Liquidity, Institutional Quality and the Composition of International Equity Outflows

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Abstract

We examine the choice between Foreign Direct Investment and Foreign Portfolio Investment at the level of the source country. Based on a theoretical model, we predict that (1) source countries with higher probability of aggregate liquidity crises export relatively more FPI than FDI, and (2) this effect strengthens as the source country's capital market transparency worsens. To test these hypotheses, we apply a dynamic panel model and examine the variation of FPI relative to FDI for source countries from 1985 to 2004. Our key variable is the probability of an aggregate liquidity crisis, estimated from a Probit model, as proxied by episodes of economy-wide sales of external assets. Consistent with our theory, we find that the probability of a liquidity crisis has a strong effect on the composition of foreign equity investment. Furthermore, greater capital market opacity in the source country strengthens the effect of the crisis probability.

1 Introduction

The liberalization of international capital markets gave rise to large amounts of international equity flows in recent years, reaching 781 billion US dollars in 2006. These flows seem to have had a major impact on the cost of capital, on the volatility of capital markets, and even on economic growth. Representative studies establishing such results include: Bekaert and Harvey (2000), Errunza and Miller (2000), Henry (2000), Chari and Henry (2004), and Bekaert, Harvey, and Lundblad (2005).[1]

In assessing the costs and benefits of the globalization of international equity markets, it is important to take account of the composition of international equity flows. These flows generally take two forms: Foreign Direct Investments (FDI) – that usually involve a control position by the foreign investor – and Foreign Portfolio Investments (FPI) – that do not involve a control position. It is well known that these two forms of investment generate very different implications for the stability of international capital markets and of host countries. For example, during financial crises, FPI investors usually rush to liquidate their investments, whereas FDI is much more resilient and thus contributes to the stability of the host country (see: Frankel and Rose, 1996; Lipsey, 2001; and Sarno and Taylor, 1999).

Despite the importance of the distinction between FDI and FPI, not much is known about the factors that guide the choice of international investors between them. Traditionally, Multinationals engaged in FDI, while collective investment funds– private equity funds, mutual funds and hedge funds – engaged in FPI. In such a world, investors seeking international exposure had to choose between investing in multinationals or in investment funds. This choice influenced the composition of equity flows between FDI and FPI. More recently, the choice between FDI and FPI has become even more direct, as collective investment funds became sources of FDI and started competing with traditional multinationals in acquiring foreign companies.[2]

The goal of this paper is to shed empirical light on the factors that affect the choice between FDI and FPI at the level of the source country. Our focus is on the effect of liquidity. The basic idea is that FDI investments are illiquid and more difficult to sell, and thus FPI investments become

[1] Stulz (2005) reviews the development of financial globalization and its limitations.

[2] According to the latest 2006 World Investment Report, collective investment funds have become growing sources of FDI. These funds raised a record amount of $261 billion in 2005, from institutional investors, such as banks, pension funds and insurance companies. About half of the funds raised were then used towards FDI. Moreover, their main type of FDI, cross-border M&As, reached $135 billion and accounted for as much as 19% of total cross-border M&As in 2005.

more desirable in the face of expected liquidity needs. To develop this hypothesis formally, we start with a model that is based on the recent work of Goldstein and Razin (2006). In the model, the illiquidity of FDI is derived endogenously as a result of the informational advantage possessed by FDI investors.

More specifically, Goldstein and Razin (2006) highlight a key difference between FDI and FPI: FDI investors are in effect the managers of the firms under their control; whereas FPI investors effectively delegate decisions to managers. Consequently, direct investors are more informed than portfolio investors regarding the prospects of their projects. This information enables direct investors to manage their projects more efficiently. This informational advantage, however, comes at a cost. If investors need to sell their investments before maturity because of liquidity shocks, the price they can get will be typically lower when buyers know that they have more information on the fundamentals of the investment project. A key implication of the model is that the choice between FDI and FPI will be linked to the likelihood with which investors expect to get a liquidity shock.

To provide better link to the data, we extend the Goldstein and Razin (2006) model by making the more realistic assumption that liquidity shocks to individual investors are triggered by some aggregate liquidity shock. We are trying to capture the idea that individual investors are forced to sell their investments early particularly at times when there are aggregate liquidity problems. In those times, some individual investors have deeper pockets than others, and thus are less exposed to the liquidity issues. Thus, once an aggregate liquidity shock occurs, some individual investors will need to sell, but they will get a low price because buyers do not know if they have deep pockets and sell because of adverse information or because they are truly affected by the aggregate liquidity crisis.

The main prediction of the extended model is that countries with a high probability of an aggregate liquidity crisis will be the source of relatively more FPI and less FDI. Another prediction is that the effect of the probability of liquidity shocks on the shares of FDI and FPI is driven by lack of transparency about the fundamentals of the investment. If the fundamentals were publicly known, then liquidity shocks would not be that costly for direct investors, as the investors would be able to sell the investment at fair price without bearing the consequences of the lemons problem. Hence, the second empirical prediction is that the effect of a liquidity shock on the ratio between FPI and FDI decreases in the level of transparency in the source country.

We take these predictions to the data. A main advantage of the new specification of the model is that it can be taken directly to macro data. We use negative purchase of external assets as an indicator of an aggregate liquidity crisis. As frequently done, we estimate the probability of a liquidity shock by using a Probit specification. Our sample covers 140 countries from 1985 to 2004. And our measures of FDI and FPI are based on source countries' stocks of external assets as compiled by Lane and Milesi-Ferretti (2006). Then, we use the dynamic panel model approach to examine the effect of the crisis probability. We find strong support for our model: a higher probability of a liquidity crisis in the source country indeed has a significant positive effect on the ratio between FPI and FDI.

We further introduce a proxy for capital market opacity to capture the degree of asymmetric information in the source country, i.e., the CIFAR (1995) accounting disclosure score. We interact this opacity measure with the likelihood of a liquidity crisis and confirm that greater capital-market opacity in the source country strengthens the effect of the crisis probability on the ratio between FPI and FDI. This illustrates that a channel for strong institutions to affect capital flows is through the mitigation of the consequence of potential liquidity shocks.[3]

Our results have strong implications for the future of FDI investments by collective investment funds. These funds have expanded significantly in the past few years due to historically low interest rates, high liquidity of investors and the good performance of private equity funds. However, events such as the recent subprime market turbulence and the resulting credit crunch could lead to difficulties for the private equity funds in conducting FDI investments. Our results are also relevant for the going debate on the transparency requirements for collective investment funds.[4] Initiatives to improve these funds' transparency may increase funds' ability to engage in FDI, as they will then be less likely to suffer from the lemons problem during liquidity crises. This can be beneficial to investment funds, as FDI engagement, in the long run, is likely to generate higher returns than FPI, due to the management efficiency.

Our paper is related to the vast empirical literature on international equity flows. Several papers study the determinants of FDI (including cross-border M&As) emphasizing factors such as wealth and credit constraints, governance, mispricing, and fire sales. They include: Froot and Stein (1991), Klein, Peek, and Rosengren (2002), Rossi and Volpin (2004), Aguiar and Gopinath (2005), Albuquerque, Loayza, and Serven (2005), and Baker, Foley, and Wurgler (2007). Other papers

[3]Earlier works have emphasized the importance of host country institution on capital inflow. For instance, Alfaro, Kalemli-Ozcan and Volosovych (2007) document that the low institutional quality, measured by host country's political risk, is the leading explanation of the lack of capital flow from rich to poor countries.

[4]See http://www.bloomberg.com/apps/news?pid=20601100&sid=aMS8oOJlJp0I&refer=germany

(e.g., Griffin, Nardari, and Stulz, 2004; Gelos and Wei, 2005; Ferreira and Matos, 2007; and Leuz, Lins, and Warnock, 2007) study the determinants of FPI. Albuquerque (2003) studies the ratio of FDI to FPI at the level of the host country, emphasizing expropriation risk. None of these papers examines the effect of potential liquidity crises or considers the determinants of the composition between FDI and FPI at the level of the source country.

The remainder of this paper is organized as follows: Section 2 describes the theoretical model underlying our empirical predictions. In Section 3, we describe the data and the econometric model used for the empirical analysis. In Section 4, we present the results of the empirical analysis. Section 5 concludes.

2 Model

2.1 Goldstein and Razin (2006): Idiosyncratic Liquidity Shocks

We start by describing the model of Goldstein and Razin (2006), with which they study a trade off between FDI and FPI based on the existence of idiosyncratic liquidity shocks.

2.1.1 Efficiency of FDI

A small economy is faced by a continuum $[0,1]$ of foreign investors. Each foreign investor has an opportunity to invest in one investment project. Foreign investment can occur in one of two forms: either as a direct investment (FDI) or as a portfolio investment (FPI). A direct investor effectively acts like a manager, whereas in case of a portfolio investment, the project is managed by an "outsider". Investors are risk neutral, and thus choose the form of investment that maximizes (ex-ante) expected payoff.

There are three periods of time: 0, 1, and 2. In period 0, each investor decides whether to make a direct investment or a portfolio investment. In period 2, the project matures. The net cash flow from the project is denoted by $R(K, \varepsilon)$:

$$R(K, \varepsilon) = (1 + \varepsilon)K - \frac{1}{2}AK^2, \tag{1}$$

where ε is an idiosyncratic random productivity factor, which is independently realized for each project in period 1, and K is the level of capital input invested in the project in period 1, after the realization of ε. The productivity shock ε is distributed between -1 and 1 with mean 0. The cumulative distribution function is $G(\cdot)$, and the density function is $g(\cdot) = G'(\cdot)$. The parameter A reflects production costs.

In period 1, after the realization of the productivity shock, the manager of the project observes ε. Thus, if the investor owns the project as a direct investment, she observes ε, and chooses K, so as to maximize the net cash flow:

$$K^d(\varepsilon) = \frac{1+\varepsilon}{A}. \tag{2}$$

Then, the ex-ante expected net cash flow from a direct investment, if held until maturity, is:

$$\frac{E\left((1+\varepsilon)^2\right)}{2A}. \tag{3}$$

In case of a portfolio investment, the owner is at arms length relationships with the manager, and thus she cannot observe ε. In this case, the manager follows earlier instructions as for the level of K. Following the logic described in Goldstein and Razin (2006), we assume that the ex-ante instruction is chosen by the owner so as to maximize the expected return absent any information on the realization of ε, and is based on the ex-ante 0 mean. Thus, the manager will be instructed to choose $K^p = K^d(0) = \frac{1}{A}$. Then, the ex-ante expected payoff from a portfolio investment, if held until maturity, is:

$$\frac{1}{2A}. \tag{4}$$

Comparing (3) with (4), we see that if the project is held until maturity, it yields a higher payoff as a direct investment than as a portfolio investment. This reflects the efficiency that results from a hands-on management style in the case of a direct investment.

2.1.2 Costs of FDI

As in Goldstein and Razin (2006), there are also costs to direct investments. We specify two types of costs. The first type, reflects the fixed initial cost that an FDI investor has to incur in order to acquire the expertise to manage the project directly. We denote this cost, which is exogenously given in the model, by C. The second type, which is derived endogenously in the model, results from the possibility of liquidity shocks occurring in period 1.

Specifically, in period 1, before the value of ε is observed, the owner of the project might get a liquidity shock. With the realization of a liquidity shock, the investor is forced to sell the project immediately. We assume that the number of foreign investors is fixed. We denote by λ the probability of liquidity shocks, and assume that there are two types of foreign investors: half of the investors face a liquidity need with probability λ_H, whereas the other half face a liquidity need with probability λ_L, where $1 > \lambda_H > \frac{1}{2} > \lambda_L > 0$, and $\lambda_H + \lambda_L = 1$. Investors know their type ex ante, but this is their own private information.

In addition to liquidity-based sales, there is a possibility that an investor will liquidate a project in period 1 if she observes a low realization of ε. Because portfolio investors do not observe ε in period 1, only direct investors sell their investment project at that time when a liquidity shock is absent. Then, using Bayes' Law, the price that buyers are willing to pay for a direct investment that is being sold in period 1 is:

$$P_{1,D} = \frac{(1-\lambda_D)\int_{-1}^{\underline{\varepsilon}_D} \frac{(1+\varepsilon)^2}{2A} g(\varepsilon)d\varepsilon + \lambda_D \int_{-1}^{1} \frac{1+2\varepsilon}{2A} g(\varepsilon)d\varepsilon}{(1-\lambda_D)\,G(\underline{\varepsilon}_D) + \lambda_D}. \tag{5}$$

Here, $\underline{\varepsilon}_D$ is a threshold level of ε, set by the direct investor; below which the direct investor is selling the project in absence of a liquidity shock; λ_D is the probability, as perceived by the market, that an FDI investor gets a liquidity shock. In (5), it is assumed that if the project is sold due to a liquidity shock, that is, before the initial owner observes ε, the value of ε is not recorded in the firms before the sale. Therefore, the buyer does not know the value of ε. However, if the project is sold for low-profitability reasons, the owner will know the value of ε after the sale.

Of course, the threshold $\underline{\varepsilon}_D$ is determined in equilibrium. The initial owner sets the threshold level $\underline{\varepsilon}_D$, such that given $P_{1,D}$, when observing $\underline{\varepsilon}_D$, she is indifferent between selling and not selling the project in absence of a liquidity shock. Thus:

$$P_{1,D} = \frac{(1+\underline{\varepsilon}_D)^2}{2A}. \tag{6}$$

Equations (5) and (6) together determine $P_{1,D}$ and $\underline{\varepsilon}_D$ as functions of the market-perceived probability λ_D. We denote these functions as: $\underline{\varepsilon}_D(\lambda_D)$ and $P_{1,D}(\lambda_D)$.

The period-1 price of a portfolio investment is easier to determine. Essentially, when a portfolio investor sells the projects in period 1, everybody knows she does it because of a liquidity shock. Thus, the price she gets for the project is given by:

$$P_{1,P} = \frac{1}{2A}. \tag{7}$$

Comparing the price of FDI, which is determined by (5) and (6), with the price of FPI, which is determined by (7), we see that the resale price of a direct investment in period 1 is always lower than the resale price of a portfolio investment in that period (see Goldstein and Razin (2006)). The intuition is that if a direct investor prematurely sells the investment project, the market price must reflect the possibility that the sale originates from inside information on low prospects of this investment project. This constitutes the second cost of FDI.

2.1.3 The Decision between FDI and FPI

With probability λ_i $(i = H, L)$, the direct investor gets a liquidity shock, and sells the project in period 1 for a price $P_{1,D}(\lambda_D) = \frac{(1+\underline{\varepsilon}_D(\lambda_D))^2}{2A}$. With probability $1 - \lambda_i$, the direct investor does not get a liquidity shock. She sells the project if the realization of ε is below $\underline{\varepsilon}_D(\lambda_D)$, but she does not sell it if the realization of ε is above $\underline{\varepsilon}_D(\lambda_D)$. In addition, the direct investor has to incur a fixed cost of C. The (ex-ante) expected net cash flow for an FDI investor is thus:

$$\begin{aligned} EV_{Direct}(\lambda_i, \lambda_D, A) &= (1-\lambda_i)\left[\begin{array}{c} \int_{-1}^{\underline{\varepsilon}_D(\lambda_D)} \frac{(1+\underline{\varepsilon}_D(\lambda_D))^2}{2A} g(\varepsilon)d\varepsilon \\ + \int_{\underline{\varepsilon}_D(\lambda_D)}^{1} \frac{(1+\varepsilon)^2}{2A} g(\varepsilon)d\varepsilon \end{array}\right] \\ &\quad + \lambda_i \frac{(1+\underline{\varepsilon}_D(\lambda_D))^2}{2A} - C. \end{aligned} \tag{8}$$

Similarly, when the investor holds the investment as a portfolio investment, the (ex-ante) expected net cash flow is simply given by:

$$EV_{Portfolio}(A) = \frac{1}{2A}. \tag{9}$$

This is because, regardless whether the investor gets a liquidity shock or not, her payoff is $\frac{1}{2A}$.

We denote the difference between the expected value of FDI and the expected value of FPI by:

$$Diff(\lambda_i, \lambda_D, A) \equiv EV_{Direct}(\lambda_i, \lambda_D, A) - EV_{Portfolio}(A). \tag{10}$$

Then, investor i will choose FDI when $Diff(\lambda_i, \lambda_D, A) > 0$; will choose FPI when $Diff(\lambda_i, \lambda_D, A) < 0$; and will be indifferent between the two (that is, may choose either FDI or FPI) when $Diff(\lambda_i, \lambda_D, A) = 0$.

As is shown in Proposition 2 of Goldstein and Razin (2006), investor i is more likely to choose FDI when the FDI cost (C) is lower; the production cost (A) is lower; the probability of getting a liquidity shock (λ_i) is lower; and the market-perceived probability λ_D of a liquidity shock for FDI investors is higher.

2.1.4 FDI and FPI in Equilibrium

To complete the description of equilibrium, it remains to specify how λ_D, the market perceived probability that an FDI investor will get a liquidity shock, is determined. Assuming that rational expectations hold in equilibrium, λ_D has to be consistent with the equilibrium choice of the two types of investors between FDI and FPI. The equilibrium condition is:

$$\lambda_D = \frac{\lambda_H \lambda_{H,FDI} + \lambda_L \lambda_{L,FDI}}{\lambda_{H,FDI} + \lambda_{L,FDI}}, \tag{11}$$

where $\lambda_{H,FDI}$ is the proportion of λ_H investors who choose FDI in equilibrium and $\lambda_{L,FDI}$ is the proportion of λ_L investors who choose FDI in equilibrium.

Goldstein and Razin (2006) show that five cases can potentially be observed in equilibrium:

Case 1: All investors choose FDI.

Case 2: λ_L investors choose FDI; λ_H investors split between FDI and FPI.

Case 3: λ_L investors choose FDI; λ_H investors choose FPI.

Case 4: λ_L investors split between FDI and FPI; λ_H investors choose FPI.

Case 5: All investors choose FPI.

Equilibrium outcomes then depend on λ_H and A in a way that is depicted by Figure 1. (See Proposition 3 in Goldstein and Razin (2006).)

As we can see in the figure, the equilibrium patterns of investment are determined by the parameters A and λ_H. Since $\lambda_H + \lambda_L = 1$, the value of λ_H also determines λ_L, and thus can be interpreted as a measure for the difference in liquidity needs between the two types of investors. In the figure we can see that there are four thresholds – A^*, $\lambda_H^*(A)$, $\lambda_H^{**}(A)$, and $\lambda_H^{***}(A)$ – that are important for the characterization of the equilibrium outcomes. These thresholds are defined in Goldstein and Razin (2006). Overall, we can see that as the production cost A increases, we are more likely to observe FPI and less likely to observe FDI in equilibrium. As the difference in liquidity needs between the two types of investors increase, we are more likely to see a separating equilibrium, where different types of investors choose different forms of investment.

2.2 Aggregate Liquidity Shock

So far we followed the model in Goldstein and Razin (2006), which assumes that liquidity shocks to individual investors are completely idiosyncratic, i.e., there is no correlation between the realization of a liquidity shock for one investor and that for other investors. A more realistic assumption is

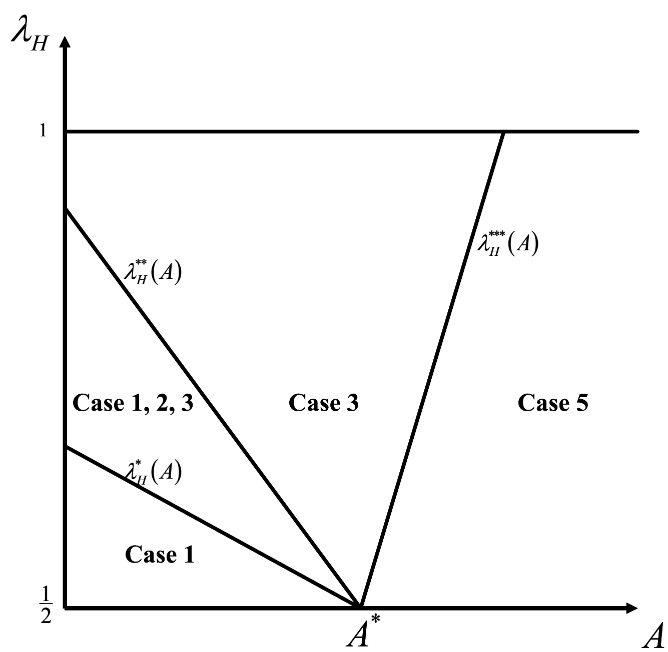

Figure 1: Equilibrium Outcomes

that liquidity shocks to individual investors are triggered by some aggregate liquidity shock.

Suppose now that an aggregate liquidity shock occurs in period 1 with probability q. Once the shock occurs, it becomes common knowledge. Conditional on the realization of the aggregate liquidity shock, individual investors may be subject to a need to sell their investment at period 1 with probabilities as in the previous section. That is, if a liquidity shock occurs (with probability q) then half of the investors need to sell in period 1 with probability λ_H and half with probability λ_L. Conditional on the realization of an aggregate liquidity shock, the realizations of individual liquidity needs are independent of each other. With probability $(1-q)$, an aggregate liquidity shock does not occur. In this case individual investors never have a liquidity need that forces them to sell at period 1.

This specification of the model is admittedly simple. The idea that we are trying to capture with this specification is that individual investors are forced to sell their investments early at times when there are aggregate liquidity problems. In those times, some individual investors have deeper pockets than others, and thus are less exposed to the liquidity issues. Thus, once an aggregate liquidity shock occurs, λ_L investors, who have deeper pockets, are less likely to need to sell than λ_H investors.

The analysis of the model under the extension to aggregate shocks is simple given the analysis of the model in the previous subsection. If an aggregate liquidity shock does not occur, then it is known that no investor needs to sell in period 1 due to liquidity needs. This implies that the only reason to sell at that time is adverse information on the profitability of the project. As a result, the market breaks down due to the well-known lemons problem (see Akerlof (1970)). Thus, when an aggregate liquidity shock does not occur, no investor sells her investment at period 1. Investors wait till the maturity of the investment, and get $\frac{E\left((1+\varepsilon)^2\right)}{2A}$ in case they hold a FDI (see (3)) and $\frac{1}{2A}$ in case they hold a FPI (see (4)). On the other hand, if a liquidity shock does happen, the expected payoffs from FDI and FPI are exactly the same as in the previous section; see (8) for FDI and (9) for FPI. Essentially, the model in the previous section corresponds to the case of $q = 1$.

Using these arguments, we can write the ex-ante expected net cash flow from FDI in the new model as (we use the superscript Ext to denote expected values in the extended model:

$$\begin{aligned} EV^{Ext}_{Direct}(\lambda_i, \lambda_D, A, q) &= (1-q)\int_{-1}^{1}\frac{(1+\varepsilon)^2}{2A}g(\varepsilon)d\varepsilon \\ &+ q\left[\begin{array}{c} (1-\lambda_i)\left[\begin{array}{c} \int_{-1}^{\varepsilon_D(\lambda_D)}\frac{(1+\varepsilon_D(\lambda_D))^2}{2A}g(\varepsilon)d\varepsilon \\ +\int_{\varepsilon_D(\lambda_D)}^{1}\frac{(1+\varepsilon)^2}{2A}g(\varepsilon)d\varepsilon \end{array}\right] \\ +\lambda_i\frac{(1+\varepsilon_D(\lambda_D))^2}{2A} \end{array}\right] - C. \end{aligned} \tag{12}$$

The ex-ante expected net cash flow from FPI in the new model is as before:

$$EV^{Ext}_{Portfolio}(A) = \frac{1}{2A}. \tag{13}$$

Then, the difference between the expected value of FDI and the expected value of FPI is:

$$Diff^{Ext}(\lambda_i, \lambda_D, A, q) \equiv EV^{Ext}_{Direct}(\lambda_i, \lambda_D, A, q) - EV^{Ext}_{Portfolio}(A). \tag{14}$$

As before, investor i will choose FDI when $Diff^{Ext}(\lambda_i, \lambda_D, A, q) > 0$; will choose FPI when $Diff^{Ext}(\lambda_i, \lambda_D, A, q) < 0$; and will be indifferent between the two (that is, may choose either FDI or FPI) when $Diff^{Ext}(\lambda_i, \lambda_D, A, q) = 0$.

Our main goal in introducing the aggregate liquidity shock is to be able to generate a testable empirical prediction on the relation between liquidity variables and the choice of investors between FDI and FPI. In the original model by Goldstein and Razin (2006), the probabilities of idiosyncratic liquidity shocks, λ_H and λ_L, affected the equilibrium allocation between FDI and FPI. The problem, however, is that idiosyncratic liquidity shocks are not observable to econometricians. The big advantage of the current model is that λ_H and λ_L are now linked to q – the probability of an aggregate liquidity shock, which is observable. Thus, our main interest is to derive a prediction on the effect that q has on the ratio of FPI to FDI and then to test it.

Repeating the analysis in Proposition 3 of Goldstein and Razin (2006) for the extended model, one can see that the equilibrium outcomes depend on the thresholds A^*, $\lambda_H^*(A)$, $\lambda_H^{**}(A)$, and $\lambda_H^{***}(A)$, just as before. The difference is that these thresholds now depend on q. In particular, A^*, $\lambda_H^*(A)$, and $\lambda_H^{**}(A)$ are decreasing in q, while $\lambda_H^{***}(A)$ is increasing in q. This implies that as the probability of an aggregate liquidity shock q increases, there will be more FPI and less FDI in equilibrium.[5] Thus, the ratio of FPI to FDI will increase. The intuition is that as the probability of an aggregate liquidity shock increases, agents know that they are more likely to need to sell the investment early, in which case they will get a low price since buyers do not know whether they sell because of an individual liquidity need or because of adverse information on the productivity of the investment. As a result, the attractiveness of FDI decreases. The empirical prediction is that countries with a higher probability of liquidity shocks will be source of a higher ratio of FPI to FDI.

2.3 The Role of Opacity

The effect of liquidity shocks on the composition of foreign investment between FDI and FPI is driven by lack of transparency about the fundamentals of the direct investment or liquidity situation of the firms. If the fundamentals or liquidity situation were publicly known, then liquidity shocks would not be that costly for direct investors, as the investors would be able to sell the investment at fair price without bearing the consequences of the lemons problem.

More precisely, suppose that the source country imposes disclosure rules on its investors that ensure the truthful revelation of investment fundamentals to the public. In such a case, FDI investors will have to reveal the realization of ε once it becomes known to them. Then, since potential buyers know the true value of the investment, direct investors will be able to sell their investment at $\frac{(1+\varepsilon)^2}{2A}$. Thus, whether or not a direct investor sells the investment, he is able to extract the value $\frac{(1+\varepsilon)^2}{2A}$, and so the expected value from investing in FDI is $\frac{E\left((1+\varepsilon)^2\right)}{2A} - C$. The expected value from investing in FPI is $\frac{1}{2A}$ as before. This is because the kind of disclosure requirements

[5] Note that there is a delicate point about this result, which comes from the fact that q does not have an unambiguous effect on the function $Diff^{Ext}$. The effect depends on the relation between λ_i and λ_D. The result comes from the fact that $Diff^{Ext}$ is decreasing in q when $\lambda_i \geq \lambda_D$ and the thresholds A^*, $\lambda_H^*(A)$, $\lambda_H^{**}(A)$, and $\lambda_H^{***}(A)$ are all derived for situations where $\lambda_i \geq \lambda_D$. More details are available from the authors upon request.

we describe here do not affect the value of portfolio investments. These are requirements that are imposed by the source country, and thus apply only for investments that are being controlled by source-country investors.[6]

Analyzing the trade off between FDI and FPI under this perfect source-country transparency, we can see two things. First, with transparency, FDI becomes more attractive than before. Second, with transparency, the decision between FDI and FPI ceases to be a function of the probability of a liquidity shock. This leads to our second empirical prediction: the effect of the probability of a liquidity shock on the ratio of FPI and FDI increases in the level of opacity in the source country.

3 Data and Empirical Model

3.1 Data on FPI and FDI

In the empirical application, we use the recently available data on a country's external assets and liabilities, as compiled by Lane and Milesi-Ferretti (2006). Lane and Milesi-Ferretti (2006) assemble a comprehensive dataset on the external assets and liabilities of 140 developed and developing countries for the period 1970–2004. They distinguish four types of international assets: foreign direct investment, portfolio equity investment, official reserves, and external debt. The convention for distinguishing between portfolio and direct investment is to see whether the ownership of shares of companies is above or below a ten percent threshold. If it is above the threshold, then it is classified as direct investment.[7]

For most countries, Lane and Milesi-Ferretti (2006) use as a benchmark the official International Investment Position (IIP) estimates. However, only very few countries have consistently reported their IIP over the period 1970–2004, with the majority of countries starting to report in the early 1990s. For earlier years, they then work backward with data on capital flows, together with calculations for capital gains and losses, to generate estimates for stock positions. In their

[6] Note that this type of transparency is different from the one studied in Goldstein and Razin (2006). In that paper the transparency was based on host-country rules, and thus affected the information investors could learn on their portfolio investments.

[7] There is the problem of "borderline" cases where it is difficult to classify an investment as FDI or FPI. In countries where FPI is liberalized, a portfolio investor might buy more than 10 percent of the shares of companies without having a "lasting interest" to control the companies. And yet that investor's investment can be classified as FDI. Using the control interest as a dividing line, there are circumstances where FDI can turn into FPI through the dilution of ownership and loss of control. Conversely, FPI can be transformed into FDI, if the investor decides to have a management interest in the companies whose assets he had earlier purchased as FPI.

estimation, due to cross-country variation in the reliability of the data, they also employ a range of valuation techniques to obtain the most appropriate series for each country. Particularly, they use similar valuation adjustment for FPI and FDI (see the Appendix for more details). In our following estimation, we use the data from 1985 to 2004 as the sample period.

Our sample includes both developed and developing countries as source countries for outward FPI and FDI. New sources of FDI are emerging among developing and transition economies, which has been a marked phenomenon for the past ten years. Meanwhile, multinationals from these economies are emerging as major regional - or sometimes even global - players. The new global links these multinationals are forging will have far-reaching repercussions in shaping the world economic landscape of the coming decades (UNCTAD: World Investment Report 2006).

Table 1 lists the countries covered in the sample from 1985 to 2004, as a source for FPI and FDI.[8] We can see that developed countries have more observations on average than developing economies do, due to the fact that developed countries engage in more foreign investment than their developing counterparts. Table 1 also shows that developed countries tend to have higher ratio of FPI/FDI, which may reflect factors other than liquidity. In the following estimation sections we will focus on the effects of the probability of liquidity crises, and the degree of country specific transparency, on the composition of the source country external assets. We will control for standard determinants of FPI/FDI, as well as for unobservable country fixed effects.[9]

3.2 Econometric Model

We investigate the effect of a country-level liquidity shock on the FPI/FDI ratio for source countries. The latter variable is the dependent variable in the following reduced form equation:

$$\ln\left(FPI/FDI\right)_{it} = \alpha X_{it} + \beta \Pr_{i,t}\left(Liquidity\ Shock_{i,t+1}\right) + \gamma Year_t + u_i + \varepsilon_{it} \tag{15}$$

for source country i at time t. u_i stands for country fixed effect, while ε_{it} follows an i.i.d normal distribution.

[8] Sample coverage in the following econometric analyses varies a bit, depending on whether countries have data on various explanatory variables. Table 1 is for the sample when countries have data available for the estimations in Column 1 of Table 3 and Column 2 of Table 4.

[9] In principle, there could be a two-stage decision process as follows. In stage 1, a potential investor has to decide whether to engage in foreign investment. In stage 2, in what form to do it (FDI or FPI). Some missing observations may indicate situations where these countries did not cross the threshold for foreign investment, hence a Heckman selection model could be desirable.

We take the log of the FPI/FDI ratio to reduce the impact of extreme values. Our selection of control variables X_{it} is motivated by Faria et al (2007), where they examine the composition of country external liabilities. They survey a set of explanatory variables, including country size, economic development level, trade openness and financial reform. They find that only country size has some explanatory power on the distribution of equity liabilities between direct investment and portfolio equity. As no work has explicitly examined the composition of external assets, we will then use the control variables in Faria et al (2007) as our starting point. First, we include two variables – the log of the population and the log of GDP per capita in constant US dollars – to capture market size and the level of economic development. We then also include trade openness, as measured by imports plus exports over GDP, to control for the connection between trade and FDI. We further include the lagged real exchange rate to capture the wealth effect on capital flow (see Froot and Stein (1991)).

Moreover, the lagged FPI/FDI may affect the current FPI/FDI.[10] Hence we estimate, alternatively, the following dynamic panel regression.

$$\ln (FPI/FDI)_{it} = \phi \ln (FPI/FDI)_{i,t-1} + \alpha X_{it} + \beta \Pr_{i,t} (Liquidity\ Shock_{i,t+1}) + \gamma Year_t + u_i + \varepsilon_{it} \tag{16}$$

There is a complication in estimating equation (16). That is, if ε_{it} is not i.i.d, but serially-correlated, then $\ln (FPI/FDI)_{i,t-1}$ will be correlated with ε_{it}, and thus create an endogeneity problem. To correct this problem, we will then use the Arellano-Bond dynamic GMM approach to estimate equation (16).

3.3 Probability of Liquidity Crisis

The crux of our theory is that a higher probability of an aggregate liquidity shock (the variable q) increases the share of FPI, relative to FDI. Therefore we include in equation (15) a variable, $\Pr_{i,t} (Liquidity\ Shock_{i,t+1})$, to proxy for this probability, as perceived in period t.[11] We emphasize that we look at the probability of such a shock to occur irrespective of whether such a shock actually

[10] Arguably, in our model, investors can rebalance their portfolio of assets every period. Thus, the stocks of external assets rather than the flows are consistent with the model. But the choice of the stock at time t may need to use the information set conveyed in the stock at time $t-1$. Therefore, empirically, we may need to allow for the lagged dependent variable in the equation to control for the dynamics of the information set.

[11] The inclusion of the liquidity shock probability is in the spirit of Razin and Rubinstein (2006), where they stress the importance of including the probability of currency crisis in estimating the relationship between exchange rate regime and economic growth.

occurs.

We define the liquidity crisis as an episode of negative purchase of external assets. The intuition is that economy wide liquidity crises in source countries will generate a sale of many types of external assets, such as foreign reserves, loans and equities. Hence negative purchase of external assets can be a reasonable proxy of liquidity crises. The flow data on external assets is from the International Financial Statistics's Balance of Payments dataset, where assets include FDI, FPI, other investments and foreign reserves. We thus define the liquidity crisis episodes as sales of external assets, which has a frequency of 13% in our sample. The Balance of Payments data do not control for the valuation effect. Therefore, they could capture the notion of the quantity of investment liquidations in our model. Table 2 lists the countries and years when there is a negative purchase of external assets. It shows that besides developing countries, some developed economies, such as Denmark, Japan, New Zealand and Spain, also experienced liquidity crises in the sample period.

To estimate the probability of liquidity crises, we apply the following Probit model:

$$I_{i,t}\left(Liquidity\ Crisis_{i,t+1}\right) = \begin{cases} 1 \ \text{ if } \ y^*_{i,t+1} > 0 \\ 0 \ \text{ if } \ y^*_{i,t+1} \leq 0 \end{cases},$$

where $y^*_{i,t+1}$, a latent variable, is a function of the following independent variables:

$$y^*_{i,t+1} = Z'_{it}\lambda + \eta_{i,t+1}, \tag{17}$$

where $\eta_{i,t+1}$ follows a standard normal distribution.

The vector Z'_{it} is motivated by the literature on financial crises (e.g., Frankel and Rose, 1996). It covers control variables from equation (15): the log of population, the log of GDP per capita,and trade openness. Moreover, it also includes US real interest rate, source country political risk index, current account surplus over GDP or government budget balance over GDP or Standard & Poor's sovereign debt rating. Political risk index, from the International Country Risk Guide, is based mainly on government stability, socioeconomic conditions, investment profile, internal conflict, external conflict, corruption, and bureaucracy quality.[12]It has been linked to financial crises in earlier literature, with higher political risk making the economy vulnerable to capital flow reversals (e.g. Gelos and Wei (2005), and Broner, Gelos and Reinhart (2006)).[13]Standard & Poor's sovereign

[12]See http://www.prsgroup.com/commonhtml/ methods.html# _International_Country_Risk.

[13]Lower political risk has also been shown to reduces the cost of capital (e.g. Harvey (2004)) and the credit spread (e.g. Eichengreen, Kletzer, and Mody (2003)).

rating reflects the future ability and willingness of sovereign governments to service their commercial financial obligations in full and on time. It is based on country's political risk, income and economic structure, economics growth prospects, fiscal flexibility, general government debt structure, offshore and contingent liabilities, monetary flexibility, external liquidity, and external debt burden. Hence it can be regarded as a summary of other control variables in Z'_{it} . When sovereign rating declines, the country will have difficulty in borrowing and hence a potential liquidity crunch.

To identify β in equation (15), the exclusion restriction needs to be satisfied. That is, there needs to be at least one variable that is correlated with $y^*_{i,t+1}$ in equation (17) but uncorrelated with ε_{it} in equation (15). We argue the following variables can satisfy the exclusion restriction: political risk index, current account surplus over GDP, and budget surplus over GDP. Our theory does not suggest their inclusion in equation (15). And we are not aware of other models where they directly influence the composition of capital outflows. In earlier literatures, institutional factors, such as political risks, have been applied to the host country FDI confiscation considerations (Albuquerque (2003) and Alfaro, Kalemli-Ozcan and Volosovych (2007)). These confiscation considerations, however, is more about host country than about source country.

Current account or budget surplus may indirectly affect the FPI/FDI composition through affecting exchange rate, which may generate some wealth effect and influence FDI and FPI asymmetrically as in Froot and Stein (1991). Froot and Stein (1991) model operates via a wealth effect in the host country. Because of frictions in control that exist in FDI but not in FPI, wealth is important only for FDI. Thus a rise in host-country wealth, from the appreciation of its real exchange rate, will increase its FDI inflow, while having no impact on its FPI receipts. One could potentially extend their model to source countries with the prediction that real exchange rate appreciation may increase FDI outflow, relative to FPI outflow. Hence we include a control variable for the wealth effect in equation (15), i.e., the lagged real exchange rate appreciation. With the wealth effect controlled for, there is unlikely to be a correlation between ε_{it} and current account or budget surplus, and β can then be unbiasedly estimated.[14]

[14] Baker, Foley, and Wurgler (2007) also argue that higher source country's wealth could significantly boost FDI outflow, due to cheap financial capital. They use the market to book ratio in the US stock market as a proxy of cheap capital for US firms. As the data on exchange rate has more country coverage than the market/book ratio, we will then use the real exchange rate to proxy for the wealth of source country.

4 Empirical Findings

4.1 Probit

We use the pooled specification to predict the liquidity crisis as in the literature on financial crises (e.g., Frankel and Rose, 1996), because Probit models with fixed effects do not provide consistent estimators due to the incidental parameters problem (Greene, 2002).[15] Table 3 presents the Probit estimations. Case1 (Column 1) examines source countries from 1985 to 2004, subject to data availability on dependant and control variables. We find that larger economic size and higher development level lower the occurrence of liquidity crises. Meanwhile, higher U.S. interest rate, higher political risk and smaller current account surplus increase the probability of crises.[16] The predicted crisis probability ranges between 0.01 and 0.57, with an average of 0.19.

In Case 2, we substitute the current account surplus on the external side with the budget surplus on the domestic side. We find that higher budget surplus is associated with smaller probability of crisis. Note that we drop the political risk in that it is correlated with government budget balance. In Column 3, we use the Standard and Poor's sovereign rating instead. When the sovereign rating is poor, government, banks and non–financial firms will find it more expensive to borrow abroad and therefore compete for domestic resources, creating upward pressure on interest rates. We use the numeric representation of the rating, with smaller number corresponding to higher risk, i.e. worse rating. The inclusion of sovereign rating reduces the sample size by 30%, owing to the smaller country coverage. We find that higher sovereign rating significantly reduces the likelihood of crisis.

4.2 Ratio of FPI to FDI

With the predicted crisis probabilities from Table 3, we can now estimate equations (15) and (16). We use as our baseline case the crisis probability estimated from the first column of Table 3. The determination of the choice between FPI and FDI is reported in Table 4. Columns 1 to 3 present the estimations with pure country fixed effects (i.e., no dynamic feedback). We start with the predicted probability as the only explanatory variable. As our theory predicts, a higher probability

[15] Probit models rely on T_i increasing for the fixed effects to be consistently estimated. But in our model, T_i is both small and fixed. Hence, the estimated fixed effects are not consistent estimators. However, the estimator of β is a function of the estimators of the fixed effects, which means that the estimation of β will not be consistent either.

[16] The R-square of the Probit estimation is 0.09. Arguably, it is not large. We use Probit to test the hypothesis that the probability of crises matters, but we are not too concerned about the degree of fitness of the Probit, as long as it is an unbiased estimate of the probability.

of liquidity shocks significantly increases the share of FPI outflow relative to FDI. A 1% rise of the crisis probability will increase the ratio of FPI stock over FDI stock by 3%. Columns 2 to 3, with more control variables, confirm the results in Column 1. It also suggests that trade openness complements FDI outflow. We find that the appreciation of the real exchange rate increases the FDI more than for the FPI, consistent with Froot and Stein (1991).[17]

Columns 4 to 6 report dynamic panel estimations. Dynamic estimation reduces the sample size, but reassuringly, higher probability of liquidity shocks still increases FPI relative to FDI. We also find that the lagged FPI/FDI ratio is associated with the current FPI/FDI ratio. The coefficient of the lagged FPI/FDI is 0.77, which suggests that there is no panel unit root process for ln(FPI/FDI). Additional Arellano-Bond tests fail to reject the hypothesis of no second-order autocorrelation. That is, the estimations in Columns 4 to 6 are valid dynamic panel estimations.

The above results could also be consistent with models that are not based on information asymmetry but on pure transaction cost or market depth. FPI tends to be easier to liquidate than FDI. For example, to liquidate FDI, it may take longer to find buyers who know the sectors and are willing to take over the management. But to liquidate FPI, it will not be difficult to sell stocks to other portfolio investors in a deep stock market. If an investor foresees a liquidity crisis and the need to liquidate assets, he may then choose FPI instead. This argument is based on pure transaction cost without involving information asymmetry. As our theoretical model is based on asymmetric information, we have a second layer of testable predictions that the above counter arguments lack. That is, liquidity shocks will interact with source-country capital market transparency to influence the FPI/FDI composition. We now test this prediction.

4.3 Capital Market Opacity in Source Country

A key prediction of our theoretical model is that the higher is the opacity in the source country, the higher is the impact of the probability of liquidity shocks on FPI/FDI. Hence, we estimate the following equation

$$\begin{aligned} \ln\left(FPI/FDI\right)_{it} = \phi \ln\left(FPI/FDI\right)_{i,t-1} + \alpha X_{it} + \beta_0 \Pr_{i,t}\left(Liquidity\ Shock_{i,t+1}\right) + \\ \beta_1 Opacity_i * \Pr_{i,t}\left(Liquidity\ Shock_{i,t+1}\right) + \gamma Year_t + u_i + \varepsilon_{it} \qquad (18) \end{aligned}$$

[17] We also add the lagged real exchange rate appreciation into the Probit estimation of crisis, but it turns out to be insignificant.

We expect to see a positive value of β_1. Note that the opacity index itself is excluded as an explanatory variable, as it is time-invariant and therefore imbedded in country fixed effects.

In our theoretical model, the opacity is related to either the fundamentals of the project or the liquidity situation of investors. We now use an index that captures the degree of opacity about investors' liquidity, and to some extent, the underlying projects. The index is the disclosure score from Center for International Financial Analysis and Research (1995), which examines firm-level annual reports for the omission or inclusion of 90 accounting items in 41 countries for the year of 1993. The score is related to firm's incomes, cash flows and balance sheets, which cover firm's liquidity and operations. It ranges from 56 to 85, with higher score associated with better corporate disclosure. It has been applied in prior studies (La Porta et al. (1998), Rajan and Zingales (1998), and Bushman, Piotroski and Smith (2004)). Besides its broad application in the literature, it also fits into our analysis well in that its report year is at the middle of our sample, which could potentially be regarded as the average transparency index over the sample year. We use 100 minus the original CIFAR transparency index to arrive at the CIFAR opacity index (Appendix Table 1), and apply it in equation (18).

In Case1, we look at the pure fixed effect estimation. There, the interaction term of opacity and the crisis probability is positive, and significantly different from zero at the one percent level. That is, the more opaque a country's capital market is, the higher the effect of the crisis probability on the country's FPI/FDI composition. Note that the coefficient for the crisis probability itself (i.e., -3.83) does not represent the net marginal effect of the crisis probability at the sample average. To calculate the sample-average net marginal effect of the crisis probability, we need to use the following formula: $-3.83 + 0.30 * Sample\ Average\ Of\ Opacity$. We then get the average marginal effect as 6.67, significantly different from zero at the one percent level. In Case 2, we further add the lagged real exchange rate, which reduces the sample by about 6%. Reassuringly, the interaction term of opacity and the crisis probability is still significantly positive. In Case 3, we examine the dynamic panel model. There, opacity again significantly amplifies the impact of the crisis probability. In Case 4, we add the lagged exchange rate and find similar results. Based on the estimation in Case 4, the net marginal effect of the crisis probability at the sample average is now 1.09, significantly different from zero at the five percent level.

The findings in Table 5 thus provide strong support of our asymmetric-information-based theoretical model. To be fair, we cannot rule out the potential existence of the pure-transaction-cost-based liquidity effect as mentioned in the last section. But based on Table 5, we feel confident to say that asymmetric information is an important driving force behind the effect of the liquidity pressure on equity outflow composition.

4.4 Sensitivity Checks

In this section, we look at several variations of equation (15). We begin with adding more variables into equation (15) to tackle potential omitted variable problems. We first add the Chinn and Ito (2007) measure of capital account openness, which is the principal component from a set of binary dummy variables that codify restrictions on cross-border financial transactions as reported in the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions. We do not find a significant effect for it on either the crisis probability or the FPI/FDI composition.

Then, we add the two-year lag of stock market capitalization over GDP to capture the development level of stock market.[18] On the one hand, a more developed stock market may have more established professional asset management (mutual funds and hedge funds, for instance), which could help domestic investors to enter international stock markets and therefore increase FPI outflow. But on the other hand, a more developed domestic stock market may provide more opportunities at home and hence reduce the incentive for portfolio investors to go abroad. It is then an empirical question which effect dominates. We do not find it to have any significant impact on equity flow composition either. More importantly, it does not alter our earlier result on the effect of crisis probability. We also use an alternative measure of stock market depth, i.e., the number of listed domestic stocks, retrieved from the World Development Indicators. Again, we do not find significant results for it. Furthermore, we add the square of the predicted probability to control for any nonlinear effect. The square term is not significant in either the pure fixed effect estimation or the dynamic panel estimation.

Thirdly, we use an alternative measure of crisis probability based on Column 2 of Table 3, where government budget balance replaces current account balance. The regression results with the new crisis probability are reported in Table 6 (Columns 1 to 2). We find that the crisis probably has significantly positive effect in the dynamic panel. We further apply another measure of crisis probability based on Column 3 of Table 3, where Standard and Poor's sovereign rating replaces current account surplus. The new results are reported in Columns 3 to 4 of Table 6. The average sample size now is around 30% less than that in Table 4. But again, we find significant impacts

[18] One may argue that stock market capitalization can be affected by stock return and might be endogenous. Hence, we take the two-year lag to reduce potential endogeneity.

of crisis probability on the FPI/FDI determination. Hence, these alternative crisis probabilities assure us that our key results are not driven by a certain functional form or specification of the Probit.

Finally, we use the one-year lags of FPI stock (log) and FDI stock (log) as explanatory variables, rather than the lag of the FPI/FDI ratio. We find that the lagged FPI is positively associated with the FPI/FDI ratio, while the lagged FDI is negatively associated with the FPI/FDI ratio. More importantly, the probability of crises still has significant impacts as in Table 4.

5 Conclusion

In this paper, we examine how the fear of liquidity shocks guides international investors in choosing between FPI and FDI. We start by presenting a model in the spirit of Goldstein and Razin (2006). In this model, FDI investors control the management of the firms; whereas FPI investors delegate decisions to managers. Consequently, direct investors are more informed than portfolio investors about the prospects of projects. This information enables them to manage their projects more efficiently. However, if investors need to sell their investments before maturity because of liquidity shocks, the price they can get will be lower when buyers know that they have more information on investment projects. We extend the Goldstein and Razin (2006) model by making the assumption that liquidity shocks to individual investors are triggered by some aggregate liquidity shock. A key prediction then is that countries that have a high probability of an aggregate liquidity crisis will be the source of more FPI and less FDI. Another prediction is that this effect will be strong only when the transparency in the source country is weak.

To test this hypothesis, we apply a dynamic panel model to examine the variation of FPI relative to FDI for source countries from 1985 to 2004. We use episodes of negative purchase of external assets as a proxy for liquidity crises. Using a Probit specification, we estimate the probability of liquidity crises for each country and in every year of our sample. Then, we test the effect of this probability on the ratio between FPI and FDI generated by the source country. We find strong support for our model: a higher probability of a liquidity crisis, measured by the probability of episodes of negative purchase of external assets, has a significant positive effect on the ratio between FPI and FDI. Moreover, higher opacity in the source country accelerates the effect of the probability of liquidity shock on FPI/FDI. Hence, liquidity shocks seem to have strong effects on the composition of foreign investment, as predicted by our model.

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6 Appendix: The Valuation Adjustment for the Stock of FDI and FPI Assets

For FPI assets, Lane and Milesi-Ferretti (2006) use the following method to calculate the market value of the stock at the end of year t (i.e, $EQAS_t$):

$$EQAS_t = EQAS_{t-1}\frac{p_t^{MS}}{p_{t-1}^{MS}} + EQAF_t\frac{p_t^{MS}}{\bar{p}_t^{MS}}$$

where $EQAS_{t-1}$ is the market value of the stock at the end of $t-1$; $EQAF_t$ is the flow during the year t; p_t^{MS} is the Morgan Stanley Composite Index of world stock markets at the end of t; and $\bar{p}_t^{MS}$ is the average Morgan Stanley composite index during year t.

For FDI assets, they use a different method to account for the valuation effect. The IMF's dataset of International Investment Position (IIP) provide book-value estimates of FDI stock for the majority of countries, and market-value estimates for a relatively small number of countries. Lane and Milesi-Ferretti (2006) complement the IIP dataset with valuation changes designed to capture shifts in relative prices across countries. Here is how they do it:

• For market-value series of FDI stock in IIP, they adjust stock positions for shifts in stock market price indices (i.e, p_t^{MS}), same as their adjustment method for FPI. However, only France, New Zealand, Norway, Sweden and the U.S. provide market value series.

• For book-value series of FDI stock in IIP, they mainly use this method: cumulative flows adjusting outstanding holdings for fluctuations in real exchange rates. They first assume that the investment pattern of a country reflects its trade pattern. Their adjustment then is to account for the impact of changes in the exchange rates of the countries where the investment takes place vis-a-vis the US dollar. Hence, their formula is

$$FDIAS_t = FDIAS_{t-1}\frac{rerpc_t}{rerpc_{t-1}} + FDIAF_t$$

where $FDIAS_{t-1}$ is the Lane and Milesi-Ferretti (2006)'s adjusted market value of FDI stock at the end of year $t-1$; $FDIAF_t$ is FDI outflow during year t; and

$$rerpc_t = \frac{cpi^{pc} e_{\$}^{pc}}{cpi^{us}}$$

where pc stands for partner countries, us for the U.S., cpi^x is the consumer price index of country x and $e_{\$}^{pc}$ is the dollar / partner countries' nominal exchange rate. Let us look at Italy's FDI asset as an example. Suppose that Italy only has FDI in Germany and France, then pc stands for the combination of France and Germany, weighted by these two countries' trade with Italy. One can verify that $rerpc$ actually is the ratio between the CPI-based real exchange rate of the country (Italy) vis-a-vis the US and the CPI-based real effective exchange rate (Italy vis-a-vis trading partners).

Hence, in Lane and Milesi-Ferretti (2006), the adjustment for FDI in book value is different from the adjustment for FPI. Will this significantly affect our estimation model in the main text? It is unlikely, because:

First, we are looking at source country rather than host country. For FPI assets, the adjustment factor, p_t^{MS}, is the global stock return, which does not vary across source countries. Hence, as long as we include year effects, we will fully capture the effect of p_t^{MS}.

Secondly, $rerpc_t$, essentially reflects the price relationship (CPI and exchange rate) between Italy's trading partners and the US. It is unlikely to be affected much by the liquidity crisis in the source country. That is, a crisis in Italy is unlikely to change much the relative price between the combination of Italy's trading partners (France, Germany, China, Canada, U.S., etc.) and the U.S. Note that if the U.S. itself is a large trading partner of Italy, then $rerpc_t$ will change very little. In the extreme case where the U.S. is the only trading partner, $rerpc_t$ will be equal to 1. And in the case where there is a world-wide contagion, again it will be captured by our year dummies.

Table 1: Ratio of FPI to FDI: Summary Statistics

Country Name	Obs	Mean	Country Name	Obs	Mean
Argentina	20	0.44	Latvia	6	-0.53
Armenia	6	-1.41	Lithuania	6	-1.98
Australia	19	-0.72	Malaysia	20	-2.15
Austria	20	-0.30	Mali	7	-3.72
Bahrain	20	0.58	Malta	10	-1.28
Belarus	6	-1.47	Mexico	20	-0.28
Belgium	2	-0.76	Moldova	6	-3.99
Botswana	9	-0.08	Namibia	13	0.86
Brazil	20	-3.25	Netherlands	20	-0.73
Bulgaria	7	-0.26	New Zealand	15	-0.90
Canada	19	-0.05	Niger	7	-5.06
Chile	20	0.32	Norway	20	-0.94
China,P.R.: Main	15	-2.86	Paraguay	20	-3.24
Colombia	20	-0.86	Peru	20	0.88
Congo, Republic	9	0.46	Philippines	20	-0.12
Costa Rica	9	-0.59	Poland	5	-1.69
Croatia	6	-2.96	Portugal	20	-0.11
Czech Republic	11	0.32	Romania	5	-2.76
Denmark	20	-0.78	Russia	10	-4.41
Dominican Republ	8	-0.30	Saudi Arabia	12	-0.86
Egypt	7	-0.14	Senegal	19	-1.44
Estonia	6	-2.39	Slovak Republic	8	1.33
Finland	20	-2.54	Slovenia	6	-2.49
France	20	-1.46	South Africa	20	-0.94
Germany	14	-0.23	Spain	20	-1.25
Greece	18	-0.40	Sweden	20	-1.50
Hong Kong S.A.R.	6	-1.14	Switzerland	19	-0.11
Hungary	13	-1.82	Thailand	17	-3.16
Iceland	13	-0.01	Togo	13	-1.38
India	19	-0.73	Trinidad and Tob	8	-2.27
Ireland	20	0.97	Tunisia	20	2.20
Israel	20	-0.10	Turkey	15	0.54
Italy	20	-0.59	Ukraine	6	-0.40
Japan	19	-0.76	United Kingdom	20	-0.13
Jordan	7	1.54	United States	19	-0.91
Kenya	19	-3.64	Uruguay	16	-0.22
Korea	19	-2.28	Venezuela, Rep.	20	-0.81

Note: Table 1 presents the average of the log of FPI stock over FDI stock for 74 source countries for the period from 1985 to 2004. Obs is the number of non-missing observations for each source country. Source: Lane and Milesi-Ferretti (2006).

Table 2: Episodes of Sales of External Assets Since 1985

Algeria	1987,1986,
Argentina	2001,1989,1987,1986,
Bahrain	2002,2001,1995,1993,1991,1990,1987,
Belarus	2003,1998,1997,
Brazil	1999,1997,1986,
Bulgaria	1996,
Chile	1993,1987,1986,
Colombia	2002,1998,1995,
Costa Rica	2002,1998,
Croatia	1998,
Denmark	1994,
Dominican Republic	2000,1996,
Egypt	1999,1998,
Greece	2001,2000,1997,1995,1992,1989,
Hong Kong S.A.R. of China	2001,1998,
Hungary	1994,
Iceland	1994,
India	1995,1990,1989,1988,1987,1986,
Indonesia	2001,
Israel	1988,1987,
Japan	1999,
Kazakhstan	1998,
Kenya	1997,1996,1995,1994,1990,1987,
Latvia	1995,
Lebanon	2004,2003,2002,
Libya	1993,1991,1988,1987,
Lithuania	1999,
Macedonia	2002,
Malaysia	1996,1995,1994,
Malta	2001,1994,
Mauritius	1998,
Mexico	2002,2000,1994,1992,1988,
Moldova	1998,
New Zealand	1997,1992,1991,1988,
Niger	2002,1998,1997,1996,
Pakistan	2004,
Paraguay	2002,2001,1997,1992,1988,1987,1986,
Peru	2000,1999,1998,1990,1987,1986,
Philippines	2001,2000,1997,1990,1987,
Poland	1996,
Romania	1999,1998,1995,
Rwanda	2003,
Saudi Arabia	1998,1996,1995,1994,1993,1992,
Senegal	1993,1990,1987,1986,
Slovak Republic	1999,1998,
Spain	1994,
Swaziland	2003,
Thailand	1997,
Togo	2001,1998,1993,1992,1987,1986,
Turkey	2001,1994,
Ukraine	1998,
Uruguay	2002,
Venezuela, Rep. Bol.	1995,1992,1988,1987,1986,

Table 3: Probit Estimation of Liquidity Crises

	Case 1	Case 2	Case 3
GDP, log	-0.090***	-0.097***	-0.14**
	[0.031]	[0.029]	[0.062]
GDP per capita, log	-0.12***	-0.23***	-0.17
	[0.034]	[0.025]	[0.11]
US real interest rate	0.10***	0.088***	0.11**
	[0.027]	[0.026]	[0.046]
Political risk	0.015***		0.00071
	[0.0034]		[0.010]
Current Account Balance/GDP	-0.015***		
	[0.0053]		
Government Budget Balance/GDP		-0.018**	
		[0.0084]	
S&P country rating			-0.17**
			[0.066]
Trade openness	-0.12	-0.26***	-0.17
	[0.086]	[0.082]	[0.17]
Constant	2.30***	2.88***	3.2
	[0.81]	[0.75]	[2.00]
R-Square	0.09	0.08	0.12
Observations	1851	1912	749

Note: Table 3 estimates the probability of liquidity crises for countries over the period 1985-2004. The dependent variable is the liquidation of source country's foreign asset. Political risk indexes is from ICRG, country rating is from Standard and Poor's, while all other variables are from the WDI. A pooled Probit regression is estimated. Standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1.

Table 4: Determinants of FPI over FDI-Baseline

	Fixed Effect	Fixed Effect	Fixed Effect	Dynamic	Dynamic	Dynamic
Probability of Crisis at t+1	3.063***	2.232**	3.758***	2.037***	1.609**	1.800***
	[0.85]	[0.96]	[1.10]	[0.55]	[0.63]	[0.61]
GDP, log		-0.857	-2.816***		-0.471	-0.952**
		[0.58]	[0.67]		[0.45]	[0.40]
GDP per capita, log		-0.159	-0.218		-0.28	-0.310*
		[0.27]	[0.27]		[0.20]	[0.17]
Trade openness		-0.313	-0.354		-0.0731	-0.164
		[0.19]	[0.22]		[0.13]	[0.13]
Real exchange rate (lag)			-0.881***			-0.318**
			[0.23]			[0.14]
Log(FPI/FDI), lag				0.700***	0.698***	0.735***
				[0.023]	[0.023]	[0.021]
Observations	1135	1135	931	1023	1023	860
R-squared	0.08	0.08	0.13			

Note: The estimated probability of liquidity crisis is based on the estimates from Table 3 (Case 1). The dependent variable is the log of FPI stock over FDI stock, for source countries from 1985 to 2004. All other explanatory variables are from the WDI. Columns 1 to 3 are estimations with country and year fixed effects. Cases 4 and 6 add the one-year-lagged dependent variable to estimates a dynamic panel model. Standard errors in brackets; *** p<0.01, ** p<0.05, * p<0.1

Table 5: Determinants of FPI over FDI-Opacity

	Case 1	Case 2	Case 3	Case 4
Population, log	-2.660***	-3.320***	-0.481*	-0.484*
	[0.69]	[0.68]	[0.26]	[0.27]
GDP per capita, log	-1.700***	-2.132***	-0.420***	-0.453***
	[0.32]	[0.31]	[0.13]	[0.13]
Trade openness	0.215	-0.619**	0.0743	-0.0499
	[0.22]	[0.26]	[0.087]	[0.10]
Probability of liquidity crisis at t+1	-3.827	-0.397	-1.848	-1.005
	[3.35]	[3.30]	[1.17]	[1.18]
(Probability of crisis at t+1)*Opacity	0.301***	0.207**	0.0769**	0.0613*
	[0.089]	[0.089]	[0.032]	[0.032]
Lagged real exchange rate		-1.948***		-0.306***
		[0.27]		[0.11]
Log(FPI/FDI), lag			0.860***	0.847***
			[0.016]	[0.017]
Observations	650	609	632	595
R-squared	0.2	0.29		

Note: The estimated probability of liquidity crisis is based on the estimates from Table 3 (Case 1). The dependent variable is the log of FPI stock over FDI stock for source countries from 1985 to 2004. The opacity index (CIFAR, 1995) is from the Center for International Financial Analysis and Research. All other explanatory variables are from the WDI. Standard errors in brackets; *** p<0.01, ** p<0.05, * p<0.1.

Table 6: Determinants of FPI over FDI -Alternative Crisis Probability

	Probit2-Dynamic	Probit2-Dynamic	Probit 3-Dynamic	Probit 3-Dynamic
Probability of crisis at t+1	1.773**	1.814*	2.227**	1.552*
	[0.87]	[1.05]	[0.90]	[0.82]
GDP, log		-1.361***		-1.649***
		[0.43]		[0.47]
GDP per capita, log		-0.123		0.0198
		[0.19]		[0.19]
Trade openness		-0.124		-0.2
		[0.16]		[0.18]
Real exchange rate (lag)		-0.346**		-0.549***
		[0.16]		[0.17]
Log(FPI/FDI), lag	0.726***	0.735***	0.642***	0.664***
	[0.024]	[0.022]	[0.027]	[0.024]
Observations	1021	793	648	598

Note: The applied probability of crisis, from Column 1 to 2 in Table 6, is based on Column 2 of Table 3, where the government budget balance is used. The applied probability of crisis, from Column 3 to 4 in Table 6, is based on Column 3 of Table 3, where the S&P sovereign rating is used. Standard errors in brackets; *** p<0.01, ** p<0.05, * p<0.1.

Appendix Table 1: Opacity Index- CIFAR

Argentina	32
Australia	20
Austria	38
Belgium	32
Brazil	44
Canada	25
Switzerland	20
Chile	22
Colombia	42
Germany	33
Denmark	25
Spain	28
Finland	17
France	22
United Kingdom	15
Greece	39
Hong Kong	27
India	39
Ireland	19
Israel	26
Italy	34
Japan	29
Korea	32
Sri Lanka	26
Mexico	29
Malaysia	21
Nigeria	30
Netherlands	26
Norway	25
New Zealand	20
Pakistan	27
Philippines	36
Portugal	44
Singapore	21
Sweden	17
Thailand	34
Turkey	42
Taiwan	42
United States	24
South Africa	21
Zimbabwe	28

Note: CIFAR (1995) is from the Center for International Financial Analysis and Research. We use 100 minus the original CIFAR transparency index to get the CIFAR opacity index