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ABSTRACT

The paper tests three hypotheses concerning foreign equity investment in the presence of liquidity risk. First, the FDI-to-FPI price differential is negatively related to liquidity risk (the "Price Discount Hypothesis"). The idea is that market participants do not know whether the FDI investor liquidates a firm because of an idiosyncratic liquidity shock, or because, as an informed investor, the firm is hit by a productivity shock. Second, the FDI-to-FPI composition of foreign equity investment skews towards FPI, if investors are expected to experience liquidity shortage in the future (the "Equity-Composition Hypothesis"). The idea is that because direct investments are more costly to liquidate, due to the price discount, the more severe is the expected liquidity shock, the smaller is the FDI-to-FPI ratio. Third, the FDI-to-FPI composition of foreign equity flows skews towards FDI, the larger are past FDI-to-FPI stocks (the "Strategic Complementarity Hypothesis"). The idea is that high liquidity need investors generate a positive information-externality for low liquidity need investors among investors who choose FDI, and further increases in the number of FDI investors comes from mainly high liquidity need investors. Such an increase reinforces the information externality, thereby lowering the FDI-to-FPI price discount, creating further incentives for investors to choose FDI.

The paper brings these hypotheses to country level data consisting of a large set of developed and developing countries over the period 1970 to 2004. The evidence gives strong support to the hypotheses. To test the hypothesis, we apply also a dynamic panel model to examine the variation of FPI relative to FDI for source and host countries from 1985 to 2004. Country-wide sales of external assets are used as a proxy for liquidity problems. We estimate the determinants of liquidity problems, and then test the effect of expected liquidity problems on stock prices, the ratio of FPI to FDI and gross flows of FDI and FPI. We find strong support for the hypotheses: greater expected liquidity problems increase the price discount, have a significant positive effect on gross flows of FPI, negative effect on gross flows of FPI, and positive effect on the ratio between FPI and FDI.

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1 Introduction

Liberalization of international capital markets gave rise to large amounts of international equity flows in recent years. 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.[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. It is claimed that FPI investors usually rush to liquidate their investments during financial crises, whereas FDI is more resilient and thus contributes to the stability of investment in 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– including 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 in turn 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] Our investigation has 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 global financial crisis, and the resulting credit crunch, led to difficulties for the private equity funds in conducting FDI investments.

The goal of the present paper is to shed empirical light on the factors that affect gross flows of

[1] See, for example, Bekaert and Harvey (2000), Errunza and Miller (2000), Henry (2000), Chari and Henry (2004), and Bekaert, Harvey, and Lundblad (2005). Stulz (2005) reviews the development of financial globalization and its limitations.

[2] According to the 2006 World Investment Report, collective investment funds have become growing sources of FDI. These funds raised an 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.

Both forms of equity flows were downscaled during the the 2008-9 global financial crisis.

FDI and FPI at a bilateral country level.[3]. The anticipation of a future increase in liquidity risk at the source and the host countries affect the choice between FDI and FPI flows. The basic idea is that there is an efficiency-information trade-off between FDI and FPI. On the one hand FDI run project yield an expected higher payoff, because the investment decisions are more efficient due to a narrowing of the information gap between ownership and management. But, on the other hand, FDI investments are illiquid and more difficult to sell before they mature, and thus FPI investments become more desirable in the face of expected liquidity needs. This hypothesis is based on Goldstein and Razin (2006) and Kirabaeva (2009). In these models, FDI investors are more informed than FPI investors about the prospects of the firms they invest in. This information enables direct investors to manage their projects more efficiently. The informational advantage, however, comes at a cost. If investors need to sell their investments before maturity because of liquidity shocks, the price they get is typically lower when buyers know that the seller has more information about the fundamentals of the investment project. A key implication of the model is that the choice between FDI and FPI is linked to the likelihood with which investors expect to get a liquidity shock. High liquidity risk investors tend to invest in the form of portfolio investment, whereas low liquidity risk investors tend to invest in the form of direct investment in a separating equilibrium. The "lemons" [4] problem faced by FDI investors who prematurely liquidate their project is however lessened when future liquidity risks increase if relatively more investors choose the FDI form for their foreign investment.

The paper takes key implications from the efficiency-information theory to the data. We use across the board liquidation of external assets as an indicator of aggregate liquidity problems. Our measures of FDI and FPI are based on source countries' stocks of external assets as compiled by Lane and Milesi-Ferretti (2007). Using a sample of 65 countries between 1985 and 2004, we first estimate the determinants of expected liquidity needs. Then, we examine the effect of predicted future liquidity events on the choice of a source country between FDI and FPI and on the FDI to FPI price differential.

[3] Goldstein, Razin, and Tong (2007) first developed the approach of estimating the effect of liquidity risk on the the composition of equity outflows.

[4] Goldstein and Razin (2006) assumed that only idiosyncratic liquidity shocks exist. Assume now that an aggregate liquidity shock triggered the idio syncratic shocks. This captures the idea that individual investors are forced to sell their investments early particularly at times when there are aggregate liquidity problems which depress the market values of debt collaterals. 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 on the profitability of their investment projects, or because they are truly affected by the aggregate liquidity crisis.

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 (2009). Other papers (e.g., Griffin, Nardari, and Stulz, 2004; Gelos and Wei, 2005; Ferreira and Matos, 2008; and Leuz, Lins, and Warnock, 2009) 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 paper follows preliminary study by Goldstein, Razin, and Tong (2009).

The remainder of this paper is organized as follows: Section 2 describes the adverse selection theory of a choice between FPI and FDI. Section 3 put forth the main hypotheses that we take to the data. In Section 3, we describe the data. The econometric model and its various specifications are presented in Section 4. In Section 5, we present measures of liquidity risk. Section 6 presents the results of the empirical analysis and Section 7 concludes.

2 Adverse-Selection Based Theory

The theory which we test of an investor choice between FPI and FDI is based on an efficiency-information trade-off. FDI investors get more efficient outcomes than FPI investors under their direct control over management, due to having better information about the firm's productivity; which allows them to make informed investment and management decisions. However, the better information mires FDI investors with a "lemons" problem: if an investment project has to be liquidated prematurely, market participants would not know whether the firm is sold because of exogenously determined liquidity needs, or because the more informed investors find some negative aspects about the asset productivity. The consequence is that market will place a discount on a direct-investor liquidated assets to be sold below assets that portfolio investors liquidate. The magnitude of the discount depends on market's perception about the likelihood of a liquidity shock.

Theory predicts that the composition of foreign equity investment entails relatively more FPI and less FDI if this country is expected to experience aggregate liquidity problems. The idea is

that direct investments are more costly to liquidate. Hence, expecting greater liquidity needs in the future, investors tend to tilt their investments towards the liquid asset, which is a portfolio investment. This hypothesis does not depend on the source of illiquidity faced by direct investors.

Goldstein and Razin (2006) and Kirabaeva (2009) derive the illiquidity situation endogenously, as a result of asymmetric information. Key feature is that foreign direct investors are able to acquire better information about the fundamentals of the firms that they hold due to their ownership position (see Appendix). This provides an advantage to FDI relative to FPI when it comes to managing the investment. But, when they need to sell due to a liquidity need, FDI investors face a "lemons" problem due to their superior information and must sell at a discount. At this stage aggregate shocks to either country A, or Country B, are added on top of the idiosyncratic shocks. This captures the idea that liquidity shocks to individual investors are triggered by some country specific aggregate liquidity shock. 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.

An equilibrium property is that the composition of current flows depends on the composition of past flows. In a pooled equilibrium, where FDI investors are heterogeneous with regard to their idiosyncratic future liquidity needs, low- liquidity needs investors generate negative externalities on the high-liquidity needs investors. Market naturally evaluates the liquidity risk as an average between the high and the low probabilities of the shocks to liquidity. If a high-liquidity needs investor has to liquidate her investment, market perceives that the premature sale has to with joint occurrences of some idiosyncratic low productivity liquidity realizations. Common knowledge concerning the distribution of idiosyncratic productivity and liquidity shocks help the market to evaluate the liquidated assets; imperfectly, because of the information asymmetry. Thus FDI asset is sold at a discount.

Another implication arises from the existence of information-based externality. Ideally, if the high-liquidity needs investors, could somehow separate themselves from the low-liquidity needs investors, the former can sell their assets at a better price. But this is not possible in the pooling equilibrium. This means that high liquidity need investors generate a positive information-exterality over low liquidity need investors among direct investors. Because an increase in the number of FDI

investors comes from high liquidity need investors, which reinforces such exteranlity, thereby lowering the price discount, and creating incentives for even more investors to choose to become direct investors rather than FPI investors. Pooling equilibrium is therefore characterized by strategic complementarity. A dynamic implication is that the larger is the past and present share of FDI flows, the larger will also be the future share of FDI flows.

3 Testable Hypotheses

We bring to the data the following hypotheses which are formulated from previous section (adverse-selection) theory.

1. "Price Discount Hypothesis". The ratio of FDI price to FPI price is negatively affected by liquidity risk. The idea is that a market participant does not know whether the FDI investor liquidates the firm because of an idiosyncratic liquidity shock, or because she has some negative information about the firm productivity.

2. "Equity-Composition Hypothesis". The ratio of (gross) flows of FPI to (gross) flows of FDI increases if investors expect more severe liquidity problems. The idea is that direct investments are more costly to liquidate, because when liquidated they are sold at a discount. Hence, expecting greater aggregate liquidity needs in the future, investors tend to tilt their investments towards a relatively more liquid asset, which is a portfolio investment.

3. "Strategic Complementarity Hypothesis". The effect of greater liquidity risk on gross ouflows and outflows of FDI, relative to FPI depends on the initial number of FDI investors, relative to the number of FPI investors. The idea is that high liquidity need investors generate a positive information-exterality over low liquidity need investors among direct investors. Because an increase in the number of FDI investors comes from high liquidity need investors, which reinforces such exteranlity, thereby lowering the price discount and creating incentives for even more investors to choose to become direct investors rather than FPI investors.

4 Data

A key variable of interest is the ratio between the assets that a country holds as FPI and the assets that it holds as FDI. To measure this ratio, we use the recently available data on a country's external assets and liabilities, as compiled by Lane and Milesi-Ferretti (2007). Lane and Milesi-Ferretti

(2007) 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, foreign portfolio (equity) investment, official reserves, and external debt. The convention for distinguishing between direct investment and portfolio investment is to see whether the ownership of shares of companies is above or below 10%. If it is above the threshold, then it is classified as direct investment.[5]

For most countries, Lane and Milesi-Ferretti (2007) 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 backwards with data on capital flows, together with calculations for capital gains and losses, to generate estimates for stock positions. In their 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. In our estimation, we use the data from 1985 till 2004 as the sample period.

Lane and Milesi-Ferretti (2000) dataset consists of 140 economies from 1970 – 2004, and the stock of international assets and liabilities are divided into four types: foreign direct investment, portfolio equity investment, official reserves, and external debt . The dataset contains more data on developed economies than developing ones due to data availability. This paper will use the data from 1985 to 2004 as the sample period. The outward FDI and FPI into the host countries are measured using the data of the host countries' stock of FDI liabilities and equity liabilities, respectively. The other macroeconomic variables, which will serve as controls in the regressions, are from WDI.

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, as multinationals from these economies become major regional - or sometimes even global - players. It seems that 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

[5] Arguably, 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.

Report 2006). Table 1 lists the countries covered in the sample from 1985 till 2004, and their mean ratio of FPI to FDI.[6] Table 2 provides summary statistics.

A key explanatory variable measures the extent of liquidity problems in the source country. As we explain in the next section, we estimate this variable using data on annual flows in external assets. This data is collected from the IMF's Balance of Payments dataset.[7] Finally, in the following empirical sections, we will also use a few macroeconomic variables as our explanatory variables. These macroeconomic data, such as GDP, current account balance, exchange rates, and trade openness, are collected from the IMF's World Economic Outlook database, which has historical cross-country coverage. Some other variables, such as political risk and opacity, are collected from various datasets and will be described in more details when introduced.

5 Measures of Liquidity Crises

We follow Goldstein, Razin, and Tong (2007) and define a liquidity crisis as an incident of the negative purchase of external assets, which is composed of foreign exchange reserves, direct investments, portfolio investments, and other assets. The rationale is that when a country is in need of liquidity, it would sell off its less liquid assets to get cash or more liquid holdings. Two measures will be used to proxy the liquidity crisis. The first measure is the truncated liquidity crisis severity variable, which is equal to the country's sales of external assets over its total assets in the next period if such sales is positive (if the liquidity crisis in the next period is present) and zero otherwise. This measure will also capture the magnitude of the liquidity crisis. The second measure is the liquidity crisis binary variable, which is equal to one if the purchase of the external assets in the next period becomes negative and zero otherwise.

6 Estimating the effect of the Severity of Liquidity Shocks

The crux of our theory is that if a country expects greater liquidity problems in the future it will increase the share of FPI relative to FDI. We use the variable $E_t\left[Severity_{it+1}\right]$ to proxy for the severity of expected liquidity shocks, as perceived in period t, and investigate how it affects the

[6] 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 Table 3.

[7] This data does not account for changes in valuation, and therefore allows us to capture the notion of the quantity of investment liquidations in our model.

FPI/FDI ratio for source countries. The empirical analysis has two stages. First, to estimate the expected severity of liquidity shocks, we run the following regression:

$$Severity_{i,t+1} = \gamma X_{it} + \theta Z_{it} + \xi_{t+1} + \varsigma_i + \eta_{it+1}. \quad (1)$$

Then, we use the expected value of $Severity_{i,t+1}$, estimated from (1), as our main explanatory variable for the ratio of FPI to FDI as well as their levels in period t.

The vector Z_{it} is motivated by the literature on financial crises (e.g., Frankel and Rose, 1996). It includes source country political risk index, current account surplus over GDP, and a country's external debt over total assets. 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.[8] 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)). Identifying the system in (1) and (**??**) requires the exclusion restriction to be satisfied. That is, the variables in Z_{it} should have no effect on $FPI/(FPI+FDI)$ except for the indirect effect via the expected liquidity shock. Indeed, our theory does not suggest the inclusion of political risk, current account surplus, and external debt as direct controls in (**??**), and we are not aware of other models that suggest such a link. In earlier literature, political risk at the host country has been tied to its level of FDI due to confiscation considerations (Albuquerque (2003) and Alfaro, Kalemli-Ozcan and Volosovych (2008)). The link between FDI and these confiscation considerations, however, does not apply to the source country. Another potential concern is that the current account balance may indirectly affect the FPI/FDI composition through affecting the exchange rate, which may then generate some wealth effect and influence FDI and FPI asymmetrically as in Froot and Stein (1991).[9] To alleviate this concern, we include a control variable for the real exchange rate in equation (**??**).[10]

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

[9] The 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.

[10] Baker, Foley, and Wurgler (2009) 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 also to proxy for the wealth of source country.

6.1 Estimating the Effect of a Liquidity Threshold

We also employ an alternative model – the threshold model. The idea here is that a liquidity shock has a strong impact on the FPI/FDI composition only after it reaches a certain threshold, and becomes a "liquidity crisis". In this model, we start by estimating the following Probit equation:

$$I_{i,t}\left(Liquidity\ Crisis_{i,t+1}\right) = \begin{cases} 1 & \text{if } Severity_{i,t+1} > 0 \\ 0 & \text{if } Severity_{i,t+1} \leq 0 \end{cases}, \tag{2}$$

where $Severity_{i,t+1}$is a function of independent variables as specified in equation (1). Here, we define a liquidity crisis as an episode of negative purchase of external assets, which has a frequency of 13% in our sample. Table 8 lists the countries and years when there is a liquidity crisis, according to this definition. It shows that besides developing countries, some developed economies, such as Denmark, Japan, New Zealand and Spain, also experienced liquidity crises in our sample period.

After estimating the liquidity crisis dummy, we use it as an explanatory variable in the second-stage equations.

6.2 Estimating the Effects of Liquidity Risk on the FDI to FPI Price Discount

The price of FDI is estimated as follow. Because an FDI is composed of both the holdings of stocks (more than 10% of the total stockholding) and Greenfield investment, the composite price of FDI is calculated as follow.

$$PFDI_{i,t} = \omega P_{i,t}^{stocks} + (1-\omega) P_{i,t}^{greenfield} \tag{3}$$

where ω is the FDI equity inflows over the total FDI inflows, which reflects the weight of the equity holding portion of FDI to the total FDI inflows (the data of both the FDI equity inflows an the total FDI inflows are from the UNCTAD WID Country Profile).

The stock market index of the host country will be used to proxy the price of FDI equity holding, $P_{i,t}^{stocks}$.

The price of Greenfield investment in the host country, $P_{i,t}^{greenfield}$, will be estimated using the following formula of the unit price of investment, which was specified in del Rio (2004).

$\mathrm{P}_{i,t}^{greenfield} = pi * [(ci * cgdp)/(ki * rgdpl)]$

The variable pi is the PPP price level of investment. The variable cgdp is the GDP per capita at world price, and ci is the investment share of cgdp. Similarly, the variable rgdpl is the GDP

per capita at constant world price using Laspeyres price index, and ki is the investment share of rgdpl. The term [(ci*cgdp)/(ki*rgdpl)] serves as the implicit deflator of investment (the data of calculating $P^{greenfield} is from Penn World Table database of the University of Pennsylvania$).

As for the price of FPI, the stock market index is used as a proxy for the composite price of various stocks in host countries. Nevertheless, the caveat of this approach is that the method of calculating the stock market index varies among different countries. The data of the stock market index of various countries are obtained from the Economist Intelligence Unit database.

The theoretical model also predicts that as the liquidity shock probability increases, more people are selling and less are buying both FDI and FPI. Thus, the prices of both will decline. On the other hand, the higher liquidity shock probability reduces adverse selection problem. As a result, the price of FDI can actually increase.

The reduced form regressions for the prices of FPI and FDI are the following:

$$\ln\left(P^{FDI}/P^{FPI}{}_{i,t}\right) = \eta W_{i,t} + \zeta_0(LiquidityCrisis_{i,t+1}) + \nu_{i,t} \tag{4}$$

The term $W_{i,t}$ includes the log of GDP, the log of GDP per capita (constant price), and inflation. The liquidity crisis variable refers to both the severity and the binary measures of liquidity crisis, which will be instrumented on the factors that affect the possibility that the country may experience a liquidity crisis. The excluded instrumental variables include the current account balance to GDP, the government budget balance to GDP, the percentage of short-term debt, and the measures of political and financial risks from International Country Risk Guide (ICRG). The current account balance and the government budget balance indicate the country's need of external financing, whereas the percentage of short-term debt signals the country's need of liquidity. The political and financial risks are associated with the creditworthiness of a country (Haque et al. (1997)). According to the price discount hypothesis, the coefficient ζ_0 should be negative due to the informational discount on the price of FDI.

In addition to the price discount hypothesis, the strategic complementarity hypothesis also predicts that if a country initially has a higher proportion of direct investors, the informational discount on the price of FDI will be lowered. Hence, the above equation will be modified as

$$\ln\left(P^{FDI}/P^{FPI}{}_{i,t}\right) = \eta W_{i,t}+\zeta_0(LiquidityCrisis_{i,t+1})+\zeta_1((FDI/AllInwardCapital)_{i,t-1}*(LiquidityCrisis_{i,t+1}))+ \tag{5}$$

The term $(FDI/AllInwardCapital)_{i,t-1}$ is used as a proxy of the proportion of direct investors (all inward capital includes inward FDI, FPI, debt, and derivatives). According to thestrategic complementarity hypothesis, the coefficient ζ_1 should be positive due to the mitigation of the informational discount on the price of FDI.

6.3 Estimating the Effects of Liquidity Risk on the Composition of Outward FPI to FDI

Reduced form econometric models will be employed to explore whether the hypothesized mechanisms of international capital movements hold in the data. First, this paper will explore the relationship between liquidity crisis and the capital flows out of the source countries. Unlike Goldstein, Razin, and Tong (2007), which regressed the ratio of FPI to FDI outflows on the predicted probability of the liquidity crisis, this paper will regress the FPI to FDI outflows on the instrumented liquidity crisis measures. The effect of the liquidity crisis on the ratio of FPI to FDI outflows will be investigated using the following set-up:

$$\ln\left(FPI/FDI\right)_{i,t}^{out} = \alpha X_{i,t} + \beta_0(LiquidityCrisis_{i,t+1}) + \gamma year_t + \mu_i + \epsilon_{i,t} (6)$$

where the liquidity crisis variable will be instrumented as previously described.

The term $LiquidityCrisis_{i,t+1}$ is measured as the negative net annual purchase of external assets – which include FDI, FPI, other investments and foreign reserves – in country i in period $t+1$. We normalize these flows by the stock of total external assets of country i at time t. X_{it} are variables that affect both the liquidity shock and the ratio of FPI to FDI. Z_{it} are variables excluded from equation (**??**), ξ_{t+1} are year fixed effects and ς_i stand for country effects. In (**??**), we take the log of the FPI/(FPI+FDI) to reduce the impact of extreme values. In this equation, v_t stands for time fixed effects, u_i stands for country effects. ε_{it} and η_{it+1} are i.i.d. residuals.

Our selection of control variables X_{it} is motivated by Faria et al. (2007), who examine the determinants of the composition of a country's external liabilities. They consider 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 little work has empirically examined the composition of external assets, we 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 flows (see Froot and Stein (1991)). Table 2 provides summary statistics of these variables.

Because the composition of FPI and FDI in the last period may influence the composition in the current period due to portfolio rebalancing (Goldstein, Razin, and Tong (2007)), the model will be run again as a dynamic panel regression with the lag of FPI/FDI as another explanatory variable.

$$\ln (FPI/FDI)^{out}_{i,t} = \alpha X_{i,t} + \beta_0 (LiquidityCrisis_{i,t+1}) + \rho \ln (FPI/FDI)^{out}_{i,t-1} + \gamma year_t + \mu_i + \epsilon_{i,t} (7)$$

The above model will be estimated using the Arellano-Bond dynamic GMM approach because it will take care of the endogeneity problem when the lag of FPI/FDI is correlated with the error term.

However, if the number of instruments is larger than the number of groups of data in the dynamic panel model with instrumental variables, it is possible that the problem of too many instruments may occur. If it does, the instruments, although each of them are valid, might be collectively invalid in the finite samples because they over fit the endogenous variable and will also weaken the reliability of the Hansen test for instrument validity (Roodman (2008)). Therefore, the number of instruments included in the dynamic panel models may be less than those included in the fixed effects models .

Next, the effects of the liquidity risk as well as the initial proportion of direct investment on the compositions of outward FPI to FDI will be explored by the following fixed effects and dynamic panel regressions:

$$\ln(FPI/FDI)^{out}_{i,t} = \alpha X_{i,t} + \beta_0(LiquidityCrisis_{i,t+1}) + \beta_1((FDI/AllInwardCapital)_{i,t-1} * (LiquidityCrisis_{i,t+1})) + \beta_2(FDI/AllInwardCapital)_{i,t-1} + \gamma year_t + \mu_i + \epsilon_{i,t} \quad (8)$$

$$\ln(FPI/FDI)^{out}_{i,t} = \alpha X_{i,t} + \beta_0(LiquidityCrisis_{i,t+1}) + \beta_1((FDI/AllInwardCapital)_{i,t-1} * (LiquidityCrisis_{i,t+1})) + \beta_2(FDI/AllInwardCapital)_{i,t-1} + \rho \ln(FPI/FDI)^{out}_{i,t-1} + \gamma year_t + \mu_i + \epsilon_{i,t} \quad (9)$$

The coefficient before the liquidity crisis variable will capture the main effect of liquidity risk, since the immediate reaction of investors facing liquidity shock would be to shift towards more liquid asset. The sign of this coefficient is predicted to be positive. In addition to the main effect of the liquidity risk, the interaction term between the liquidity risk and the proportion of inward FDI to all inward capital is also included to capture the effect of the mitigated adverse selection problem. As predicted by the strategic complementary hypothesis, the higher proportion of direct investors will lower the informational discount on the price of FDI and hence increase the outward FDI. Thus, the coefficient of the interaction term is expected to be negative. The set of controls will be the same as in the previous regression.

6.4 Estimating the Effects of Liquidity Risk on the Gross Flows and the Net Flows of FDI and FPI

The regressions previously run on the compositions of outward FPI to FDI will be run again on the values of FPI and FDI to observe whether the results are consistent with one another.

Finally, to capture the influence of liquidity crisis on the net amount of each type of international capital, the two regressions above will be run again using the net FPI and the net FDI as dependent variables.

$$(\text{FPI}^{out} - FPI^{in})_{i,t} = \alpha X_{i,t} + \beta_0(InstrumentedLiquidityCrisis_{i,t+1}) + \beta_1(Instrumented(FDI/AllInwardCapital)$$
$$(LiquidityCrisis_{i,t+1})) + \beta_2(FDI/AllInwardCapital)_{i,t-1} + \gamma year_t + \mu_i + \epsilon_{i,t} \quad (10)$$

$$(\text{FDI}^{out} - FDI^{in})_{i,t} = \alpha X_{i,t} + \beta_0(InstrumentedLiquidityCrisis_{i,t+1}) + \beta_1(Instrumented(FDI/AllInwardCapital$$
$$(LiquidityCrisis_{i,t+1})) + \beta_2(FDI/AllInwardCapital)_{i,t-1} + \gamma year_t + \mu_i + \epsilon_{i,t} \quad (11)$$

The main effect of the instrumented liquidity crisis variable will influence the net amount of each type of capital via both the outward and inward directions, while the main effect of the initial proportion of FDI and the interaction term will affect the net FPI and FDI mainly through the inward direction.

Finally, we consider another specification for (**??**), where the lagged FPI/FDI can affect the current FPI/FDI. Hence, we estimate:

$$\ln(FPI/(FPI+FDI))_{it} = \phi \ln(FPI/FDI)_{i,t-1} + \alpha X_{it} + \beta E_t[Severity_{it+1}] + + \gamma \ln(FPI/(FPI+FDI))_{it-1} + v_t + \quad (12)$$

There is a complication in estimating equation (12). 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 then use the Arellano-Bond dynamic GMM approach to estimate equation (12).

7 Results

7.1 Effects of Liquidity Risk on Stock Prices

The results of the regression of the ratio of FDI price to FPI price are presented in Table 3. Column 1 reveals the results of regressing the FDI to FPI price ratio on the instrumented liquidity crisis severity measure, while column 2 shows the results of regressing the price ratio on the instrumented liquidity crisis binary variable. The overall results are consistent with the price discount hypothesis regardless of the measures of liquidity crisis used in the regressions. The higher liquidity risk negatively affects the ratio of FDI price to FPI price. This mirrored the informational discount because market participants do not know whether an FDI is sold due to liquidity shock or due to adverse productivity realization. In addition, the results showed that the higher GDP per capita (constant price) is associated with the increase in the ratio of FDI price to FPI price.

Nevertheless, when taking into account the initial portion of direct investors in the market, the regression results reveal that adverse selection problem is mitigated. Table 4 illustrated the results of regressing the ratio of FDI price to FPI price on the instrumented liquidity crisis variables and the interaction term between liquidity crisis and the initial portion of FDI investors. The negative coefficients of the instrumented liquidity crisis measures remained in line with the price discount hypothesis. However, the positive coefficients of the interaction term indicate that with higher initial portion of FDI investors, the higher liquidity risk can actually raise the ratio of FDI price to FPI price. This is consistent with the strategic complementarity hypothesis, which infers that the higher initial portion of direct investors will increase the probability that FDIs are sold due to liquidity shock, lowering the informational discount on the price of FDI.

7.2 Effect of Liquidity Risk on the Composition of Equity Flows

Table 5 presents the regression results of the ratio between outward FPI and FDI. Columns 1 and 2 report the fixed effects estimations, while columns 3 and 4 present the Arellano-Bond dynamic panel estimations. The results of all the regressions in this part point toward the same direction

The empirical results in this part appear to be in line with the predictionsin Goldstein and Razin (2006) and the empirical results in Goldstein, Razin, and Tong (2007). The higher probability of liquidity crisis would lead to the higher outward FPI relative to the outward FDI, which supports the asset-liquidity hypothesis. The reason is that the higher liquidity risk in the source country increases the probability that investors from the source country may face liquidity shock and hence

would not hold their investment until maturity. If that is the case, then those investors would lose from holding FDI since the selling price of FDI before maturity is lower than that of FPI due to information asymmetry. Such conjecture is supported by the positive coefficient of the instrumented liquidity crisis variable in the regressions of the outward FPI to the outward FDI. This result holds when using the liquidity crisis severity as well as the liquidity crisis dummy as the instrumented explanatory variables.

While the asset-liquidity hypothesis infers that the higher liquidity risk will result in the higher ratio of outward FPI to FDI, the strategic complementarity hypothesis indicates that the higher liquidity risk may in turn decrease the ratio of outward FPI to FDI if a country initially has high proportion of direct investors. In order to investigate whether the strategic complementarity hypothesis is consistent with the data, the ratio of outward FPI to FDI will be regressed on both the instrumented liquidity crisis variable and the interaction term between the instrumented liquidity crisis and the initial portion of direct investment (as well as other control variables). The results of the fixed effects and the dynamic panel regressions are shown in Tables 6 and 7, respectively. Only the dynamic panel results support the strategic complementarity hypothesis (neither the instrumented liquidity crisis nor the interaction term are significant in the fixed effects regressions). In the dynamic panel regressions, the positive coefficient of the instrumented liquidity crisis still confirms that the higher liquidity risk is associated with the higher outward FPI relative to the outward FDI. On the other hand, the negative coefficient of the interaction term indicated that if a country has a higher initial portion of direct investment, the increase in liquidity risk will result in the lower ratio of outward FPI to FDI. This coincides with the mechanism that the higher proportion of direct investment will mitigate the information asymmetry problem and thus the information discount on the price of FDI, reducing the lost in selling FDI before maturity. Therefore, when facing the higher liquidity risk, investors would not have to reduce the holdings of FDI as much as before.

To examine the validity of the dynamic panel estimations, the existence of unit root in the data of FPI to FDI ratio as well as the presence of higher order auto-correlations must be determined. The coefficients of the lagged FPI to FDI in columns 3 and 4 are lower than 1, respectively, indicating that there is no unit root. Also, the Arrelano-Bond tests fail to reject the null hypothesis of no auto-correlation in the second, third, and fourth orders. Therefore, the results of the dynamic panel regressions are valid and support the theoretical predictions.

7.3 Effects of Liquidity Risk on Gross Flows and Net Flows of FDI and FPI

To explore the mechanism of the liquidity crisis and the outward international capital more thoroughly, the regression models must also be estimated separately for the levels of the outward FDI and the outward FPI. Both the fixed effects and the dynamic panel estimations for the level of the outward FDI portray the same picture. The results, which are presented in Table 8, indicate that after controlling for the price and other factors (including the lagged quantity in the case of dynamic panel estimation), the higher probability of liquidity crisis still has a significant negative effect on the outward FDI, which is in line with the theoretical prediction that investors from the source country would want to hold less FDI when facing a higher probability of liquidity shock. However,the coefficients of the instrumented liquidity crisis are not significant in the regressions of the outward FPI except for the dynamic panel regression of the level of FPI using the severity measure of liquidity crisis as a regressor (see Table 9). Hence, it appears in the data that the liquidity crisis probability affects the composition of outward international capital mainly through the channel of outward FDI.

The regressions of the net FDI (outward FDI less inward FDI), which are presented in Table 10, show consistent results throughout all specifications of liquidity crisis measures. Countries with higher liquidity risk will have the higher net FDI. On the other hand, if the country has a large proportion of inward direct investment, the higher liquidity risk will be associated with the lower netFDI. In addition, countries with higher initial proportion of inward direct investment are the ones that attract more inward FDI, decreasing the net FDI.

When examining the effects of liquidity risk on the net FPI using the liquidity crisis severity measure, the results (in Table 11) show that countries with higher liquidity risk will have the higher net FPI. However, the interaction term indicated with a large proportion of inward direct investment, the higher liquidity risk will be associated with the lower net FPI. The main effect of the proportion of the initial inward direct investment signaled that countries with higher initial proportion of inward direct investment could be the ones with more inward FDI and less inward FPI, increasing the net FPI. Nonetheless, only the interaction term remain significant when replacing the liquidity crisis severity by the binary variable.

Overall, the findings about the effects of the liquidity risk on the prices, the compositions, and the levels of FPI and FDI are consistent with one another and support the theoretical predictions. The sale of assets in response to liquidity shock lowers the price of FDI relative to that of FPI,

whereas the mitigation of the " lemon" problem helps pushing up the relative prices of FDI and FPI. More importantly, because of informational discount on the price of FDI, the rise in liquidity risk tends to reduce the holdings of FDI, thereby increasing the ratio of outward FPI and outward FDI. Nevertheless, if the proportion of direct investors is higher, the reduced "lemon" problem will drive up the demand of FDI and thus decrease the FPI to FDI ratio.

8 Conclusion

In this paper, we examine how the fear of liquidity shocks guides international investors in choosing between FPI and FDI. Our hypothesis is based on an information-efficiency trade-off (Goldstein and Razin (2006), Kirabaeva (2009)). 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. As a consequence of a better information they are able to manage their projects, and invest in them, more efficiently. However, if investors need to liquidate investments, the price they can get will be lower whenever buyers know that the seller is more informed.The paper tests three hypotheses concerning foreign equity investment in the presence of liquidity risk. First, the FDI-to-FPI price differential is negatively related to liquidity risk (the "Price Discount Hypothesis"). The idea is that market participants do not know whether the FDI investor liquidates a firm because of an idiosyncratic liquidity shock, or because, as an informed invesor, the firm is hit by a productivity shock. Second, the FDI-to-FPI composition of foreign equity investment skews towards FPI, if investors are expected to experience liquidity shortage in the future (the ""Equity-Composition Hypothesis"). The idea is that because direct investments are more costly to liquidate, due to the price discount, the more severe is the expected liquidity shock, the smaller is the FDI-to-FPI ratio. Third, the FDI-to-FPI composition of foreign equity flows skews towards FDI, the larger are past FDI-to-FPI stocks (the "Strategic Complementarity Hypothesis"). The idea is that high liquidity need investors generate a positive information-exterality for low liquidity need investors among investors who choose FDI, and further increases in the number of FDI investors comes from mainly high liquidity need investors. Such an increase reinforces the information exteranlity, thereby lowering the FDI-to-FPI price discount, creating further incentives for investors to choose FDI.The paper brings these hypotheses to country level data consisting of a large set of developed and developing countries over the period 1970 to 2004. The evidence gives strong support to the hypotheses. To test the hypothesis, we apply also a

dynamic panel model to examine the variation of FPI relative to FDI for source and host countries from 1985 to 2004. Country-wide sales of external assets are used as a proxy for liquidity problems. We estimate the determinants of liquidity problems, and then test the effect of expected liquidity problems on stock prices, the ratio of FPI to FDI and gross flows of FDI and FPI. We find strong support for the hypotheses: greater expected liquidity problems increase the price discount, have a significant positive effect on gross flows of FPI, negative effect on gross flows of FPI, and positive effect on the ratio between FPI and FDI.

9 Appendix: A Two-Country Model

Applying the efficiency-information trade-off concept in Goldstein and Razin (2006) small open economy into a two-country framework, Kirabaeva (2009) models the behavior of FDI and FPI investors in a two-country world, as follows. There are two countries (k ={A,B}), three periods (t = 0, 1, 2), and a continuum [0,1] of foreign investors. In this model, there are two countries (k ={A,B}), three periods (t = 0, 1, 2), and a continuum [0,1] of foreign investors. Denote α as the proportion of investors living in country A and 1-α as those living in B. Each investor from country k has a Diamond-Dybvig type of preference:

$$E[\,U_{\,k}\,(C_1, C_2)\,] = \lambda_k E\,[u\,(C_1)] + (1 - \lambda_k)\,E\,[u\,(C_2)]$$

where λ_k denotes the probability of liquidity shock in country k. Because there is no aggregate uncertainty, λ_k is also a proportion of investors who face liquidity shock. Assume without the loss of generality that country A has lower probability of liquidity shock than country B ($\lambda_A < \lambda_B$). In each period 1 and 2, each investor has a mean-variance type of preference:

$$E\,[u\,(C_t)] = E\,[C_t] + (\gamma/2)\,Var\,[C_t]$$

Each investor is endowed with one unit of good in period zero, which can be consumed or invested. There are two kinds of assets, safe asset or cash, in which 1 unit of investment would yield the return of 1 every period, and a risky long-term investment project i in country k, in which 1 unit of investment in period zero yields the return of R_k^i in period two. The return R_k^i from an investment project is equal to the idiosyncratic investment productivity with the mean R_k and variance σ_k^2. The mean productivity R_k can also be interpreted as the productivity signal, and it takes the value of R_{kl} with the probability of π_k and R_{kh} with the probability of 1-π_k. Hence, the expected productivity signal is equal to

$$E\,[R_k] = \pi_k R_{kl} + (1 - \pi_k)\,R_{kh}$$

At period zero, an investor could be a direct investor by investing the amount x_{dk}^i (which is equal to x_k^i) directly in one project or he could become a portfolio investor investing the amount x_{pk}^i in each project for N_k projects ($x_{pk}^i = N_k x_k^i$). Because direct investors have control over the management of the investment project while portfolio investors leave management in the hands of agents, a direct investment will obtain higher management efficiency than a portfolio investment. Hence, the probability of low productivity for FDI is lower than that for FPI ($\pi_{dk} < \pi_{pk}$) and the

expected return of FDI is higher than that of FDI.

$$R_{dk} = E\left[R_{dk}\right] = \pi_{dk} R_{kl} + \left(1 - \pi_{dk}\right) R_{kh} > R_{pk} = E\left[R_{pk}\right] = \pi_{pk} R_{kl} + \left(1 - \pi_{pk}\right) R_{kh}$$

The variances of the direct investment and portfolio investment are σ_k^2 and σ_k^2/N_k, respectively.

At period one, the liquidity shock realizes. As a result, those who face liquidity shock, regardless of whether they are direct or portfolio investors, must sell their assets in order to consume their wealth within period one. The investments' productivity realizations also occur at this period. And because direct investors have controls over the project management, only them acquire the information about the projects' productivity realization and would sell their investment if the productivity turns out to be low. Therefore, when direct investments are sold in period one, the market would not know whether they are sold because of liquidity need or because of low productivity. This leads to adverse selection problem.

Denote λ_{dk} as the probability perceived by the market that a direct investor investing in country k receives a liquidity shock. The market believes that a direct investment is sold because of liquidity shock with the probability $\frac{\lambda_{dk}}{\lambda_{dk}+(1-\lambda_{dk})\pi_{dk}}$, and it perceives that the productivity realization of a direct investment prematurely sold due to liquidity shock is high (R_{kh}), because if the productivity realization is low, direct investors would sell their projects right away regardless of whether or not they receive a liquidity shock. The market also believes that a direct investment is sold due to low productivity with the probability $\frac{(1-\lambda_{dk})\pi_{dk}}{\lambda_{dk}+(1-\lambda_{dk})\pi_{dk}}$, and the productivity realization of such direct investment is R_{kl}. As a result, the market perceives that the expected return of a direct investment sold in period one is equal to

$$\widehat{R}_{dk} \equiv \frac{\left(1 - \lambda_{dk}\right)\pi_{dk}}{\lambda_{dk} + \left(1 - \lambda_{dk}\right)\pi_{dk}} R_{kl} + \frac{\lambda_{dk}}{\lambda_{dk} + \left(1 - \lambda_{dk}\right)\pi_{dk}} R_{kh}$$

with a variance σ_k^2.

The question is what is the value of λ_{dk}? Let δ_{ik} be the fraction of direct investors from country i investing country k. Then the fraction of direct investors from both country A and B investing country A is $\delta_k = \alpha\delta_{Ak} + (1-\alpha)\delta_{Bk}$, so λ_{dk} can be calculated as

$$\lambda_{dk} = \frac{\alpha\delta_{Ak}\lambda_A + \left(1 - \alpha\right)\delta_{Bk}\lambda_B}{\alpha\delta_{Ak} + \left(1 - \alpha\right)\delta_{Bk}}$$

On the contrary, portfolio investors do not obtain such private information about the investment projects. Hence, portfolio investments would only be sold because of liquidity need. Thus, the market perceives that the expected return and the variance of a portfolio investment sold in period one is R_{pk} and σ_k^2/N_k, respectively.

At period two, the payoffs of the remaining asset holdings realize, and those without liquidity shock in period one will consume their wealth.

After solving the mean-variance utility maximization problem of both direct and portfolio investors in period one, the optimal demands of FPI and FDI in period one are as follow:

$$y_{pk} = \frac{\overline{R}_{pk} - p_{pk}}{\gamma\sigma_k^2/N_k}$$

$$y_{dk} = \frac{R_{dk} - p_{dk}}{\gamma\sigma_k^2}$$

Substitute these solutions in the investors' Diamond-Dybvig utility function to get the optimal demands for direct and portfolio investments in period zero, which are the following:

$$x_{pk}^i = \frac{(R_{pk} - 1) - \lambda_i (R_{pk} - p_{pk})}{(1 - \lambda_i)\gamma\sigma_k^2/N_k}$$

$$x_{dk}^i = \frac{(R_{kh} - 1) - \lambda_i (R_{kh} - p_{dk})}{(1 - \lambda_i)\gamma\sigma_k^2}$$

In order for both direct and portfolio investment to coexist in period one in an equilibrium, the important property is that the optimal demands, which reflect the expected utilities, of direct and portfolio investment must be equal, or else all investor would by only a type of investment that yields the higher expected utility. Thus,

$$\frac{\widehat{R}_{dk} - p_{dk}}{\gamma\sigma_k^2} = \frac{\overline{R}_{pk} - p_{pk}}{\gamma\sigma_k^2/N}$$

The above property together with the market clearing condition written below will be used to compute the prices of FDI and FPI.

$$(\alpha(1 - \lambda_A) + (1 - \alpha)(1 - \lambda_B))\, y_k = \begin{pmatrix} \alpha\delta_{Ak}(\lambda_A + (1 - \lambda_A)\pi_k) x_{dk}^A \\ +(1 - \alpha)\delta_{Bk}(\lambda_B + (1 - \lambda_B)\pi_k) x_{dk}^B \\ +\alpha(1 - \delta_{Ak})\lambda_A x_{pk}^A \\ +(1 - \alpha)(1 - \delta_{Bk})\lambda_B x_{pk}^B \end{pmatrix}$$

This market clearing condition simply means that in a country k, the quantity of investment supplied by investors with liquidity shock or with low productivity realization is equal to the

quantity of investment demanded by those without liquidity shock.

Then, how do investors choose between direct and portfolio investment in period zero? When deciding between a direct investment and a portfolio investment, an investor would choose a type that yields a higher expected utility. Since it is assumed that investors from country A has lower probability of liquidity shock (liquidity risk) than those from country B, a direct investment with higher management efficiency would be more attractive to investors from country A, ceteris paribus. There are five possible cases of capital flows composition in equilibrium (or equilibria):

Case 1: All investors choose portfolio investment

Case 2: Some investors from A choose direct investment

All investors from B choose portfolio investment

Case 1 and 2 constitute a Type I equilibrium, which is unique due to the strategic substitutability in becoming a direct investor. That is, there exists a unique equilibrium with the proportion of direct investors δ_{Ak}, below which $EU(x^A_{dk}) > EU(x^A_{pk})$ and above which $EU(x^A_{dk}) < EU(x^A_{pk})$. As a result, the price of direct investment declines as a fraction of direct investors increases.

Case 3: All investors from A choose direct investment

All investors from B choose portfolio investment

Case 4: All investors from A choose direct investment

Some investors from B choose portfolio investment

Case 5: All investors choose direct investment

Case 3, 4, and 5 constitute a Type II equilibrium, which could be a unique equilibrium or multiple equilibria. There are two reasons multiple equilibria exist. On one hand (as in Type I equilibrium), as a fraction of direct investors increases, the price of direct investment decreases, reflecting strategic substitutability. On the other hand, as there are more direct investors with higher liquidity risk, it is more likely that a direct investment is sold due to liquidity need, improving the price of the prematurely sold direct investment.

A this stage, the model consists of idiosyncratic liquidity shocks, but no aggregate shocks. Assume that liquidity shocks to individual investors are triggered by some country-specific aggregate liquidity shock. Specifically, there is a probability of a country-specific aggregate liquidity shock in country A (country B). Once the shock occurs, it becomes common knowledge. Conditional on the realization of the aggregate liquidity shock, individual investors in the country may be subject to a need to sell their investment at period 1. With probability (1-q), an aggregate liquidity shock does not occur. In this case individual investors do not have a liquidity need that forces them to sell at

period 1.

This specification of the how aggregate shock triggers idiosyncratic shocks 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 in country i, investors, who have deeper pockets, are less likely to need to sell than 1- investors (i =A,B).

10 Appendix

Table 1: Summary Statistics

Summary Statistics For Dependent Variables					
Variable	Obs	Mean	Std. Dev.	Min	Max
ln(outward FPI / outward FDI)	1708	-0.98	1.72	-8.32	4.36
ln(outward FDI)	2199	6.44	3.39	-3.91	15.01
ln(outward FPI)	1753	6.25	3.44	-4.61	14.74
ln(inward FPI / inward FDI)	1725	-2.13	1.95	-11.47	2.89
ln(inward FDI)	2475	8.07	2.29	1.42	14.84
ln(inward FPI)	1725	6.81	3.41	-3.91	14.54

Summary Statistics For Variables of Interest					
Variable	Obs	Mean	Std. Dev.	Min	Max
Liquidity crisis dummy	2436	0.17	0.38	0	1
Liquidity crisis dummy*(FDI/all inward capital)i,t-1	2235	0.16	0.35	0	1
Truncated liquidity crisis severity	2399	0.02	0.09	0	2.73
Truncated liquidity crisis severity*(FDI/all inward capital)i,t-1	2232	0.02	0.10	0	2.73

Summary Statistics For Instruments					
Variable	Obs	Mean	Std. Dev.	Min	Max
Current Account Balance/GDP	2463	-2.26	6.32	-28.76	22.42
Govt. Budget Balance/GDP	1892	-0.03	0.05	-1	0.19
ICRG financial risk index	1602	35.13	8.50	10	50
ICRG political risk index	1602	67.31	14.81	27	97

Summary Statistics For Controls					
Variable	Obs	Mean	Std. Dev.	Min	Max
Log of GDP	1723	5.90	2.96	-4.61	14.65
Log of GDP Per Capita	1716	8.04	1.52	4.82	10.79
Log of Stock Market Capitalization	1108	-1.55	1.36	-8.46	1.57
Trade Openness	1680	4.16	0.56	2.53	5.93
Real Exchange Rate	1199	103.82	24.99	41.75	354.96
Lag of Real Exchange Rate	1189	4.63	0.22	3.73	5.87
GDP deflator	1715	1517.7	14680.7	1.00E-07	314948.7

Table 2: Pair Wise Correlations between the Variables of Interest and the Instruments

	Current account balance to GDP	Government budget balance to GDP	Percentage of short-term debt	ICRG financial risk index	ICRG political risk index
Liquidity crisis dummy	-0.1722	-0.1266	-0.0108	-0.2576	-0.2553
Liquidity crisis dummy*Initial inward FDI portion	-0.1157	-0.0112	0.035	-0.0983	-0.1362
Truncated liquidity crisis severity	-0.1094	-0.0655	0.0196	-0.207	-0.1958
Liquidity crisis severity*Initial inward FDI portion	-0.1088	0.0015	0.0281	-0.1289	-0.1496

Table 3: The Effect of Liquidity Crisis Probability on the FDI to FPI Price Ratio (Fixed Effects)

	Severity	**Binary**
Instrumented liquidity crisis	-48.29**	-5.05**
	20.97	*2.12*
Log of GDP	-0.31	-2.43
	0.19	*2.76*
Log of GDP per capita (constant price)	3.74***	2.52**
	1.39	*1.17*
GDP deflator	0.010	-0.003
	0.028	*0.027*
Numbers of observation	458	458
Numbers of countries	47	47
Underidentification test (Anderson canon. corr. LM statistic)	5.769	7.21
P-value	0.0559	0.0655
Sargan Statistic (overidentification test of all instruments)	1.895	4.258
P-value	0.1686	0.1189

The dependent variable is the log of the price of FDI over the price of FPI. The country and time fixed effects are included in both equations. The italic numbers are the standard deviations.

Table 4: The Effect of Liquidity Crisis and Initial Foreign Direct Investment Portion on the FDI Price to FPI Price Ratio

	Severity	**Binary**
Instrumented liquidity crisis	-47.49**	-12.03**
	22.10	*5.32*
Instrumented liquidity crisis*initial direct investment portion	258.96*	36.41*
	153.57	*22.12*
Initial direct investment portion	-0.57	1.53
	1.83	*4.11*
Log of GDP	-4.62***	-8.10**
	1.07	*2.59*
Log of GDP per capita (constant price)	4.42**	11.25***
	1.89	*4.28*
GDP deflator	38.21***	61.63***
	11.69	*23.05*
Numbers of observation	356	343
Numbers of countries	40	39
Underidentification test (Anderson canon. corr. LM statistic)	5.843	5.168
P-value	0.0538	0.0755
Sargan Statisti (overidentification test of all instruments)	0.155	1.097
P-value	0.6935	0.2949

The dependent variable is the log of the price of FDI over the price of FPI. The country and time fixed effects are included in both equations. The italic numbers are the standard deviations.

Table 5: The Effect of Liquidity Crisis on the Outward FPI to FDI Ratio

	Fixed Effects		Dynamic Panel	
	Severity	Binary	Severity	Binary
Instrumented liquidity crisis	17.40*	1.10*	2.30**	0.35*
	8.92	*0.67*	*0.93*	*0.93*
Log of GDP	-1.83**	-1.96**	-0.02*	-0.02
	0.93	*0.79*	*0.01*	*0.01*
Log of GDP per capita (constant price)	-2.06***	-2.69***	-0.01	-0.01
	0.40	*0.40*	*0.04*	*0.04*
Log of stock market capitalization	0.23***	0.16**	-0.01	-0.01
	0.07	*0.06*	*0.03*	*0.03*
Trade openness (lag)	-1.11***	-1.25***	-0.04	-0.04
	0.31	*0.27*	*0.04*	*0.04*
Real exchange rate (lag)	-2.56***	-2.28***	-0.21	-0.21
	0.38	*0.28*	*-0.19*	*0.19*
GDP deflator	-1.40E-02***	-1.40E-02***	-0.001**	-0.001**
	2.25E-03	*2.04E-03*	*0.001*	*0.001*
Lag of outward FPI to FDI ratio			0.91***	0.91***
			0.03	*0.03*
Numbers of observation	694	719	330	337
Numbers of countries	56	56	31	31
Underidentification test (Anderson canon. corr. LM statistic)	11.005	16.288		
P-value	0.027	0.0003		
Sargan Statistic (overidentification test of all instruments)	4.845	2.206		
P-value	0.184	0.138		
Hansen test of overid. restrictions			8.740	0.020
P-value			0.120	1.000

Table 6: The Effect of Liquidity Crisis Probability and the Initial Direct Investment Portion on the Outward FPI to FDI Ratio (Fixed Effects)

	Severity	Binary
Instrumented liquidity crisis	-15.04	-0.45
	12.36	0.75
Instrumented liquidity crisis*initial direct investment portion	-22.95	-0.89
	68.95	4.13
Initial direct investment portion	-3.90***	-4.72***
	0.63	0.88
Log of GDP	-0.30***	-0.43***
	0.09	0.16
Log of GDP per capita (constant price)	0.29	0.17
	0.62	0.66
Log of stock market capitalization	0.39***	0.27**
	0.09	0.12
Trade openness	-0.69*	-1.13*
	0.37	0.59
Real exchange rate (lag)	-0.79**	-0.24
	0.37	0.44
GDP deflator	-0.004	-0.002
	0.002	0.002
Numbers of observation	497	199
Numbers of countries	51	27
Underidentification test (Anderson canon. corr. LM statistic)	6.074	10.122
P-value	0.108	0.018
Sargan Statistic (overidentification test of all instruments)	3.208	1.986
P-value	0.201	0.370

Table 7: The Effect of Liquidity Crisis and the Initial Direct Investment Portion on the Outward FPI to FDI Ratio (Dynamic Panel)

	Severity	**Binary**
Instrumented liquidity crisis	2.03***	0.42*
	0.58	*0.58*
Instrumented liquidity crisis*initial direct investment portion	-12.47**	-12.47*
	5.87	*5.87*
Initial direct investment portion	0.25	0.25
	0.23	*0.23*
Log of GDP	-0.02**	-0.02*
	0.01	*0.01*
Log of GDP per capita (constant price)	0.04*	0.04**
	0.02	*0.02*
Log of stock market capitalization	0.00	0.00
	0.03	*0.03*
Trade openness	0.01	0.01
	0.04	*0.04*
Real exchange rate (lag)	-0.30*	-0.30
	0.17	*0.17*
GDP deflator	-0.0009**	-0.0009**
	0.0004	*0.0004*
Lag of outward FPI to FDI ratio	0.90***	0.90***
	0.04	*0.04*
Numbers of observation	499	495
Numbers of countries	54	54
Hansen test of overid. restrictions	16.49	16.53
P-value	0.124	0.123

Table 8: The Effect of Liquidity Crisis on the Level of the Outward FDI

	Fixed Effects		**Dynamic Panel**	
	Severity	**Binary**	**Severity**	**Binary**
Instrumented liquidity crisis	-19.20**	-1.88**	-0.67*	-0.07**
	9.01	*0.90*	*0.37*	*0.37*
Log of GDP	-0.66	-0.54	0.02***	0.02***
	0.82	*0.80*	*0.01*	*0.01*
Log of GDP per capita (constant price)	2.68*	2.54***	0.06***	0.06***
	0.37	*0.36*	*0.03*	*0.03*
Log of stock market capitalization	0.04	0.11*	0.05***	0.05***
	0.06	*0.06*	*0.02*	*0.02*
Trade openness (lag)	0.67**	0.57**	-0.09**	-0.09***
	0.27	*0.26*	*0.03*	*0.03*
Real exchange rate (lag)	1.56***	1.04***	0.08	0.08
	0.32	*0.24*	*-0.08*	*0.08*
GDP deflator	1.27E-02***	1.25E-02***	0.000	0.000
	2.12E-03	*2.11E-03*	*0.000*	*0.000*
Lag of the level of outward FDI			0.95***	0.95***
			0.01	*0.01*
Numbers of observation	760	787	394	410
Numbers of countries	58	59	32	32
Underidentification test (Anderson canon. corr. LM statistic)	7.946	7.798		
P-value	0.047	0.0203		
Sargan Statistic (overidentification test of all instruments)	1.536	0.639		
P-value	0.464	0.424		
Hansen test of overid. restrictions			13.320	9.770
P-value			0.206	0.202

Table 9: The Effect of Liquidity Crisis on the Level of the Outward FPI

	Fixed Effects		Dynamic Panel	
	Severity	Binary	Severity	Binary
Instrumented liquidity crisis	-1.65	-0.05	1.36**	0.19
	5.44	*0.44*	*0.65*	*0.65*
Log of GDP	-2.21***	-2.17***	0.00	0.00
	0.57	*0.55*	*0.01*	*0.01*
Log of GDP per capita (constant price)	0.62**	0.60**	0.06	0.06
	0.24	*0.25*	*0.05*	*0.05*
Log of stock market capitalization	0.31***	0.32***	0.05	0.05
	0.04	*0.04*	*0.04*	*0.04*
Trade openness (lag)	-0.35*	-0.34*	-0.14**	-0.14***
	0.19	*0.19*	*0.06*	*0.06*
Real exchange rate (lag)	-0.78***	-0.82***	-0.09	-0.09
	0.23	*0.19*	*-0.13*	*0.13*
GDP deflator	-1.85E-03	-1.94E-03	-0.001	-0.001
	1.36E-03	*1.33E-03*	*0.001*	*0.001*
Lag of the level of outward FPI			0.93***	0.93***
			0.05	*0.05*
Numbers of observation	695	696	343	343
Numbers of countries	56	56	31	31
Underidentification test (Anderson canon. corr. LM statistic)	10.873	16.660		
P-value	0.012	0.0008		
Sargan Statistic (overidentification test of all instruments)	1.609	1.706		
P-value	0.447	0.426		
Hansen test of overid. restrictions			4.230	3.330
P-value			0.836	0.912

Table 10: The Effect of Liquidity Crisis Probability on Net FDI Flows

	Severity	**Binary**
Instrumented liquidity crisis	246732.80*	18351.99*
	141791.30	*11179.61*
Instrumented liquidity crisis*initial direct investment portion	-1733785.00**	-116495.90***
	768100.20	*43162.36*
Initial direct investment portion	-33375.52**	-28621.34*
	13974.00	*14739.56*
Log of GDP	4207.04**	4176.82*
	2114.08	*2171.34*
Log of GDP per capita (constant price)	-2669.30	-6193.64
	8956.86	*9333.93*
Log of stock market capitalization	2690.32**	2434.33*
	1226.05	*1385.67*
Trade openness (lag)	-9349.85	-11804.13
	8336.48	*8376.37*
Real exchange rate (lag)	-10463.16	-13603.92*
	7096.88	*7211.01*
GDP deflator	-24.97	-17.51
	33.15	*35.47*
Numbers of observation	202	202
Numbers of countries	28	28
Underidentification test (Anderson canon. corr. LM statistic)	13.344	16.489
P-value	0.064	0.087
Sargan Statistic (overidentification test of all instruments)	8.075	9.049
P-value	0.233	0.433

The dependent variable is the outward FDI less inward FDI. The country and time fixed effects are included in both equations. The italic numbers are the standard deviations.

Table 11: The Effect of the Liquidity Crisis Probability on the Net FPI

	Severity	Binary
Instrumented liquidity crisis	269065.90**	8441.30
	120992.20	*11182.91*
Instrumented liquidity crisis*initial direct investment portion	-1341151.00**	-62916.77*
	557554.70	*36898.79*
Initial direct investment portion	22368.69*	17984.77
	11689.61	*11575.98*
Log of GDP	-7123.10***	-6768.83***
	1756.04	*1637.61*
Log of GDP per capita (constant price)	-44295.13***	-42472.10***
	7566.93	*7071.45*
Log of stock market capitalization	69.67	-192.38
	1033.01	*1101.89*
Trade openness (lag)	15365.83**	14277.44**
	6771.58	*6320.18*
Real exchange rate (lag)	2185.11	1997.11
	5789.68	*5549.03*
GDP deflator	46.26*	45.54*
	27.76	*26.70*
Numbers of observation	207	204
Numbers of countries	28	28
Underidentification test (Anderson canon. corr. LM statistic)	11.300	10.501
P-value	0.023	0.033
Sargan Statistic (overidentification test of all instruments)	6.014	1.271
P-value	0.111	0.736

The dependent variable is the outward FPI less inward FPI. The country and time fixed effects are included in both equations. The italic numbers are the standard deviations.