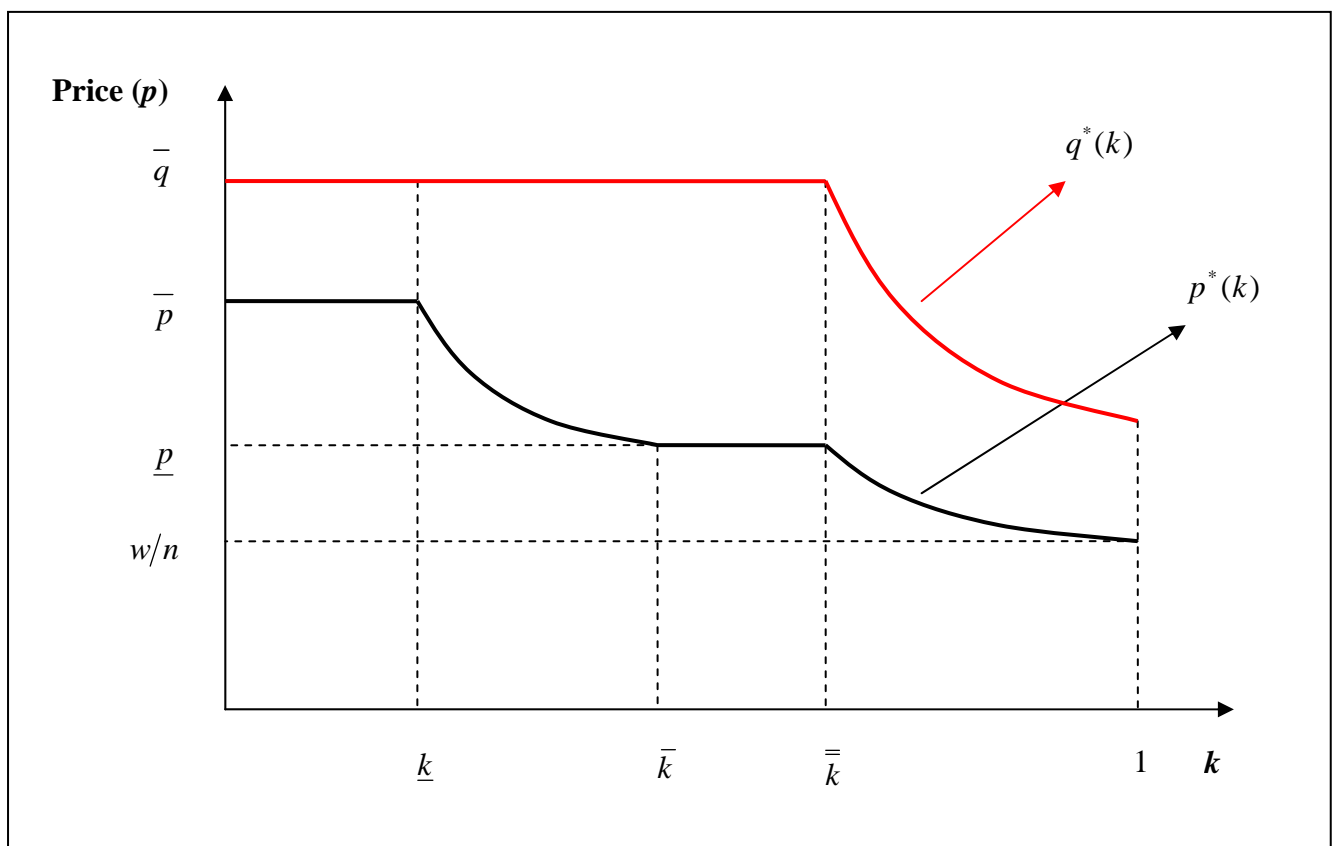


Figure 9: Prices with limited outsider funds (Proposition 4).

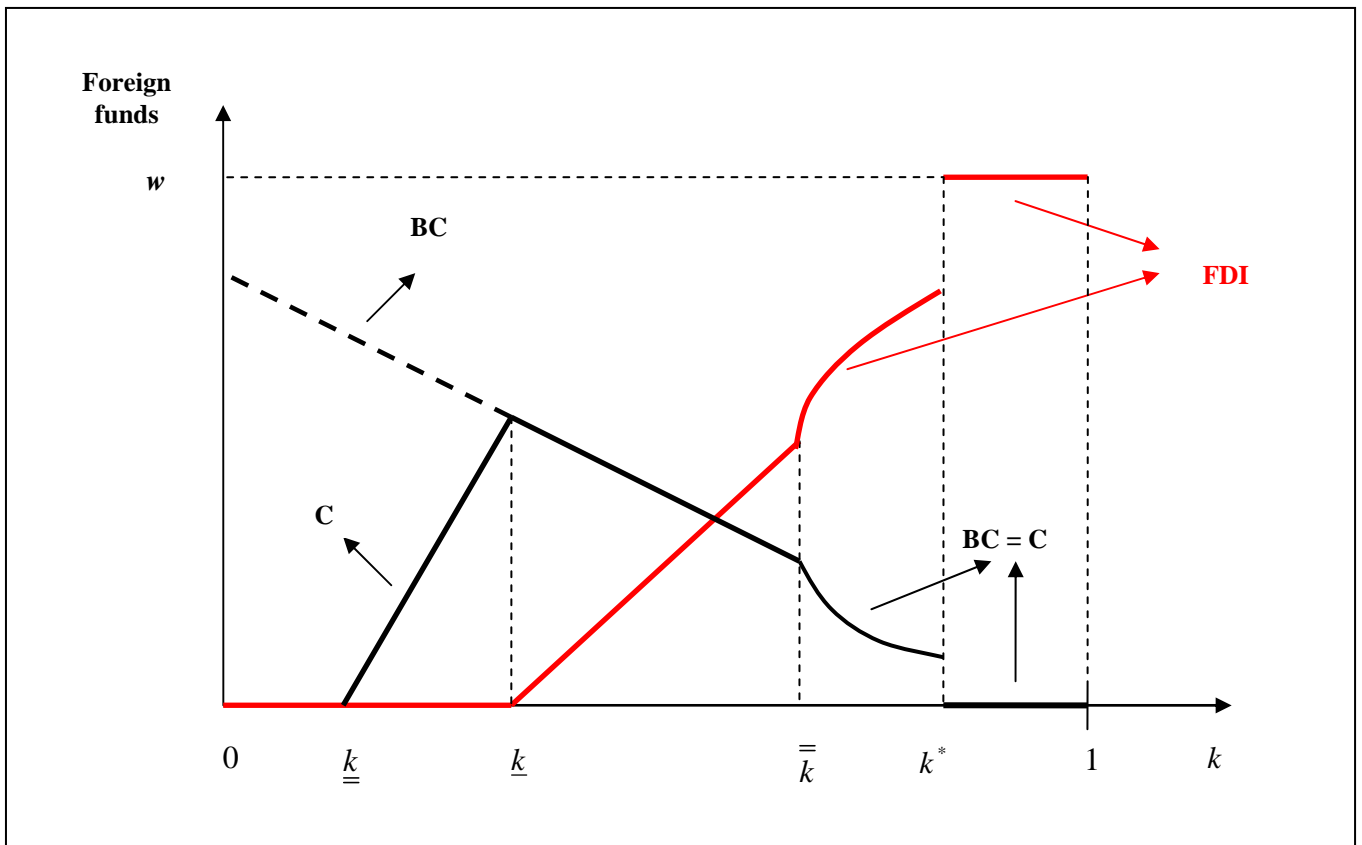


Figure 10: Capital flight and FDI (Proposition 4).

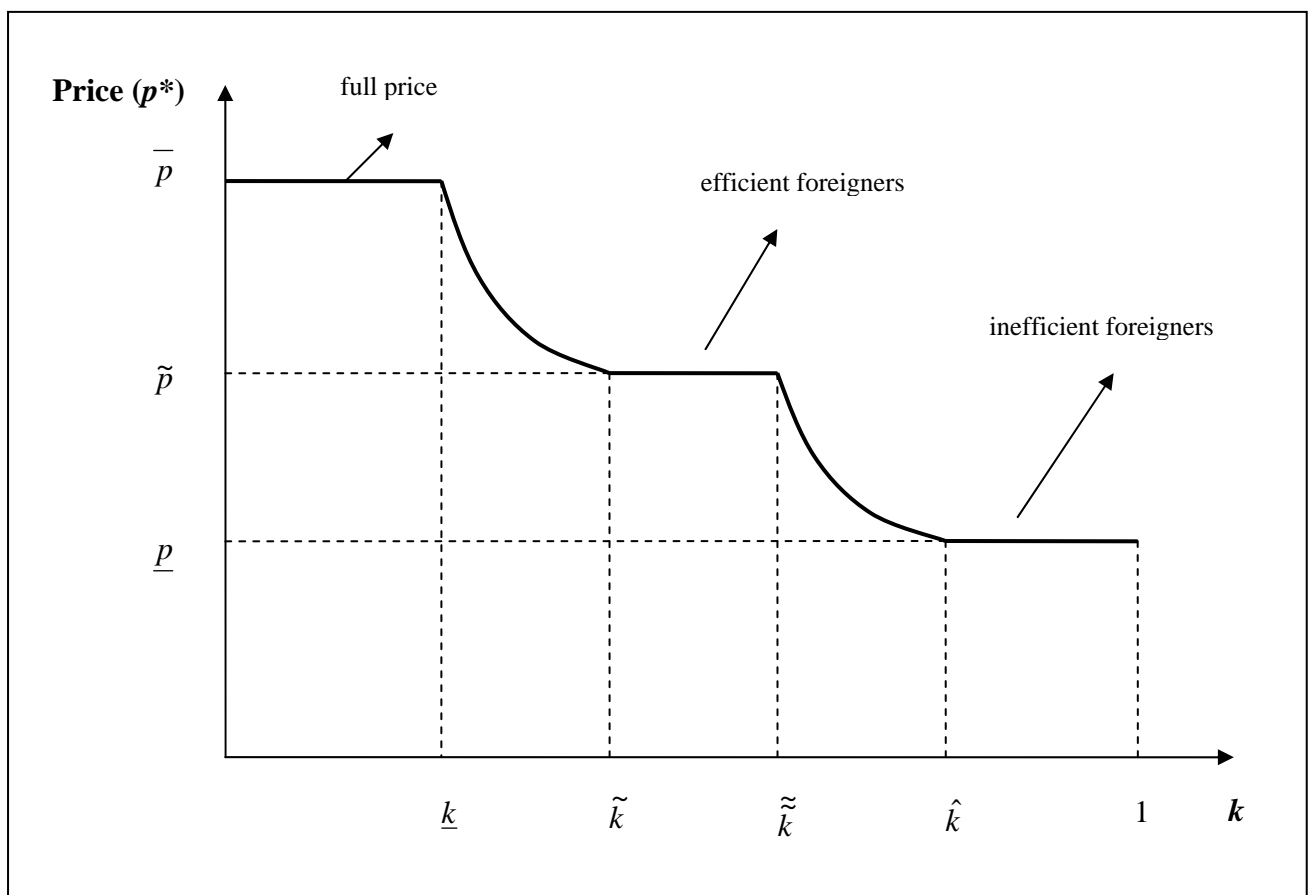


Figure 11: Price with differential efficiency levels of foreigners (Proposition 5).