Fire-Sale FDI and Liquidity Crises[*]

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Abstract

In placing capital market imperfections at the center of emerging market crises, the theoretical literature has associated a liquidity crisis with low foreign investment and the exit of investors from the crisis economy. However, a liquidity crisis is equally consistent with an inflow of foreign capital in the form of mergers and acquisitions (M&A). To support this hypothesis, we use a firm-level dataset to show that foreign acquisitions *increased* by 91% in East Asia between 1996 and 1998, while intra-national merger activity declined. Firm liquidity plays a significant and sizeable role in explaining both the increase in foreign acquisitions and the decline in the price of acquisitions during the crisis. This contrasts with the role of liquidity in non-crisis years and in non-crisis economies in the region. This effect is also most prominent in the tradable sector. Quantitatively, the observed decline in liquidity can explain 25% of the increase in foreign acquisition activity in the tradable sectors. The nature of M&A activity supports liquidity-based explanations of the East Asian crisis and provides an explanation for the puzzling stability of FDI inflows during the crises.

1 Introduction

There is a growing theoretical literature that places capital market imperfections at the center of emerging market crises. A deterioration in access to liquidity is shown to induce and exacerbate a real crisis in emerging markets, even in the absence of a shock to fundamentals.[1] This literature associates liquidity crises with low foreign investment and an exit of investors from the crisis economy. However, an equally plausible consequence of a liquidity crisis would involve the buy-out of domestic firms by foreign firms. This option, while raised in earlier work, is not the primary focus of recent crisis models and has not been subject to formal empirical investigation.[2]

In this paper, we empirically investigate the behavior of mergers and acquisitions (M&A), both domestic and foreign, in East Asia during the crisis of 1997-98. We find that M&A activity is consistent with the tightening of liquidity constraints for domestically owned firms. Specifically, nations suffering dramatic reversals in portfolio equity and debt flows simultaneously experience an *increase* in foreign acquisitions, particularly of liquidity constrained firms, a phenomenon we describe as fire-sale foreign direct investment (FDI).

Since the reversal of capital flows constitutes the defining feature of recent crises in emerging markets, understanding the behavior of these flows is crucial to identifying the precipitating shocks. Any such analysis needs to confront the surprising stability of foreign direct investment inflows into emerging markets during crisis years, a sizeable component of which are M&A's.[3] This stability in FDI contrasts with the sharp reversals in portfolio flows and bank lending (see figure 1).

We begin our analysis in Section 2 by deriving testable implications for the behavior of mergers and acquisitions in response to a deterioration in liquidity. For this purpose,

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[1]See Aghion, Bacchetta, and Banerjee (2000), Chang and Velasco (2001), and Caballero and Krishnamurthy (2001).

[2]The possibility that firms were being sold at a discount due to illiquidity was raised early on by Krugman (1998) based on anecdotal evidence on acquisitions.

[3]M&A as a percentage of FDI inflows ranged from 12% for Malaysia to 73% for South Korea in the late 1990s. These percentages were noticeably higher during the crisis in East Asia.

we introduce a stylized model of foreign acquisitions in emerging markets. An important assumption we make is that during a crisis foreign firms bring access to greater liquidity than would otherwise be available to the acquired firm. We argue that foreign ownership brings transparency, relationships, and management that help bridge the gap between emerging markets and deeper overseas financial markets. Such benefits are unlikely to result from portfolio flows due to the small and dispersed nature of portfolio transactions. The premise that a large foreign ownership stake mitigates capital market imperfections therefore implies an important distinction between portfolio capital and FDI.

To test the predictions of the model, we employ a firm level dataset on mergers and acquisitions that records all cross-border and within-country mergers and acquisitions from 1986 through 2001. The dataset includes firm level financial characteristics of the target firm and acquisition prices, providing us with a rich information set to analyze acquisition behavior. The empirical literature on cross-border mergers and acquisitions has been essentially limited to developed country capital markets. In an influential paper, Froot and Stein (1991) use aggregate data to explore the role of real exchange rate changes in explaining the increase in FDI into the U.S in the 1980's. Blonigen (1997) focuses on the real exchange rate to explain the sectoral pattern of Japanese acquisitions of U.S. firms. Related to fire-sales, Pulvino(1998) uses a novel dataset to investigate liquidity-induced sales in the U.S. aircraft industry. This paper presents the first detailed empirical study of mergers and acquisitions in emerging markets.

The results of our empirical analysis are presented in Section 3. We find that the number of foreign mergers and acquisitions in East Asia *increased* by 91% between 1996 and the crisis year of 1998. Significantly, over the same period, domestic mergers and acquisition declined by 27%. In support of the liquidity hypothesis, we find that the effect of liquidity (proxied by cash flow, cash stock and sales) on the probability of being acquired changes significantly during the crisis year. While during non-crisis years high cash flow and sales has an insignificant effect on the probability of being acquired, in 1998 additional cash implies a *lower* probability of acquisition. A natural prediction of the model is that

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liquidity constraints should have a greater impact on firms in high-growth sectors. While the large real devaluation of East Asian currencies in 1997-98 and the simultaneous collapse of the domestic economies limited the cash flow of firms in the nontradable sectors, they also severely reduced the firms' investment opportunities. Correspondingly, we find liquidity effects to be more prominent in the tradable sectors. Our estimates indicate that the decline in firm liquidity between 1996 and 1998 can account for 25% of the observed increase in acquisition activity in the tradable sectors.

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. In support of the hypothesis that cash-strapped firms sell at a steeper discount during a liquidity crisis, cross-sectional regressions find that an additional dollar of cash has 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. Further, this elasticity is higher (1.12) for firms acquired in the traded sector.

We divide our sample into sub-periods to determine the role of liquidity over time and find that liquidity effects are significant and sizeable only in 1998. Given that liquidity shocks are typically thought to be short-lived, we argue this is further support for the liquidity-sale hypothesis. We also find that liquidity considerations were more important in driving foreign-domestic acquisitions than domestic-domestic acquisitions, consistent with our underlying premise regarding the advantages of foreign ownership. Lastly, as a further test of our methodology, we estimate the role of liquidity in Singapore and Taiwan (Asian economies that were not subject to large capital account reversals in 1997-98) and find no evidence of liquidity based fire-sales in these economies.

In Section 4, we discuss other plausible interpretations of the evidence. One explanation based on the predominant shock being a decline in firm productivity (without a more significant decline in liquidity) would be consistent with the decline in the average sales price of acquired firms. However, it would be inconsistent with all other evidence regarding the number of acquisitions, the responsiveness of the probability of acquisition and the

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price of acquisition to changes in liquidity that we identify. A second plausible explanation based on regulatory changes introduced during the crisis is consistent with the rise in the aggregate number of foreign acquisitions during the crisis. Consequently, to identify the role played by liquidity we exploit the cross-sectional variation using firm-level data. This allows us to isolate the effects of liquidity after controlling for any regulatory change at the industry level. Finally, hypotheses regarding cash flow as a proxy for omitted firm fundamentals have difficulty explaining the fact that high cash flow lowered the probability of being acquired in 1998 while simultaneously increasing the premium paid for the firm.

2   Empirical Hypotheses

This section presents a simple two-period model to spell out intuitively robust implications of a liquidity crisis. The goal of the model is to formalize testable predictions regarding the behavior of foreign acquisitions during a liquidity crisis.

The model makes a distinction between foreign ownership and domestic ownership. A domestic firm that is acquired by a foreign firm is assumed to gain access to superior technology and deeper credit markets. The first distinction is a mild technology spillover assumption that requires that the merged/acquired firm realize productivity gains. Spillovers to other firms are assumed to be zero. This assumption is consistent with Aitken and Harrison (1999), who find positive productivity gains from foreign direct investment but little impact on other domestic firms. Goldberg (2004) surveys the empirical evidence on FDI and identifies a consensus in support of direct productivity spillovers.[4]

The second distinction rests on the premise that capital markets are deeper in industrialized countries and firms that are headquartered in such markets have greater access to outside funding. In our sample, 89% of the foreign acquisitions during the crisis period where by firms headquartered in high income countries (as defined by the World Bank), and for the sample as a whole that number is 82%. Our empirical hypotheses therefore include

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[4]See also Blomstrom and Wolfe (1989) for evidence of general productivity spillovers in Mexico.

the assumption that foreign firms have greater access to liquidity as compared to domestic firms during crisis periods.[5] There is growing empirical support that foreign ownership plays a positive role during crises. For example, Desai, Foley and Forbes (2003) find affiliates of US firms invest more than domestic firms during and after a currency crisis. In further support of our premise, they also find that the US parent increases direct financing of its subsidiaries following a crisis. Blalock, Gertler, and Levine (2003) find that in Indonesia only exporters with foreign ownership increased investment significantly during the crisis, which is consistent with our differential liquidity constraint assumption.

While we do not model portfolio investment explicitly, we make an important distinction between FDI and portfolio investment. We presume that it is the large ownership stake associated with FDI that mitigates capital market imperfections. Portfolio investment being small and anonymous does not overcome the liquidity constraint. As indicated in Table 1, the median shares acquired by foreign firms is 50% in our sample.

At the start of period one, a domestically owned firm, j, is characterized by an initial capital stock $K_{j,1}$, a borrowing constraint $\bar{D}_j$, and period-one profits $\pi_{j,1}$. In period 1, the firm chooses its optimal investment, I, subject to the borrowing constraint and anticipated period-two productivity, $A_{j,2}$ (we assume perfect foresight). Firms are price takers and the price of additional capital is normalized to one. Any differences across firms in the price of output are folded into $A_{j,2}$ (in particular, the differential impact of a real devaluation across firms will be captured by differences in $A_{j,2}$, as explained in Appendix B). To simplify expressions, we assume that the interest rate and discount rate are zero.

The value of a firm under domestic ownership, V^D, can then be expressed as (dropping subscript j):

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[5]There are numerous theoretical models that provide microfoundations for borrowing constraints, such as imperfect and asymmetric information (see Bernanke, Gertler and Gilchrist (1998) for a survey of capital market imperfections and macroeconomics). As the goal of the paper is not to add to this already large theoretical literature, we will take as given that firms may face a borrowing constraint and this constraint is tighter for emerging market firms, especially in crisis periods.

$$V^D(K_1, A_2, \pi_1, \bar{D}) \quad = \quad \max_I \{\pi_1 - I + A_2 F(K_2) + (1-\delta)K_2\} \tag{1}$$

$$\text{s.t. } K_2 \quad = \quad (1-\delta)K_1 + I$$

$$I \quad \leq \quad \bar{D} + \pi_1,$$

where $F' > 0$, $F'' < 0$, and $\delta \in (0,1)$ is the rate of capital depreciation. The difference between current profits and investment $(\pi_1 - I)$ represents retained earnings (if positive) or (the negative of) debt due in the final period. The first constraint is a standard capital accumulation equation. The second constraint captures the borrowing constraint.

The value to a foreign owner, V^F, of the same firm is given by

$$V^F(K_1, A_2, \pi_1) \quad = \quad \max_I \{\pi_1 - I + \phi A_2 F(K_2) + (1-\delta)K_2\} \tag{2}$$

$$\text{s.t. } K_2 \quad = \quad (1-\delta)K_1 + I$$

where $\phi > 1$ captures the superior productivity associated with foreign ownership and foreign owners are not subject to a borrowing constraint.[6] Clearly, $V^F > V^D$, $\forall j$. However, the transfer of ownership to the foreign acquiror entails a fixed reorganization cost γ. A foreign firm then acquires a domestic firm as long as the acquisition generates a positive surplus, that is $S \equiv V^F - V^D - \gamma \geq 0$.

If acquired, the price paid for the firm is determined according to a Nash-bargaining solution :

$$P = \beta S + V^D = \beta \left(V^F - V^D - \gamma \right) + V^D, \tag{3}$$

where $\beta \in (0,1)$ captures the domestic owners bargaining power and V^D is the outside option for the domestic firm.[7] The extent to which the value of the firm under domestic

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[6]We assume no constraint on foreign ownership's debt, but the important point is that the foreign firm enjoys a higher debt limit than the domestically owned firm.

[7]Recall that the zero outside option for the foreign investor is only a simplifying assumption.

ownership influences the price of acquisition depends on the bargaining parameter β. A large pool of potential foreign partners might drive β to one and the domestic firm would receive the full surplus. Liquidity would then not influence the price of acquisitions. However, M&A in emerging markets does not resemble a perfectly competitive market. In only 2.5% of the acquisitions in our sample was a competing bid offer made. It should also be noted that the incidence of acquisition (as opposed to price) does not depend on the relative bargaining power of the two parties.

Figure 2 identifies the range of firms acquired. The solid line denotes the combinations of future productivity (A_2) and liquidity ($l \equiv \pi_1 + \bar{D}$) which imply zero acquisition surplus, all else equal. Firms that lie above this line will be acquired. For high enough A_2, a domestic firm will be acquired regardless of liquidity due to the superiority (and complementarity with A_2) of foreign technology. As we reduce available liquidity for a given A_2, a domestically owned firm will eventually become constrained and have to forego profitable investment opportunities. This widens the gap between V^F and V^D, making the acquisition efficient.[8]

In regard to price, an increase in A_2, all else equal, increases V^F more than V^D due to the superior technology employed by foreign ownership. This raises the surplus of the acquisition and therefore increases the price of the acquired firm. Similarly, extending additional liquidity to a constrained firm increases V^D, reducing the gap between V^F and V^D and raising the acquisition price. Of course, to an unconstrained firm additional liquidity has zero effect on the acquisition surplus.

2.1 Liquidity Crises and Testable Implications

Conceptually, we consider a liquidity crisis as a *ceteris paribas* decline in liquidity available to domestically owned firms. That is, conditional on firm characteristics, domestically

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[8] The assumption that foreign firms complement existing technology (ϕ enters multiplicatively) is justified by the finding of Aitken and Harrison (1999) that foreign investment targets relatively productive domestic firms.

owned firms as a group find it difficult to borrow during the crisis.[9]

Specifically, let $G_0(l)$ denote the benchmark or "normal-period" cumulative distribution of liquidity, *conditional* on A_2, γ and other firm-specific characteristics, which we summarize as "θ". If $G_1(l)$ is the equivalent distribution during a liquidity crisis, then our definition implies that G_0 "first order stochastically dominates" (*fosd*) G_1.

Let N_i denote the fraction of firms acquired under G_i, $i = 0, 1$, where 1 is the crisis distribution. That is,

$$N_i \equiv \int \int_{S \geq 0} dG_i(l) dH(A_2, \gamma, \theta), \tag{4}$$

where H is the distribution of firm characteristics (A_2, γ, θ).

Proposition 1 *If G_0 fosd G_1, then $N_0 \leq N_1$.*

Proof: Let $\mathbf{1}_{\{x\}}$ equal one if x is true and zero otherwise. Then

$$N_i = \int \int \mathbf{1}_{\{S \geq 0\}} dG_i(l) dH(A_2, \gamma, \theta). \tag{5}$$

Conditional on other firm characteristics, $\mathbf{1}_{\{S \geq 0\}}$ is nonincreasing in l. The definition of $fosd$ implies that $\int \mathbf{1}_{\{S \geq 0\}} dG_0(l) - \int \mathbf{1}_{S \geq 0} dG_1(l) \leq 0$. Integrating over other firm-specific characteristics preserves this inequality, implying that $N_0 \leq N_1$. The intuition is straight forward: as more firms become constrained, more firms will be willing to pay the cost γ to gain access to foreign liquidity.

One regression we consider below involves the probability of acquisition conditional on observable firm characteristics. We take the cost of reorganization γ to be the source of unobserved, idiosyncratic variation across firms.[10] That is, if $y = y(l, A_2, \theta)$ denotes the

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[9]We do not model the origins of this capital market imperfection and why it may have been exacerbated in 1997-1998, but instead derive its implications for cross-border acquisitions.

[10]In this section, we treat γ as orthogonal to other firm characteristics. In the empirical work, we control for underlying firm characteristics by including firm fixed effects.

probability of acquisition conditional on firm characteristics and $\gamma \sim \Gamma(\gamma)$, then $y = \int_{S \geq 0} d\Gamma$. Recall that additional liquidity (to a constrained firm) lowers S while increased productivity increases the surplus of an acquisition. This implies:

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\frac{\partial y}{\partial l} \quad \begin{cases} = 0, & \text{if unconstrained} \\ < 0, & \text{if constrained} \end{cases}
$$
$$
\frac{\partial y}{\partial A_2} \quad > 0.
$$

The population averages of the partial derivatives in (6) are obtained by taking expectations over firms. Let $E_i(x) = \int \int x dG_i(l) dH(A_2, \theta)$, $i = 0, 1$, represent the population average of a random variable x during normal period $(i = 0)$ and during a liquidity crisis $(i = 1)$. Assuming the distribution of γ satisfies certain conditions (see Appendix C), we have

Proposition 2 *If G_0 fosd G_1, then (i) $E_0\left(\frac{\partial y}{\partial l}\right) \geq E_1\left(\frac{\partial y}{\partial l}\right)$ and (ii) $E_0\left(\frac{\partial y}{\partial A_2}\right) \leq E_1\left(\frac{\partial y}{\partial A_2}\right)$.*

Proof: See Appendix C.

Proposition 2 states that, on average, additional liquidity has a more negative impact on the probability of acquisition during a liquidity crisis. Similarly, the sensitivity of the probability of acquisition to firm productivity increases during a liquidity crisis.

As noted in the introduction, Froot and Stein (1991) emphasize the role of real exchange rate changes on inward U.S. FDI using aggregate data. In our framework, Froot and Stein's model links the liquidity crisis (a tightening of $\bar{D}$) to a real depreciation. While we test for the importance of liquidity in the cross-sectional pattern of M&A, we cannot test Froot and Stein's hypothesis directly against other aggregate shocks that may influence firm liquidity.[11]

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[11]In particular, our empirical specifications control for all aggregate shocks using country∗time∗industry dummy variables. Considering the variety of aggregate shocks (observed and unobserved) that are correlated with the real exchange rate, we cannot replace the aggregate dummies with the real exchange rate and confidently interpret the estimated coefficient.

Appendix B provides a detailed analysis of the effect of real exchange rate movements on π_1 and A_2. In particular, a real depreciation is likely to lead to an increase in investment opportunities and profits for tradable sector firms, and vice versa for nontradable firms. As the incidence of acquisition turns on whether firms are constrained *relative* to investment opportunities, the net effect is ambiguous and is therefore an empirical question. However, given that sales take time to adjust to relative prices (as in the standard "J-curve" of trade theory), it seems plausible that a real depreciation will find tradable firms' future prospects expanding faster than current profits. The preceeding propositions would then suggest that the effect of liquidity will be strongest in the tradable sector.

In terms of the price of an acquisition, a liquidity crisis will lead to a fall in the average price of the domestic firm. That is, constrained firms have a less valuable outside option (V^D), all else equal, and thus a lower price. The more constrained firms in the population, the lower the average price. Moreover, liquidity influences the surplus of an acquisition only if the domestic firm is constrained. Thus, the average sensitivity of price to liquidity increases during a liquidity crisis. Conversely, an increase in A_2 has a limited impact on V^D if a firm is constrained as it cannot make full use of the improved productivity. As the sensitivity of V^F to A_2 remains the same regardless of domestic liquidity, the average price of an acquired firm is less sensitive to growth prospects during a liquidity crisis. Specifically:

Proposition 3 *If G_0 fosd G_1, then (i) $E_0\left(\frac{\partial P}{\partial l}\right) \leq E_1\left(\frac{\partial P}{\partial l}\right)$ and (ii) $E_0\left(\frac{\partial P}{\partial A_2}\right) \geq E_1\left(\frac{\partial P}{\partial A_2}\right)$.*

Proof: See Appendix C.

Given the above discussion, the empirical predictions of a liquidity crisis can be summarized as follows.

(i) The number of acquisitions increases during a liquidity crisis;

(ii) On average, the sensitivity of the conditional probability of acquisition to firm liquidity declines (becomes more negative) during a liquidity crisis;

(iii) On average, the sensitivity of the conditional probability of acquisition to future productivity increases during a liquidity crisis;

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(iv) The average price of an acquisition declines during a liquidity crisis;

(v) On average, the sensitivity of the price of an acquisition to firm liquidity increases during a liquidity crisis;

(vi) On average, the sensitivity of the price of an acquisition to future productivity declines during a liquidity crisis.

3 Empirical Results

Our empirical work focuses on five East Asian nations: South Korea, Thailand, Indonesia, Malaysia, and the Philippines. These were the nations hit hardest by the Asian crisis of 1997. Corsetti, Pesenti, and Roubini (1998)) provide a detailed account of the crisis that was characterized by a dramatic reversal of short-term capital flows from these economies. Thailand abandoned its currency peg in July of 1997, followed by devaluations in Indonesia, Malaysia, Philippines and South Korea.

3.1 Data

Our primary dataset is Thompson Financial Securities Data Company's (SDC) mergers and acquisition database, which contains dates and details of cross-border and domestic mergers and acquisitions. The database includes all corporate transactions involving at least 5% of the ownership of a company where the transaction was valued at $1 million or more (after 1992, deals of any value are covered) or where the value of the transaction was undisclosed. Public and private transactions are covered. SDC also reports numerous details about the target and acquiring firm, including income and balance sheet items, industry, and ownership. For each firm acquired, SDC reports five years of historical data, allowing the construction of a panel of acquired firms.

We begin our sample in 1986 and include all mergers and acquisitions through the end of 2001. In total, we have close to 6,000 completed deals, roughly one third of which involve a foreign acquiror. Forty-five percent of deals involve a private target, with publicly

traded firms and subsidiaries accounting for a quarter each. The remainder consists of government firms (1%) and joint-ventures (4%). Many of the regressions below require income statement and balance sheet data that are unavailable for privately held firms. Therefore, the regression samples are weighted towards publicly traded firms.

We take the announcement date as the date of the merger or acquisition. Table 1 reports the distribution of the shares involved in cross-border acquisitions. The median purchase involves 49% of the firm, with over a quarter involving the entire firm. Ten percent of the deals fall short of meeting the usual FDI definition of 10% of outstanding equity.

To avoid limiting our sample to firms that were eventually acquired, we augment the SDC database with data on firms contained in Thompson Financial's Worldscope database. This database consists of annual data on public companies in developed and emerging markets. The combined sample contains over 7,700 firms.[12]. Table 1 summarizes key financial details of the firms used in the regressions below. All level variables are reported in million dollars and the precise definitions of accounting terms are provided in Appendix A.

3.2   The Probability of Acquisition

The first prediction of our theoretical model is that the number of cross-border acquisitions should increase during a liquidity crisis. A simple plot of the number of acquisitions supports this prediction. Figure 3 plots the number of acquisitions of domestic firms by foreign companies (solid line) summed over the five Asian countries[13] and arranged by the year in which the acquisitions were announced.[14] The dashed line reports the number of acquisitions

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[12]Some firms contained in Worldscope are also contained in SDC due to a previous (partial) acquisition by a foreign firm. We delete duplicate observations.

[13]The country-level times series of acquisitions look substantially like the aggregated data. Two exceptions are the fact that foreign acquisitions in Indonesia are constant between 1997 and 1998 and domestic-domestic acquisitions increase in Korea in 1998.

[14]Figure 3 includes all completed acquisitions. We include all purchases of the target's equity, regardless of the percentage of shares involved, as this value is missing for many acquisitions. Restricting to deals in which over fifty percent of the target's equity is purchased yields a similar picture.

of domestic firms by domestic companies for comparison. The upward trend in mergers and acquisitions from the start of the period is apparent in the plot. Moreover, there is a sharp uptick in acquisitions by foreign companies in 1998, the first full year immediately after the onset of the crises in mid- and late-1997. There is an 91% increase in foreign acquisitions between 1996 and 1998, with most of the increase taking place in 1998. Interestingly, the number of acquisitions by other domestic firms declines by 27% over this same period.

Figure 4 plots the number of foreign-domestic acquisitions according to whether the target firm is involved in tradable (solid line) versus nontradable production. We define tradable sectors as manufacturing (3-digit SIC codes 200-399) and nontradable as the remaining sectors. Since we do not have firm or sectoral level data on exports, we follow the extensive macro literature that uses cruder classification schemes to distinguish between tradables and non-tradables. De Gregorio et. al. (1994) calculate export shares at the sectoral level for 14 OECD countries and conclude that the results support the standard practice of using manufactures as tradables and services as nontradables.[15] Both tradable and nontradable sectors experience an increase in acquisitions in 1998, however, the number and percentage increase in foreign acquisitions in the tradable sectors (142%), was far greater than the increase in the nontradable sectors (61%).

To explore more systematically whether liquidity is driving the patterns observed in figure 3, we estimate a number of linear probability regressions using the panel of firms described in Section 3.2.[16] Our probability regressions take the form:

$$y_{jict} = \alpha_0 + \alpha \mathbf{X_{jict}} + \delta \mathbf{X_{jict}} * D_{98} + \mathbf{D}_{jict} + \varepsilon_{jict}. \tag{6}$$

The dependent variable y_{jict} is an indicator variable which takes the value one if firm j in industry i in country c is acquired in year t by a foreign firm, and takes the value zero

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[15]One may consider such nonmanufacturing sectors as agriculture and natural resources to be tradable, but these sectors are a negligible percentage of the sample.

[16]We have also estimated logit and conditional logit regressions and the results stay substantially the same.

otherwise.[17] We explore acquisitions by other domestic firms in Section 3.5.2. Our regressors $\mathbf{X}$ are measures of firm liquidity and potential growth while $\mathbf{D}$ is a vector of "fixed-effect" dummy variables. We will discuss the content of $\mathbf{X}$ and $\mathbf{D}$ below. The variable D_{98} is a dummy variable for the year 1998. We take that year – the first full year after the devaluations of mid- and late-1997 – as our crisis period. This year also accounts for the sharpest uptick in the number of foreign acquisitions. The number of foreign acquisitions was 13% higher in 1997 as compared to 1996 and then 70% higher in 1998 as compared to 1997. In Section 3.5.1 we explore whether the crisis includes additional years as well. The vector δ therefore represents the change in acquisition sensitivity to firm liquidity and growth during the crisis.

Our first measure of firm liquidity is log cash flow reported for the most recent fiscal year. Cash flow is a traditional measure of liquidity and represents the flow of cash from operations available to a firm during a given year. The definition of cash flow differs slightly between the SDC and Worldscope databases (see definitions in Appendix A). To verify this difference does not influence our estimates, we include results using net sales in place of cash flow. Net sales has a common definition in both databases and is highly correlated with cash flow. Our third measure of liquidity is cash stock plus marketable securities, a proxy used frequently in the recent literature (e.g. Love(2001)).[18]

The appropriate measure for liquidity is controversial and a topic of extensive debate in the literature that examines the role of liquidity constraints on investment.[19] A major concern with the use of cash flow or sales as a measure of liquidity is that it may also be associated with other relevant (but unobserved) firm characteristics. We will correct for some of this omitted variable bias through fixed effects discussed below. To the extent that

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[17]SDC identifies the status of the acquisition at the date of announcement, with the vast majority of the sample being coded "Completed" or "Pending". In our probability regressions, we report results for the sample restricted to completed acquisitions only.

[18]We have also used net worth as a proxy for liquidity and found results consistent with the other measures for liquidity. Unfortunately, we do not have data on the currency composition of liabilities, which would likely play a role in firm liquidity during the devaluation (see for example Aguiar (forthcoming)).

[19]See Hubbard (1998) for a survey.

firm type is time varying and correlated with cash flow, higher cash flow may be associated with a higher probability of acquisition if it signals strong firm fundamentals. On the other hand, our liquidity model implies that higher cash flow should have a negative effect on the probability of being acquired, as the surplus generated from a merger is lower. To isolate the effect due to liquidity, we will compare the change in the coefficient of cash flow during the crisis year to the coefficient estimated from the rest of the sample.

Capital expenditure (investment) reported for the most recent fiscal year is used as a proxy for growth opportunities (as in Olley and Pakes (1996)). That is, we assume that a firm that is investing in new physical capital faces relatively strong growth prospects. We do not use the more traditional measure of Tobin's Q as many of our firm's are not listed and the market prices we do observe are influenced by the potential/announcement effect of an acquisition. Since firm level capital expenditure measure can be affected by firm liquidity issues, for robustness, we replaced capital expenditures with sales growth (as a ratio of total assets) and obtained similar results. We have also used industry average measures, which presumably are less contaminated by firm specific variables, and again obtained similar results.

The probability of an acquisition obviously may vary with other characteristics of the firm not contained in the database. To limit the impact of omitted variables we include firm and year fixed effects, i.e. $\mathbf{D} = (D_j, D_t)$ is a vector of firm and year dummies. Thus we only use the time series variation in firm characteristics in predicting the probability of acquisition. The fixed effect will not be sufficient if liquidity is correlated with omitted time-varying firm characteristics (year dummies control for any time-varying aggregate variables). However, we will compare the coefficient on cash flow for the crisis year with other years, differencing out the general correlation with omitted variables. The remaining bias, if any, will result from *changes* to the correlation in the crisis year (a possibility we will discuss in Section 4).

As an alternative to firm fixed effects, we also specify $\mathbf{D}$ to be a vector of indicator variables $\{D_{ict}\}$ representing the triplet of (industry, country, year). That is, we include

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indicator variables for industry (at the 3 digit sic level), country and year and all interactions of these variables. This fixed effect controls for any changes in government policies, relative prices, economic prospects and other such omitted variables that may vary across industries, countries and across time.

Note that the two alternative fixed effects, D_j and D_{ict}, imply very different regressions. The former is essentially comparing a firm to itself over time, the latter exploits the cross-section of companies in a particular 3-digit industry in a particular country in a particular year. Despite this difference, we show below that the conclusions from the two fixed-effect specifications are substantially the same.

The model of liquidity introduced in Section 2, and summarized in statements (ii) and (iii) at the end of Section 2.1, implies $\delta_{\text{cash flow}} < 0$ and $\delta_{\text{capital expenditures}} > 0$. Table 2 reports the results of the benchmark probability regressions specified in (6). Standard errors adjusted for heteroscedasticity and clustering by firm are reported in parentheses. Panel I includes all completed foreign acquisitions and panel II restricts the sample to acquisitions in which the target firm is in a tradable sector. In each panel, columns (1) and (3) utilize firm and year fixed effects while (2) and (4) control for industry*nation*year interactions.

In specifications using all sectors, the dummy for 1998 interacted with liquidity is always negative, with the difference exceeding standard significance levels in two of four cases. The magnitude of the decline is similar across all specifications, as well, implying that the alternative specifications may vary in efficiency but do not reveal bias. This pattern is much stronger in both magnitudes and statistical significance in the traded sectors (panel II), which is consistent with the investment opportunities effect dominating the increased cash flow effect for tradable sector firms. While liquidity plays almost no role in predicting acquisition in noncrisis years, liquidity's effect becomes significantly more negative in 1998. The total effect of liquidity on acquisition is significantly negative in all specifications of panel II. In 1998, a 1% decline in sales for a tradable sector firm is associated with a 0.023 percentage point increase in the probability of acquisition (Panel II column 4).

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The results of table 2 are robust to using cash stocks as an alternative measure of liquidity. Column (1) of table 3 indicates that liquidity as measured by cash stocks plays a significantly greater role in determining the pattern of acquisition during the crisis than is the case during normal years. Specifically, firms during the crisis with low cash stocks are more likely to be acquired than cash-rich firms. The role of liquidity during normal periods is much smaller. This pattern is robust to the inclusion of log assets as an additional regressor (column 6).[20]

The measures of liquidity used in table 2 may capture a firm size effect that is unrelated to liquidity. This is particularly relevant for specifications that do not contain a firm fixed effect. Accordingly, we perform a sensitivity analysis by scaling all variables by total assets. We find that our results remain unchanged and have reported several specifications in table 3. The crisis dummies for cash flow and sales remain significantly negative and of comparable magnitude as those reported in table 2.

To assess the quantitative importance of the drop in liquidity in driving the increase in acquisition between 1996 and 1998, consider that the unconditional (tradable sample) probability of acquisition increased from 0.4% to 3.6%, an increase of 3.2 percentage points. Over the same period, mean log sales fell by roughly 0.34 (i.e. sales fell 34%). According to the estimated elasticity of 0.023, this drop in log sales predicts an increase in the probability of acquisition of 0.8 percentage points, or 25% of the observed increase.

Capital expenditure is intended to capture the growth prospects of a firm. The model predicts that the coefficient on this variable should increase during the crisis year. As with liquidity, the results are strongest for the tradable sectors. The baseline coefficient on capital expenditures is positive, consistent with the premise that foreign firms target relatively productive domestic firms. As predicted, the role of capital expenditure increases during the crisis year. The magnitude of the increase in this relationship during the crisis,

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[20]Due to the smaller sample size when restricting to firms that report assets, we have controlled for industry*country*year effects at the one-digit SIC level. The point estimates are substantially the same as for the 3-digit fixed effects but with a substantial increase in degrees of freedom.

$\delta_{\text{capital expenditure}}$, relative to the base coefficient tends to be large. For tradable sector firms, a 1% increase in capital expenditure is associated with a 0.025 percentage point increase in the probability of acquisition during the crisis, significantly larger than the normal period elasticity.

3.3 Price of Acquisitions

An important element of liquidity-forced sales is that constrained firms are being sold at a discount. In terms of Section 2's model, liquidity constrained firms have diminished outside options, reducing the Nash bargaining price of acquisition. Figure 5 plots the median ratio of the price of acquisition (offer price) to book value of assets against year of acquisition (solid line). The dashed line is the ratio of offer price to market price, where market price is defined as the closing share price four weeks prior to the announcement of the acquisition. The plot clearly indicates that the price of acquired firms (relative to book value) declines dramatically in 1998. The market price also declines sharply, leaving the ratio of offer price to market price largely unchanged.

To determine whether liquidity plays a role in this price decline, we estimate for an acquired firm j in industry i in country c at time t,

$$p_{jict} = \beta_0 + \beta \mathbf{X_{jict}} + \theta \mathbf{X_{jict}} * D_{98} + \mathbf{D}_{ict} + u_{jict}. \tag{7}$$

The dependent variable, p_{jict}, is the log ratio of offer price to book value reported by SDC and $\mathbf{X}$, as before, represents cash flow (or sales) and capital expenditures. As before, we control for industry, time, country variations by including an indicator for each variable and all its interactions. Since we have only one price observation per firm, we cannot use firm level fixed effects. According to statements (v) and (vi) in Section 2, we should expect $\theta_{\text{cash flow}} > 0$ and $\theta_{\text{capital expenditures}} < 0$.

Table 4 reports the results. Columns (1)-(3) use acquisitions in the traded sector and

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columns (4)-(6) use all acquisitions.[21] Consistent with our probability regressions, the effect is largest in the tradable sectors. In all specifications for the tradable sector, the evidence supports the importance of liquidity during the crisis. In particular, the base coefficients on log cash flow and log sales are never significantly different from zero. However, the interaction with the 1998 dummy is always large and significantly positive, indicating that relative liquidity in 1998 exerted an unusually strong influence on the cross-section of prices. According to Table 4 (column 2), a 1% decline in sales is associated with a 1.74% decline in the offer price to book value for a firm acquired in the tradable sector. The normal period elasticity is 0.22.

3.4 Further Tests

3.4.1 Testing across Sub-periods

To test if liquidity plays a role outside of 1998, we divide our tradable sample into sub-periods and estimate separate regressions for the periods 1986-1996, 1997, 1998, 1999, and 2000-2001. The results, reported in Table 5, indicate that 1998 is indeed a unique year. This year is the only year in which both sales and capital expenditure enter significantly in the pattern predicted by our model. It is only in 1998 that an additional dollar of sales significantly lowers the probability of being acquired. The coefficient on sales and capital expenditure are also the largest in 1998. As one would expect of a liquidity crisis, the effects are short-lived.

3.4.2 Acquisitions by Domestic Firms

Table 6 explores the role of liquidity and growth in acquisitions by domestic firms of other domestic firms. Recall from figure 3 that the number of foreign acquisitions increased in 1998, while domestic-domestic acquisitions declined. Similarly, table 6 documents additional differences between the two types of acquisitions. In particular, the change in the coefficient on sales during the crisis has mixed signs, is substantially smaller in magnitude

[21]Since not every acquisition reports a transaction price, we augment the regression sample by pooling all (foreign and domestic) acquisitions for which there is data.

than those reported for foreign acquisitions in table 2 and not significantly different from zero. Similarly, the significantly positive increase in sensitivity to capital expenditures seen in foreign acquisitions during the crisis is not apparent in domestic acquisitions. These results suggest that liquidity considerations were more important in driving foreign-domestic acquisitions relative to domestic-domestic acquisitions.

3.4.3   Foreign Acquisitions in Non-Crisis Economies

As a further test of our methodology, we evaluated the response of acquisitions to net sales in Singapore and Taiwan, two Asian economies that did not experience a large capital account reversal in 1997-98. In support of our tests, we found that the change in the coefficient on sales during the crisis has mixed signs, are substantially smaller in magnitude as compared to coefficients reported in columns (3) and (4) of table 2 panel II, and are not significantly different from zero. Similarly, the qualitative response of acquisitions to capital expenditure is dramatically different.[22]

4   Discussion

An issue to bear in mind is that government policies changed in the wake of the crisis, particularly regarding foreign capital. To stem the outflow of capital, economies such as South Korea relaxed many restrictions regarding foreign direct investment while Malaysia imposed additional controls on portfolio flows. It seems likely that these regulatory changes played a significant role in raising the aggregate number of foreign acquisitions during the crisis. Much of these reforms were implemented at the sectoral level (e.g. allowing foreign ownership of real estate, banks etc). In identifying the role played by liquidity, we therefore also rely on the cross-sectional evidence, where we include dummies for country*year*industry interactions. This controls for any regulatory change at the industry level, allowing us to identify the effects of liquidity holding constant macro policies.

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[22]Table not reported but available from authors on request.

In arguing that our results support a liquidity crisis interpretation of the Asian crisis, we need to consider whether alternative theories explain the same set of facts. One plausible alternative hypothesis would be that the behavior of mergers and acquisitions was in response to a shock to productivity. This would be consistent with the decline in the average sales price of acquired firms. However, this explanation (without amplification through reduced liquidity) does not square with the remainder of our results. In the terminology of Section 2, we can define a productivity crisis as a *fosd* shift down in the distribution of A_2. Such a drop in productivity leads to a fall in acquisitions, which is counterfactual. Similarly, a productivity crisis yields counterfactual implications for the coefficients in our linear probability regressions. In particular, a general decline in productivity implies an increase in the coefficient on liquidity during the crisis. The intuition rests on the fact that a productivity crisis limits investment opportunities, reducing the number of firms that are liquidity constrained (holding constant the distribution of liquidity). The fact that the coefficient on liquidity falls during the crisis runs counter to this hypothesis.

A second concern with our interpretation of the data may be the imperfect proxies for liquidity and growth potential. In particular, as noted in Section 3, cash flow is correlated with firm fundamentals other than liquidity. The firm fixed effect controls for constant firm attributes. Of course, any time-varying omitted factors that are correlated with cash flow will be reflected in the base coefficient. However, the focus of this study is the *change* in the coefficient during 1998, which is sensitive only to the *change* in the corelation between cash flow and omitted variables. While such a change in the relationship between cash flow and firm fundamentals may occur, a mechanism that produces such a change as well as accounts for the other empirical results presented above is not readily apparent.

For instance, it is plausible that cash flow serves as a signal of the underlying productivity of a firm. This signal may become more informative during a crisis, perhaps due to the fact that performance in an extreme environment yields a better signal of the strength of a firm. That is, high cash flow in a crisis becomes a very positive signal about firm fundamentals. While this would accord with the price regressions in which cash-rich firms

sold at an increased premium in 1998, the negative coefficient on crisis cash flow in table 2 would then imply that the increase in acquisitions in 1998 was motivated by increased purchases of firms suddenly revealed to be *low* productivity. Therefore, this mechanism not only rests on the hypothesized change in correlation, but additionally and counterfactually requires that foreign firms shop for low quality partners. In general, we find hypotheses regarding cash flow as proxy for omitted fundamentals fail to plausibly explain the entire set of facts documented in this paper.

5 Conclusion

In this paper we investigate the relationship between liquidity crises and foreign acquisition activity. We find that in the case of cross-border M&A in East Asian economies liquidity played a significant and sizeable role in explaining the dramatic increase in foreign acquisition activity and the consequent continued inflow of FDI during the Asian crisis. Similarly, firm liquidity is shown to predict the price of acquisition, linking the sharp fall in the median price of acquisitions to the decline in liquidity observed during the crisis. The effects are most prominent in the tradable sectors. Moreover, proxies for liquidity have a greater impact on the probability of acquisition and the price of acquisition in 1998 than in other years in the sample. This is consistent with a liquidity crisis being a short-term phenomenon. Additionally, we find no consistent evidence of liquidity based acquisitions in non-crisis economies and in acquisitions by other domestic firms in crisis economies. The nature of M&A activity supports liquidity-based explanations of the East Asian crisis and provides an explanation for the surprising stability of FDI inflows during the crises.

Appendix

A   Definition of SDC Accounting Terms

Assets: Total balance sheet assets including, current assets, long-term investments and

funds, net fixed assets, intangible assets, and deferred charges, as of the date of the most current financial information prior to the announcement of the transaction (million US$). Equals total liabilities plus shareholders' equity plus minority interest.

Capital Expenditure: Gross purchases of property, plant, and equipment (million US$). Does not include acquisition of other companies.

Cash Flow: SDC: Earnings before interest, taxes, depreciation and amortization for the most recent fiscal year prior to the announcement of the transaction (million US$). Worldscope: Earnings before extraordinary items and preferred and common dividends, but after operating and non-operating income and expense, reserves, income taxes, minority interest and equity in earnings, plus all non-cash charges or credits.

Cash Stock: SDC: Cash and the temporary investment of cash, including commercial paper and short-term government securities, at the end of the most recent fiscal year prior to the announcement of the transaction. Worldscope: Cash (money available for use in the normal operations of the company) plus short term investments (temporary investments of excess cash in marketable securities that can be readily converted into cash).

Liabilities: All debt and obligations owed to creditors, including all current and long-term liabilities (million US$).

Net Worth: Assets minus liabilities (million US$).

Offer Price/Book Value: Offering price in the deal divided by target's book value per share as of the date of the most current financial information prior to the announcement of the transaction.

Offer Price/Market Value: Premium of offer price to target trading price 4 weeks prior to the original announcement date.

Sales: Primary source of revenue after taking into account returned goods and allowances for price reductions (million US$). If not available, total revenues are used. For banks, net sales equals interest income plus non-interest income.

B   The Real Exchange Rate and Acquisitions

This appendix explores how a real exchange rate depreciation would influence the pattern of M&A in the framework of section 2. Our numeraire is the price of the traded good (dollars), which is fixed at one by the world market. Let p_N denote the relative price of nontradables, i.e. the real exchange rate. The production function in the text, $AF(K)$, can be considered the reduced form of $Y = \tilde{A}K^\beta N^\alpha$ where N are non-traded variable inputs and $\tilde{A}$ is total factor productivity. We restrict $\alpha + \beta < 1$ to ensure all firms produce in equilibrium. In each period, the firm will maximize profits over the variable inputs. The production function evaluated at the optimum is then

$$Y = (1-\alpha)p_j^{\frac{1}{1-\alpha}} p_N^{\frac{-\alpha}{1-\alpha}} \tilde{A}^{\frac{1}{1-\alpha}} K^{\frac{\beta}{1-\alpha}}$$

wher p_j is the price of the firm's output. The reduced form production function used in the text is obtained by replacing $A = (1-\alpha)p_j^{\frac{1}{1-\alpha}} p_N^{\frac{-\alpha}{1-\alpha}} \tilde{A}^{\frac{1}{1-\alpha}}$ and $F(K) = K^{\frac{\beta}{1-\alpha}}$. In regard to the real exchange rate, we can see that A increases during a real depreciation if the firm produces tradables (i.e. $p_j = 1$ and p_N falls). Conversely, A declines in case the firm produces nontradables ($p_j = p_N$). The same production function applies to both periods. Therefore, a real depreciation leads to an increase in current profits (π_1) and future productivity (A_2) for a tradable sector firm and vice versa for a nontradable sector firm. The effect on acquisition is therefore ambiguous – it depends on whether the increase (decrease) in desired investment outpaces the increase (decrease) in current revenue.

C   Additional Proofs

Proof of Proposition 2: Define $\gamma^* \equiv \{\gamma | S = 0\}$ to be the fixed cost at which the surplus of a match is zero. That is, $\gamma^* = V^F - V^D$. Then $y = \int_{S \geq 0} d\Gamma = \int_{\underline{\gamma}}^{\gamma^*} d\Gamma = \Gamma(\gamma^*)$, where we assume that γ^* always lies in the interior of the support of γ. Differentiation implies $\frac{\partial y}{\partial l} = \Gamma'(\gamma^*)\left(\frac{\partial V^F}{\partial l} - \frac{\partial V^D}{\partial l}\right) \leq 0$. Differentiating again implies $\frac{\partial^2 y}{\partial l^2} =$

$-\mathbf{1}_{\{constrained\}} A_2 F''(K_2) \Gamma'(\gamma^*) + \frac{\Gamma''(\gamma^*)}{(\Gamma'(\gamma^*))^2} \left(\frac{\partial y}{\partial l} \right)^2$. The first term is nonnegative (and positive if the firm is constrained and Γ is increasing). The second term has the sign of Γ''. In the case that γ has a uniform distribution, $\Gamma'' = 0$. More generally, as long as Γ'' is small over the support of γ^* (which is a subset of the support of γ), then $\frac{\partial^2 y}{\partial l^2} \geq 0$. The usual stochastic dominance argument then implies (i) in proposition 2. Similarly, $\frac{\partial y}{\partial A_2} = \Gamma'(\gamma^*) \left(\phi F(K_2^F) - F(K_2^D) \right)$, which is strictly positive (the superscripts on K_2 indicate the capital stock under foreign and domestic ownership, respectively). Differentiating with respect to l gives: $\frac{\partial^2 y}{\partial l \partial A_2} = -\mathbf{1}_{\{constrained\}} F'(K^D) \Gamma'(\gamma^*) + \frac{\Gamma''(\gamma^*)}{(\Gamma'(\gamma^*))^2} \left(\frac{\partial y}{\partial l} \right) \left(\frac{\partial y}{\partial A_2} \right)$. The first term is nonpositive and strictly negative when the firm is constrained. Again, assuming that Γ is close to linear, then $\frac{\partial^2 y}{\partial l \partial A_2} \leq 0$ and our stochastic dominance assumption then implies (ii).

Proof of Proposition 3: Recall that $P = \beta S + V^D = \beta \left(V^F - V^D - \gamma \right) + V^D$. An increase in π raises V^F and an unconstrained V^D one for one by the amount of additional profit. If constrained, V^D increases by an additional $(A_2 F'(l) - \delta)$. Similarly, an increase in $\bar{D}$ leaves V^F unchanged, but increases a constrained domestic firm by $(A_2 F'(l) - \delta)$. Given the concavity of F, this latter term is strictly decreasing in l over the constrained region (and zero otherwise). Therefore, $\frac{\partial P}{\partial l}$ is nonincreasing in l and strictly decreasing over the constrained range. Our *fosd* assumption then implies (i). Similarly, $\frac{\partial P}{\partial A_2} = \beta(F(K^F) + (1-\beta)F(K^D)$, and so $\frac{\partial^2 P}{\partial l \partial A_2} = \mathbf{1}_{constrained}(1-\beta)(F'(l)) \geq 0$, with a strict inequality if constrained. Our *fosd* assumption then implies (ii).
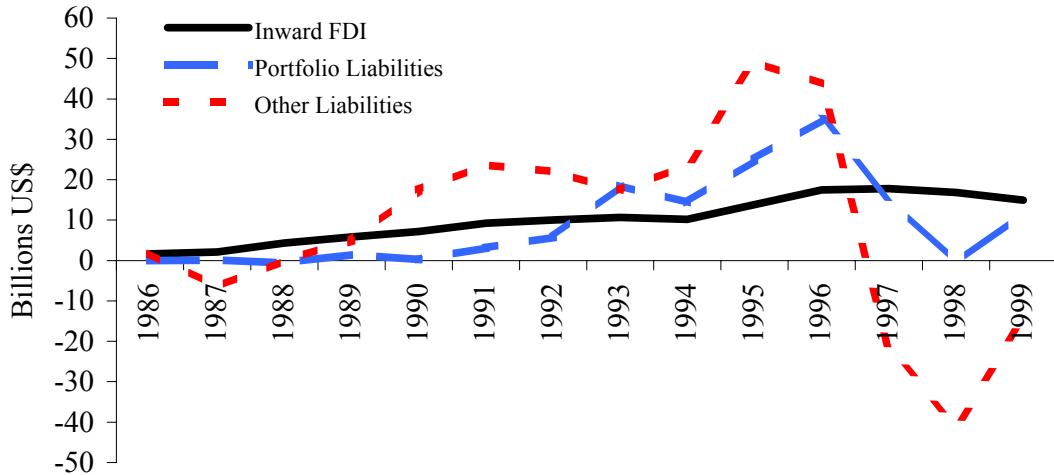
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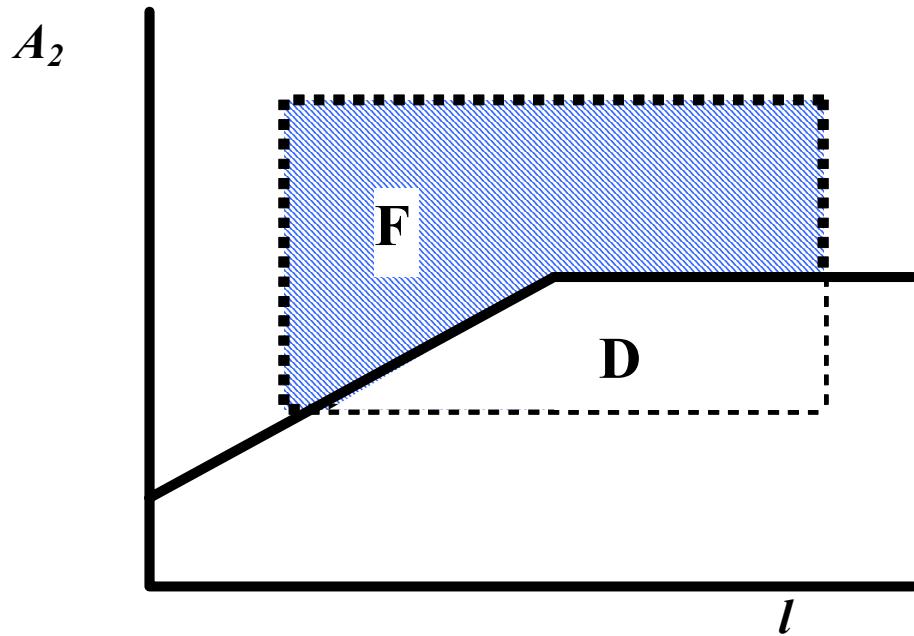
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Figure 1: Capital Inflows into East Asia
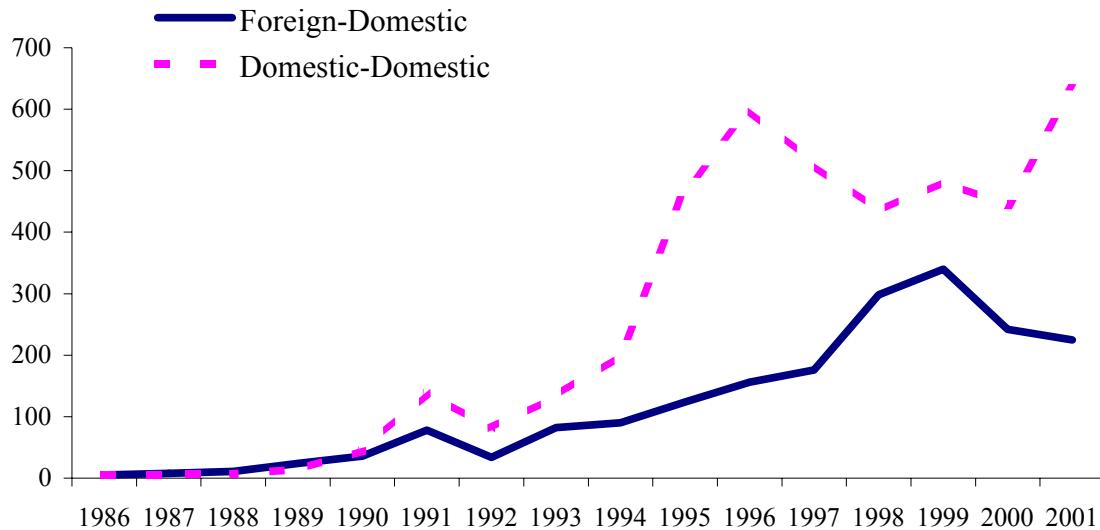
Source: IFS. Net inflows (liabilities) summed over the five East Asia nations. Categarories are as defined by IFS.

Figure 2: Range of Foreign Acquisition
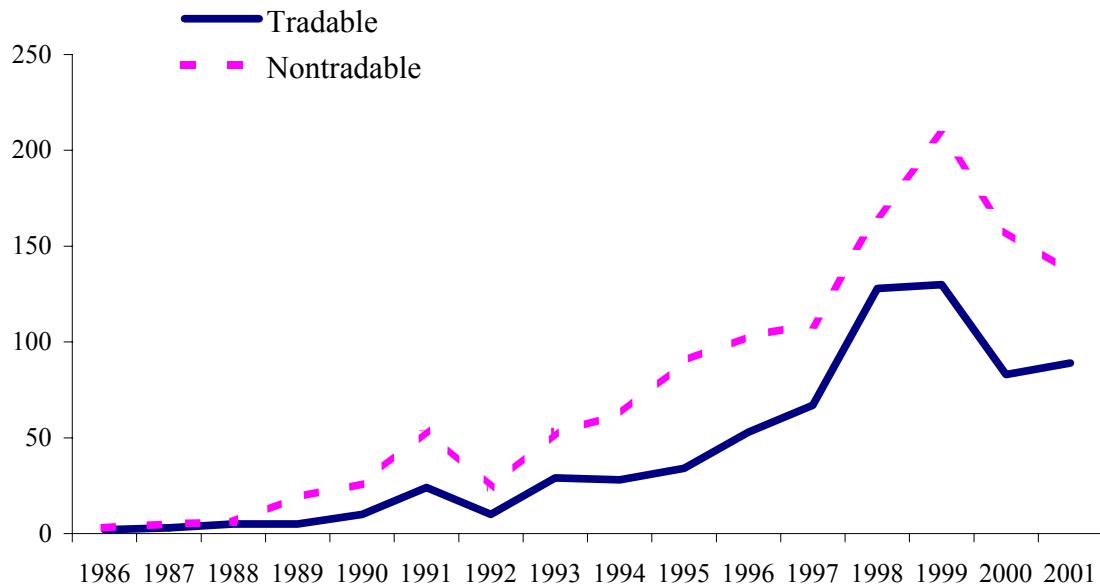
A_2 and l refer to productivity and liquidity, respectively, as defined in the text. The area within the box represents the support of firms at the start of period one. The solid line represents pairs of productivity and liquidity for which the surplus of foreign acquisition is zero (drawn for a fixed γ). The shaded area denoted "F" represents firms for which acquisition is efficient; firms within the region denoted "D" remain domestically owned.

Figure 3: Completed Acquisitions -- Foreign and Domestic
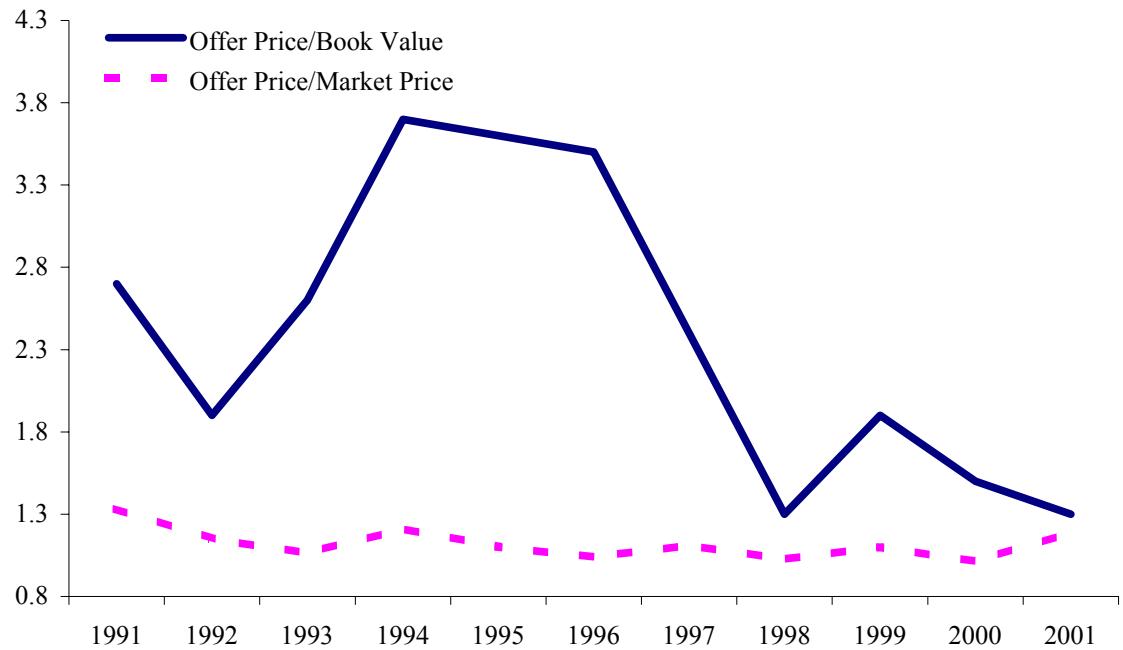
This figure depicts the number of completed acquisitions announced in the relevant year summed over the five East Asian nations. The solid line represents acquisitions by entities based outside the country of the acquired firm. The dashed line represents cases in which the acquiring firm and the target firm are based in the same country.

Figure 4: Completed Acquisitions -- Tradable vs. Nontradable Sectors

This figure depicts the number of completed acqusitions by foreign firms broken down by industry of acquired (target) firm. Tradable is defined as manufacturing and includes acquired firms with primary SIC code between 200 and 399. Acquired firms which list their primary industry outside this range are classified as nontradable.

Figure 5: Median Ratio of Offer Price to Book Value

Median offer price to book value (solid line) and offer price to market value (dotted line) as defined in text.

Table 1: Descriptive Statistics of the Target Firm

	Foreign Acquisitions				Domestic Acquisitions			
	Excluding 1998		1998		Excluding 1998		1998	
	Median	Std. Dev.	Median	Std. Dev.	Median	Std. Dev.	Median	Std. Dev.
Shares Acquired (%)	49.82	35.31	50.00	34.64	70.00	35.91	100	31.93
Sales	4.44	2.42	4.65	2.31	4.39	1.83	4.95	1.68
Cash flow	3.38	2.56	3.32	1.73	2.58	1.74	2.42	1.80
Sales/Assets	-0.91	1.27	-0.89	1.03	-0.73	1.15	-1.22	1.12
Cash Flow/Assets	-2.13	1.21	-2.30	0.68	-2.49	0.99	-2.45	1.18
Cash Stock/Assets	-2.81	1.47	-3.25	1.71	-3.03	1.49	-2.96	1.09
Cap. Exp/Assets	-2.80	1.72	-2.28	1.48	-3.17	1.59	-2.47	1.83
Salesgrowth/assets	0.01	1.07	0.01	0.10	0.02	0.18	0.01	0.07
IndustryCap.Exp/assets	-3.48	1.03	-3.65	0.69	-3.52	0.95	-3.66	0.89

Note: All variables are in logs. 90% of our sample acquisitions involve the purchase of at least 10% of equity, qualifying as FDI.

Table 2: Probability of Acquisition by Foreign Company (1986-2001)
(Linear Probability Regression)

	(I) All Acquisitions				(II) Tradable Sector Acquisitions			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
ln(Cash Flow)	0.0018 (0.0024)	0.0038 (0.0024)			0.0026 (0.0032)	0.0048 (0.0033)		
* Year 1998	**-0.0104 *** (0.0062)	-0.0106 (0.0109)			**-0.0150 *** (0.0075)	**-0.0255 *** (0.0127)		
ln(Sales)			0.0033 (0.0033)	-0.0024 (0.0029)			0.0005 (0.0064)	-0.0004 (0.0036)
* Year 1998			**-0.0088 *** (0.0048)	-0.0109 (0.0085)			**-0.0219 *** (0.0093)	**-0.0223 *** (0.0116)
ln(Capital Expenditure)	**0.0050 **** (0.0018)	0.0014 (0.0020)	0.0017 (0.0012)	**0.0045 *** (0.0025)	**0.0045 *** (0.0025)	0.0031 (0.0025)	0.0022 (0.0017)	**0.0061 **** (0.0022)
* Year 1998	0.0043 (0.0050)	0.0109 (0.0104)	0.0036 (0.0041)	0.0095 (0.0072)	0.0058 (0.0063)	**0.0224 *** (0.0102)	0.0103 (0.0067)	**0.0186 *** (0.0086)
Constant	-0.0388 (0.0296)	0.0046 (0.0045)	0.0373 (0.0239)	**0.0244 *** (0.0103)	-0.0514 (0.0363)	-0.0001 (0.0063)	-0.0243 (0.0573)	0.0153 (0.0133)
Firm & Year Fixed Effects	Yes	No	Yes	No	Yes	No	Yes	No
Year*Nation*Industry Fixed Effects	No	Yes	No	Yes	No	Yes	No	Yes
R2	0.34	0.40	0.39	0.41	0.32	0.38	0.38	0.37
Observations	9,603	9,603	11,331	11,331	5,364	5,364	6,219	6,219
Mean Dependent Variable	0.016	0.016	0.017	0.017	0.015	0.015	0.016	0.016

Note: Robust standard errors are in parenthesis. ***, ** and * indicate significance at the 1%, 5% and 10% level, respectively.
Year*Nation*Industry fixed effects include fixed effects for each year, country and industry at the 3-digit SIC code, and all interactions of these variables. The dependent variable takes the value 1 when a domestic company is acquired by a foreign company. Acquisitions only include completed transactions. Tradable and nontradable refer to the sector of the target (acquired) firm. All industries defined as manufacturing (SIC codes 200-399) are included in tradables.

Table 3: Probability of Acquisition by Foreign Company: Tradable Sector Firms (1986-2001)
Alternative Specifications

	(1)	(2)	(3)	(4)	(5)	(6)
ln(Sales/assets)		-0.0078 (0.0056)	-0.0045 (0.0036)		-0.0009 (0.0035)	
* Year 1998		**-0.0187*** (0.0109)	**-0.0252*** (0.0139)		**-0.0231*** (0.0139)	
ln(Cash Stock/assets)	**-0.0075*** (0.0021)					**-0.0064*** (0.0021)
* Year 1998	**-0.0163*** (0.0095)					**-0.0159*** (0.0096)
ln(Cash Flow/assets)				**0.0059** (0.0026)		
* Year 1998				**-0.0121*** (0.00072)		
ln(Capital Expenditure/assets)	**0.0087*** (0.0018)	0.0014 (0.0015)	**0.0078*** (0.0014)	**0.0061*** (0.0017)	0.0068 (0.0015)	**0.0078*** (0.0017)
* Year 1998	**0.0204** (0.0088)	0.0059 (0.0057)	**0.0171*** (0.0066)	**0.0216** (0.0088)	**0.0151** (0.0061)	**0.0192** (0.0085)
ln(Assets)					**0.0069*** (0.0022)	**0.0075*** (0.0027)
* Year 1998					0.0016 (0.0061)	-0.0009 (0.0079)
Firm and Year Fixed Effects	N	Y	N	N	N	N
Industry*Country*Year Fixed Effects	Y	N	Y	Y	Y	Y
Observations	3934	5983	5983	4907	5983	3934
Mean Dependent Variable	0.022	0.017	0.017	0.016	0.017	0.022

Note: Robust standard errors are in parenthesis (clustered by firm). ***, ** and * indicate significance at the 1%, 5% and 10% level, respectively. Year*Nation*Industry fixed effects include fixed effects for each year, country and industry at the 1-digit SIC code, and all interactions of these variables. The dependent variable takes the value 1 when a domestic company is acquired by a foreign company. Acquisitions only include completed transactions and target firms with ln(assets)>1.4. This removes outlier firms that account for less than 1% of the sample. Tradable and nontradable refer to the sector of the target (acquired) firm. All industries defined as manufacturing (SIC codes 200-399) are included in tradables.

Table 4: Price of Acquisition (1986-2001)

Dependent Variable: ln(Offer Price/ Book Value)

| | Tradable Sectors | | | All Sectors | | |
	(1)	(2)	(3)	(4)	(5)	(6)
ln(Cash Flow)	-0.0583 (0.3726)			-0.0909 (0.1165)		
* Year 1998	**1.1891 *** (0.6536)			**0.7284 *** (0.2685)		
ln(Sales)		0.2170 (0.1561)			-0.0402 (0.0768)	
* Year 1998		**1.5237 *** (0.6383)			0.6261 (0.4072)	
ln(Cash Flow/assets)			-0.2578 (0.5275)			-0.0784 (0.1551)
* Year 1998			**1.4262*** (0.5305)			**0.7465*** (0.3958)
ln(Capital Expenditure)	-0.0719 (0.2407)	-0.2148 (0.1460)		0.0068 (0.0748)	-0.0123 (0.0686)	
* Year 1998	-0.5569 (0.6014)	**-1.1921 *** (0.6721)		-0.1297 (0.2170)	-0.2326 (0.2437)	
ln(Capital Expenditure/assets)			-0.1886 (0.2861)			0.0019 (0.0855)
* Year 1998			-0.3409 (0.3136)			-0.1112 (0.2642)
ln(Assets)			-0.0971 (0.1629)			-0.1067 (0.1067)
* Year 1998			**0.5902*** (0.1731)			**0.6099*** (0.2285)
Constant	0.7758 (0.6793)	-0.3536 (0.5553)		**0.8306 *** (0.2466)	**0.7278 *** (0.3325)	
Year*Nation*Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
R2	0.92	0.88	0.93	0.87	0.84	0.88
Observations	243	307	242	557	706	557
Mean Dependent Variable	0.66	0.68	0.67	0.79	0.78	0.79

Note: Robust standard errors are in parenthesis. ***, ** and * indicate significance at the 1%, 5% and 10% level, respectively. Year*Nation*Industry fixed effects include fixed effects for each year, country and industry at the 3-digit SIC code, and all interactions of these variables. We include all acquisitions for which there is data on the price of the transaction. All industries defined as manufacturing (SIC codes 200-399) are included in tradables.

Table 5: Breakdown by Periods
Probability of Acquisition by Foreign Company of Tradable Firms
(Linear Probability Regression)

	1986-1996	1997	1998	1999	2000-2001
ln(Sales)	-0.0059 (0.0048)	-0.0164 (0.0197)	**-0.0227 **** (0.0108)	-0.0099 (0.0079)	**0.0085 **** (0.0043)
ln(Capital Expenditure)	0.0024 (0.0024)	0.0079 (0.0108)	**0.0247 ***** (0.0083)	**0.0102 *** (0.0062)	**0.0055 **** (0.0025)
Constant	0.0306 (0.0201)	0.0736 (0.0711)	**0.0992 **** (0.0405)	**0.0549 **** (0.0314)	-0.0249 (0.0171)
Year*Nation*Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes
R2	0.55	0.30	0.48	0.31	0.29
Observations	1,867	536	613	875	2,328
Mean Dependent Variable	0.008	0.015	0.036	0.023	0.015

Note: Robust standard errors are in parenthesis. ***, ** and * indicate significance at the 1%, 5% and 10% level, respectively. Year*Nation*Industry fixed effects include fixed effects for each year, country and industry at the 3-digit SIC code, and all interactions of these variables. The dependent variable takes the value 1 when a domestic company is acquired by a foreign company. Acquisitions only include completed transactions. Tradable and nontradable refer to the sector of the target (acquired) firm. All industries defined as manufacturing (SIC codes 200-399) are included in tradables.

Table 6: Probability of Acquisition by Domestic Firm in Tradable Sector (1986-2001)
(Linear Probability Regression)

	(1)	(2)
ln(Sales)	0.0162	0.0032
	(0.0106)	(0.0043)
* Year 1998	-0.0003	0.0015
	(0.0069)	(0.0130)
ln(Capital Expenditure)	-0.0007	0.0031
	(0.0029)	(0.0026)
* Year 1998	-0.0048	-0.0018
	(0.0043)	(0.0077)
Constant	-0.2150	0.0001
	(0.1543)	(0.0156)
Firm & Year Fixed Effects	Yes	No
Year*Nation*Industry Fixed Effects	No	Yes
R2	0.35	0.40
Observations	6,219	6,219
Mean Dependent Variable	0.023	0.023

Note: Robust standard errors are in parenthesis. ***, ** and * indicate significance at the 1%, 5% and 10% level, respectively.
Year*Nation*Industry fixed effects include fixed effects for each year, country and industry at the 3-digit SIC code, and all interactions of these variables. The dependent variable takes the value 1 when a domestic company is acquired by another domestic company. Only completed acquisitions are included.