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The Composition Matters: Capital Inflows and Liquidity Crunch during a Global Economic Crisis

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Abstract

This paper studies whether the volume and composition of capital flows affect the degree of credit crunch during the 2007-2009 crisis. Using data on 3823 firms in 24 emerging countries, we find that, on average, the decline in stock prices was more severe for firms that are intrinsically more dependent on external finance for working capital. Interestingly, while the volume of capital flows per se has no significant effect, the composition matters a lot. In particularly, greater dependence on non-FDI capital inflows before the crisis worsens the credit crunch during the crisis, while exposure to FDI alleviates the liquidity constraint.

Keywords: Financial Globalization, Financial Crisis, Spillover, Liquidity Constraint

JEL Classification: F3, G2, G3

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1. Introduction

Financial globalization, in theory, can bring capital, knowledge, and discipline to a country, thereby improving efficiency and productivity. The empirical literature, however, does not produce clear-cut results. This has generated a large body of work which has been reviewed in several survey articles (see Stulz 2005; Henry 2007; Kose, Prasad, Rogoff, and Wei 2003, 2009, and 2010; and Rodrik and Subramanian 2009). One channel through which exposure to financial globalization may carry a downside is increased vulnerability to a financial crisis. This is thought to be especially relevant if the composition of capital inflows is skewed toward non-FDI types such as bank lending and portfolio flows (Wei 2001 and 2006; Levchenko and Mauro 2007) since international bank lending, and to some smaller extent portfolio flows, are more likely to be reversed than FDI in the event of a crisis.

This paper aims to test whether the severity of an emerging market economy's credit crunch during the 2008-2009 global financial crisis is systematically linked to the volume and the composition of its pre-crisis international capital inflows. The crisis originated in developed countries and spread to emerging markets through several channels, including a reversal of global capital flows. It differs from most crises in emerging market economies that are emphasized in the existing literature, which tend to be home-grown debt crises or balance-of-payments problems. Because the crisis started in the financial sector, it is not self-evident that non-financial firms suffered from a liquidity crunch. For example, Bates, Kahle, and Stulz (2009) noted that non-financial firms in the United States held an abundance of cash prior to the crisis. Chari, Christiano, and Kehoe (2008) rejected the idea of a sharp decline in either bank lending to non-financial firms or commercial paper issuance by non-financial firms during the financial crisis. The European Central Bank in March 2009 (ECB Monthly Bulletin) summarized its judgment on the topic by stating that *"There is no clear evidence to date that supply constraints have cut off access to credit."*

Nonetheless, there are reasons to think that a financial crisis in developed countries could generate a liquidity crunch for non-financial firms in an emerging market economy even if these firms do not borrow directly from foreign banks. The liquidity of a domestic banking sector is partially supported by domestic banks' borrowing from foreign banks. In principle, when foreign lending retrenches, as it is prone to do in a global crisis, domestic banks may be forced to cut down lending to domestic non-financial firms. This creates a channel that links the liquidity crunch experienced by non-financial firms in a country to the country's prior exposure to foreign lending. In comparison, if FDI flows are less cyclical, then a liquidity crunch in a host country should be less linked to its FDI exposure. Foreign portfolio flows are likely to be in between FDI and bank lending in terms of reversibility during a crisis. These possibilities have important economic and policy implications, and should therefore be subject to thorough empirical testing.

We use data on 3823 manufacturing firms in 24 countries, and explore cross-firm as well as cross-country variations in stock price responses to the crisis. The basic idea is this: changes in aggregate economic

indicators and aggregate stock prices potentially reflect a multitude of factors, making it difficult to identify the severity of a credit crunch. However, if a credit crunch exists, it should be reflected in the relative stock price movement of those manufacturing firms that rely disproportionately on external finance for investment and working capital, versus those firms that don't. To preview the main results, we find clear evidence of a worsening credit crunch in emerging market economies in 2008. Relative to those firms whose intrinsic dependence on external finance for working capital (DEF_WK) is at the bottom quartile, those firms whose DEF_WK is at the top quartile experienced a greater decline in their stock prices by at least nine percentage points during the same period. While the average effects are statistically significant, they are not quantitatively overwhelming when compared to the extent of the total fall in stock prices.

This paves the way for the central part of the paper: the role of country-level exposure to financial globalization in the transmission of the supply-of-finance shock. We zoom in on pre-crisis exposure to international capital flows in particular, and interact it with firms' sensitivity to external finance. We find that the total volume of pre-crisis capital inflows is not systematically related to the severity of the credit crunch, but the composition of the capital inflows matters in an important way. In particular, a large pre-crisis exposure to non-FDI capital inflows tends to be associated with a more severe credit crunch during the crisis, but pre-crisis exposure to FDI does not worsen a credit crunch. This provides fresh evidence for the idea in the literature that different types of capital flows bring different benefits and costs to recipient countries.

This paper is linked to two sets of literature. The first is on credit crunches (for example, Bernanke and Lown 1991; Borensztein and Lee 2002; Kroszner, Laeven, and Klingebiel 2007; Dell'Ariccia, Detragiache, and Rajan 2008; Claessens, Kose, and Terrones 2008). A small but growing literature has investigated the origin and consequences of the current crisis, including Mian and Sufi (2008); Reinhart and Rogoff (2008); Dell'Ariccia, Igan, and Laeven (2008); Greenlaw et al. (2008); Almeida et al. (2009); Ehrmann, Fratzscher, and Mehl (2009); and Eichengreen et al. (2009). None of these papers examines the role of the composition of capital flows in the transmission of the crisis across countries.

The second literature to which this paper is related studies the benefits and costs of financial globalization. A subset of the literature investigates possibly different effects of the composition of capital flows for economic growth or vulnerability to balance of payments crises. The views diverge. On the one hand, some regard FDI as more stable and thus less likely to trigger a financial crisis than portfolio financial flows and bank loans (e.g. Berg, Borenzstein, and Pattillo 2004). On the other hand, others doubt the relative destabilizing properties of bank lending and portfolio flows (e.g. Claessens, Dooley, and Warner 1995). In a more recent paper, Levchenko and Mauro (2007) find mixed evidence: while FDI is less volatile than other types of capital flows as measured by coefficient of variation, different types of capital flows do not seem to differ significantly in persistence, pro-cyclicality, and responsiveness to U.S. interest rates. For emerging market economies, the current global crisis is different from a usual balance-of-payments crisis or a home-grown financial crisis, which were the subjects of virtually all previous papers

on financial crises. Thus, while none of the previous papers studies if and how the extent of a liquidity crunch experienced by non-financial firms across countries is linked to a country's pattern of capital flows, the current crisis provides an opportunity to do so.

The paper proceeds as follows. Section 2 presents our key specification, construction of key variables, and sources of data. Section 3 discusses the main empirical results and a slew of robustness checks and extensions. Section 4 offers concluding remarks.

2. Specification and Key Variables

2.1 Basic Specification

Our basic empirical strategy is to check whether an *ex ante* classification of firms by their characteristics in terms of degree of liquidity constraint helps to predict the *ex post* magnitude of their stock price changes from the start of the global crisis (taken as July 31, 2007) to Dec 31, 2008. To be precise, our specification is given by the following equation:

$$\text{StockReturn}_{i,k,j} = \text{country fixed effects} + \beta * \text{FinancialDependence}_{k} + \text{Control}_{i,k,j} + \varepsilon_{i,k,j} \quad (1)$$

where *i* stands for company, *k* for sector, and *j* for country. Note that this is a purely cross-sectional regression, and the key regressors are pre-determined (in 2006). We start by assuming the same β_j for all countries in order to estimate an average effect, but will allow for variations across countries later. We standardize the measures of dependence on external finance, so that β can be read off as representing the percentage of decline in the stock prices for an increase in the external finance dependence by one standard deviation.

Asset pricing models provide guidance for control variables. We add the three factors from Fama and French (1992): firm size (log assets), the ratio of the market value to book value, and the beta (the correlation between the firm's stock return and the market return). We further control for sector-level intrinsic sensitivity to a demand contraction as in Tong and Wei (2008). In some specifications, we also add a fourth control variable: a momentum factor from Lakonishok, Shleifer, and Vishy (1994). We follow Whited and Wu (2006) and incorporate the four factors by entering the relevant firm characteristics directly in our regressions rather than entering them indirectly by first going through a factor model. For control variables, these two ways of incorporating the four factors should be equivalent. Entering firm characteristics directly in our regressions is easier to implement, though the interpretation of the coefficients on these factors is less straightforward.

We make sure that our key regressors are pre-determined with respect to the full-fledged financial crisis. In other words, our thought experiment is this: if we classify manufacturing firms into different baskets, based on their *ex ante* sensitivity to shocks to external finance (in terms of investment and working capital needs), will this classification help us to forecast the *ex post* stock price performance of these firms? If there is forecasting ability associated with these classifiers, would it carry over beyond what can be explained by the Fama-French three factors and the momentum factor?

To see how a pattern of pre-crisis exposure to capital flows affects the extent of a liquidity crunch, we now consider the interaction between a country's pattern of financial integration and its manufacturing firms' dependence on external finance. In other words,

$$\beta_j = \beta_1 + \beta_2 \text{ Pattern\_of\_Capital\_Flow}_j \quad (2)$$

where the Pattern_of_Capital_Flow experienced in country j is measured by either the total volume of pre-crisis capital inflows, or the composition of capital inflows (FDI v. non-FDI). The slope coefficient, β_2, then captures the extent to which the severity of a credit crunch depends on patterns of capital inflows.

2.2 Key Data

Percentage change in stock price

The stock price index is retrieved from Datastream, which adjusts for dividends and capital actions such as stock splits and reverse splits. Table 1 presents the log difference of stock prices for manufacturing firms in 24 emerging countries over the period from the end of July 2007 to the end of December 2008.[1] (Manufacturing sectors are those with U.S. SIC 3-digit codes ranging between 200 and 399). The log difference of the stock price index was 81.8% on average, with a standard deviation as large as 66.7%. It shows significant variation both across sectors within a country and across countries, with Poland and Russia experiencing the largest decline in stock prices and Mexico and Thailand the smallest.

Financial dependence indexes

We develop two measures of intrinsic dependence for external finance:

- Intrinsic dependence on external finance for investment (DEF_INV)

We construct a sector-level approximation of a firm's intrinsic demand on external finance for capital investment following a methodology in Rajan and Zingales (1998):

[1] December 31, 2008 was the latest data point available when the paper was completed.

$$\text{Dependence on external finance for investment} = \frac{\text{capital expenditures - cash flow}}{\text{capital expenditures}}, \quad (4)$$

where Cash flow = cash flow from operations + decreases in inventories + decreases in receivables + increases in payables. All the numbers are based on U.S. firms, which are judged to be least likely to suffer from financing constraints (during a normal time) relative to firms in other countries. While the original Rajan and Zingales (1998) paper covers only 40 (mainly SIC 2-digit) sectors, we expand the coverage to around 250 SIC 3-digit sectors.

To calculate the demand for external financing of U.S. firms, we take the following steps. First, every firm in the COMPUSTA USA is sorted into one of the SIC 3-digit sectors. Second, we calculate the ratio of dependence on external finance for each firm from 1990-2006. Third, we calculate the sector-level median from firm ratios for each SIC 3-digit sector that contains at least 5 firms, and the median value is then chosen, to be the index of demand for external financing in that sector. Conceptually, the Rajan-Zingales (RZ) index aims to identify sector-level features, i.e. which sectors are naturally more dependent on external financing for their business operation. It ignores the question of which firms within a sector are more liquidity constrained. What the RZ index measures could be regarded as a "technical feature" of a sector, almost like a part of the production function. To capture the economic concept of the percentage of capital expenditure that has to be financed by external funding, we winsorize the RZ index to range between 0 and 1.

- Intrinsic dependence on external finance for working capital (DEF_WK)

Besides capital needed for investment, working capital is required for a firm to operate and to satisfy both short-term debt payment and ongoing operational expenses. Firms may use lines of credit, term loans or commercial paper to cover such needs. Firms may also use trade credit (implicit borrowing from either upstream suppliers by delaying payments for inputs or from downstream customers by collecting payments before delivery of output) to finance the need for working capital. If a liquidity crunch makes it difficult for a firm to raise funds for working capital that is distinct from external financing for long-term investment, we would like to capture that. If there is an unexpected liquidity crunch for working capital, those industries that depend intrinsically more on external finance for working capital should experience a larger decline of stock prices.

We construct a sector-level measure of intrinsic need for external finance for working capital using the notion of "cash conversion cycle", which is "commonly used in financial analysis to measure the liquidity position of a firm" (Raddatz 2006). The cycle measures the time elapsed from the moment a firm pays for its inputs to the moment it receives payment for the goods it sells. We assume that dependence on external finance for working capital is due to pure technological reasons, such as the length of time in the production process and the mode of operation. For U.S. firms during a non-crisis period, when the supply

of finance is as abundant as in any country, the relative values of the cash conversion cycle across sectors reflect relative true needs for external finance for working capital. Specifically,[2]

$$\text{Cash conversion cycle} = 365 * \left(\frac{\text{inventories - account payables}}{\text{cost of goods sold}} + \frac{\text{account receivables}}{\text{total sales}} \right)$$

It is used as a measure of dependence on external finance by Kroszner, Laeven, and Klingebiel (2007) and Braun and Raddatz (2008) in addition to Raddatz (2006). We construct the index as follows: First, for each U.S. firm during 1990-2006, we calculate the cash conversion cycle based on the annual data from Compustat USA Industrial Annual. Second, we define the sector-level value of the index (for each SIC 3 digit sector) as the median across all firms in the sector. We assume the same index applies to all other countries. Across all 3-digit sectors, the median and mean values of the index are 87 and 89 days respectively, with a standard deviation of 29 days.

In the literature, another way to measure dependence on external finance for working capital is the ratio of inventories to sales (Raddatz 2006). An inspection of the definition of the cash conversion cycle reveals that the ratio of inventories/sales is a component of the former. The cash conversion cycle is essentially the ratio of inventories to sales net of trade credit that a firm extends to its upstream suppliers and downstream customers. Since the cash conversion cycle is more general, we favor this measure. Moreover, since a drying-up of trade credit is a form of tightening of the supply of external finance that appears to be an important feature of the 2007-2009 global crisis, the cash conversion cycle seems particularly appropriate for a study on the global crisis.

Control Variables and Summary Statistics

In some subsequent analyses, we add other variables meant to control for risks, such as the three factors from the Fama-French (1992) model, which are firm size (as measured by the log of book assets), market asset to book asset ratio, and beta from the datasets of Worldscope and Datastream. The firm-level market beta is based on the correlation between monthly firm stock price and the country-level market index over the past five years. We also include a measure of the momentum factor: that is, the stock return for the firm from January 31, 2007 to June 30, 2007.

In our model, we use the domestic beta. Griffin (2002) finds that domestic factor models perform better in explaining time-series variations in returns and have lower pricing errors than the world factor model. Moreover, the addition of foreign factors to domestic models leads to less accurate in-sample and out-of-

[2] Inventories, accounts receivable, and accounts payable are year-end numbers, while costs of goods and sales are aggregated over the year. We multiply the ratio by 365, i.e., the number of days in a year.

sample pricing. Hence, "practical applications of the three-factor model… are best performed on a country-specific basis."

Another regressor is an index of a firm's sensitivity to a contraction in consumer demand. Tong and Wei (2008) propose such an index at the sector level based on the stock price reactions of the firms in that sector to the September 11, 2001 terrorist attack. To construct the index, we first compute the change in log stock price for each U.S. firm from September 10, 2001 to September 28, 2001. We then look at the mean of the log stock price change for each three-digit SIC sector, and use it to measure the sector-level demand sensitivity. Excluding financial sector firms, we are left with 361 3-digit level sectors in total.

This index reflects the sensitivity of a firm's stock price to an unexpected shock in consumer demand, and it is not contaminated by a firm's sensitivity to liquidity shocks or other factors. We verify that there was a big downward shift in expected aggregate demand, as reflected by a downward adjustment in the consensus forecast of subsequent U.S. GDP growth in the aftermath of the shock at the same time. Because the Federal Reserve took timely and decisive actions, it may be argued that the effect of the 9/11 shock on firms' financial constraints was small or at most short lived. In the 2001 episode, both the level of the real interest rate and the TED spread (risk premium), after initial spikes, quickly returned to a level only moderately higher than the pre-9/11 level. This suggests that the market regarded the Federal Reserve's actions in the first few days following the terrorist attack as sufficient to restore the market's desired level of liquidity. We therefore conclude that the cumulative stock price change from September 10 to 28, 2001, is unlikely to also reflect firms' reactions to a deterioration of credit availability. (In contrast, the subprime crisis news is associated with a much greater increase in the TED spread.) Additional details can be found in Tong and Wei (2008).

Table 2a reports summary statistics of the key variables. Table 2b reports pair-wise correlations among the variables. In the following regression, we standardize DEF_INV and DEF_WK (so the standard deviation is one by construction). As a result, the regression coefficients on these variables directly measure the percentage change in the stock prices from an increase in the dependence on external finance by one standard deviation. We can also compare the relative magnitudes of the two indexes more easily.

3. Empirical Analysis

3.1 The Extent of Financial Constraint

We examine percentage changes in stock prices (or more precisely, difference in the log of stock price) from July 31, 2007 to December 31, 2008 for manufacturing firms in 24 emerging countries. In Column 1 of Table 3, the dependence on external finance for investment (DEF_INV) is the only regressor, and it has

a negative but statistically insignificant coefficient. In Column 2, with the dependence on external finance for working capital (DEF_WK) as the only regressor, its coefficient is also negative, and significant at the 5% level. In Columns 3, we put DEF_INV and DEF_WK together in the regression, and find that DEF_WK maintains its earlier magnitude and sign. This is not surprising, as the correlation between the two indexes is low (only 0.04). That is, they appear to capture different needs for external finance.

Columns 1 to 3 show that the fall in stock prices is statistically larger for sectors with higher dependence on external finance for working capital. What about the economic significance? An increase in dependence on external finance for working capital (DEF_WK) from the 25th to the 75th percentile leads to an additional decline in the stock price by 9.3 percentage points. This is economically important.

The difference in the significance levels between DEF_WK and DEF_INV can be interpreted in two ways. First, it is possible that DEF_WK is a better measure of a firm's intrinsic dependence on external finance than DEF_INV. Indeed, Fisman and Love (2007) suggest that DEF_INV may capture sector-specific shocks, though it is less likely to be the case here since DEF_INV is pre-determined (measured with pre-crisis data and based on U.S. firms' actual use of external finance). Second, to the extent that the two measures capture different aspects of a firm's dependence on external finance, the statistical results suggest that the contraction of credit supply and widespread concern among financial institutions about counterparty risk have inflicted disproportionate pain on those firms that are heavily dependent on external finance for working capital.

In Column 4, we add beta as a control variable. The coefficient on the "beta*market return" variable is positive and significant. This is intuitive as it says that firms with a smaller beta experience a smaller reduction in their stock prices during the market downturn, other things being equal. We also add, as controls, firm size and market-to-book ratio from the Fama-French model, as well as the momentum factor (stock return from January 31 to June 30, 2007). The firm size variable is positive, as larger firms may have better access to credit even in times of crisis. Firms with a high market-to-book ratio experience a greater decline in price. Adding these factors slightly reduces the magnitude of DEF_WK, suggesting that part of the financial constraint on DEF_WK is correlated with firm-level risk factors as described by the Fama-French model.

In Column 5, we control for a sector's intrinsic sensitivity to aggregate demand. This is significantly negative, verifying that a demand contraction is one reason for the deteriorating performance of manufacturing firms. In Column 6, we further control for firms' pre-crisis leverage. We find that leveraged firms suffered greater stock price declines during this crisis, probably due to the difficulty of rolling over debt in an environment of tight financial supply. In the last two columns, we continue to find a significant effect of DEF_WK but not of DEF_INV.

Since a global recession could affect a firm's earnings directly through reduced exports, we further examine if the firm-level sensitivity to trade plays a significant role during the crisis. We employ a two-step procedure to construct a measure of sensitivity to trade. First, a firm's annual stock return is regressed onto a constant and the annual percentage change in the country's exports in the relevant 3-digit sector from 1992 to 2006. Second, the coefficient on the exports variable is used to proxy the trade sensitivity of the firm. By adding this variable to the regressions in Table 3 (Column 7), the sample size shrinks by around 4.5%. In any case, the trade-sensitivity index does not turn out to be statistically significant. When we reclassify the negative values of trade sensitivity as zeros to reduce potential noises in the proxy, we obtain a negative but still insignificant coefficient (with a coefficient of -3.05 and a standard error of 2.33; see the last column of Table 3). Importantly, adding trade sensitivity does not alter the earlier results for DEF_WK.

3.2 The Role of Pre-Crisis Exposure to International Finance

So far we have documented the tightening of financial constraints, on average, across countries. We now turn to the central part of the analysis by examining whether the cross-country variation in the severity of a credit crunch is related to a country's pre-crisis exposure to international capital flows.

International capital flows increased rapidly from 2002, peaking in 2007. Since 2008, however, world capital inflows have declined sharply, by 44% in absolute dollar amount relative to the peak in 2007. As a result, emerging markets have experienced a "systemic sudden stop," a capital account reversal with a systemic and largely exogenous origin, as defined by Calvo, Izquierdo, and Mejia (2008).

Capital flow reversals could bring catastrophic economic results. For example, they could disrupt liquidity supply available to firms and raise the foreign debt burden of firms due to currency depreciation. In the previous literature, there was some weak evidence that the output loss incurred by a capital flow reversal is more severe for emerging markets that are more integrated with the global financial market (see Kose, Prasad, Rogoff, and Wei 2009). Most such evidence is based on country level data. In this paper, we combine firm-level financial data with country-level capital flows to study whether and how a capital flow reversal affects firms' access to external finance.

To measure a country's pre-crisis exposure to foreign capital, we adopt a *de facto* measure: the country's annual inflow of capital over GDP averaged from 2002 to 2006. (We will use an alternative measure based on actual policy restrictions in a robustness check.) Table 4 presents the pre-crisis exposure. We can see that emerging markets on average enjoy a significant inflow of capital from 2002 to 2006, although this is still smaller than in a typical developed country.

We multiply the volume of capital inflow by the two indexes of financial constraints (DEF_INV and DEF_WK), respectively, and add these interaction terms to the econometric model. We separate

emerging markets from developed countries, as the literature has documented an asymmetric effect of financial integration on these two groups of countries (Kose, Prasad, Rogoff, and Wei 2009). We focus on emerging markets in our baseline case.

Table 5 examines the volume effect of pre-crisis capital flows. The dependent variable is stock returns from July 31, 2007 to December 31, 2008. The sample consists of listed manufacturing companies in 24 emerging markets. In Column 1 of Table 5, we include the interactions between the volume of capital inflows and the two measures of financial dependence, respectively. Neither interaction term is significant. On average, the extent of the liquidity crunch does not appear to be linked to a country's pre-crisis volume of capital inflows. In Column 2, we control for firm level factors, and in Column 3, we add sector fixed effects. In these two specifications, the volume of capital flow multiplied by DEF_INV is not significant, while capital flow multiplied by DEF_WK is significant at the 10% level. Hence there are some indications that the volume of pre-crisis capital flows may have affected the degree of a liquidity crunch during the 2007-2008 crisis, but the evidence is not overwhelming.

However, it may be misleading to conclude that a country's exposure to financial globalization does not matter. The literature suggests that the composition of capital flows matters in currency and balance of payments crises (Wei 2001 and 2006, and Kim and Wei 2002). For example, it has been pointed out that the volume of international bank lending (scaled by a recipient country's GDP) is generally more volatile than international direct investment as measured either by standard deviation or coefficient of variation. The literature also suggests that projects financed by FDI are less reversible because they are more difficult to be liquidated than projects financed by other types of international capital (Goldstein and Razin 2006; and Goldstein, Razin, and Tong 2010). The 2007-2009 crisis provides a fresh opportunity to examine the connection between a liquidity crunch and the composition of capital flows. Hence we separate capital inflows into three components: foreign direct investment (FDI), foreign portfolio investment (FPI), and foreign loans (FL). This breakdown follows the definition in the IMF's International Financial Statistics dataset.

Figure 1 traces the different components of international capital inflows from 1999 to 2009 for the economies in our sample, with the data from the IMF's World Economic Outlook database. While all three components rose in the years leading up to the crisis and exhibited a reversal during the crisis, there are still visible differences among them. In particular, both the rise and the fall are the sharpest for international bank loans. In contrast, international direct investment (FDI) is comparatively stable. While the pre-crisis rise of FDI was more gradual than international bank loans, the reversal by FDI started only in 2008 and has been relatively mild. Does this translate into differential capital reversal at the country level? Figure 2 plots the reversal of total capital inflows from 2007 to 2009 at the country level against the initial share of FDI in total capital inflows (in 2007). Indeed, a higher pre-crisis FDI share in capital inflow is associated with a smaller magnitude of capital reversal during the crisis. Of course, this is only

suggestive evidence that the composition of capital inflows may matter for a country's fortune during a crisis.

We now examine formally whether the degree of financial constraint faced by non-financial firms during the 2007-2009 crisis is related to the components of pre-crisis capital flows in that country. Each component is multiplied by our two financial dependence indicators for long-term investment (DEF_INV) and short-term working capital (DEF_WK), respectively. The results are in Table 6. In Column 1, the multiplication of DEF_INV with FPI is significantly negative at the 10% level. That is, firms that need external finance for long-term investment suffer more from a liquidity crunch in countries with a large exposure to FPI. Meanwhile, foreign loans generate a negative coefficient and FDI generates a positive coefficient, although both are statistically insignificant. In Column 2, we add DEF_WK and the interaction terms. We find similar sign patterns. While FDI has a positive coefficient that is significant at the 5% level, both FPI and foreign loans have negative coefficients which are significant at the 1% level. Moreover, the foreign loans variable generates a coefficient more than twice that on FPI, consistent with the story that international loans are reversed (not renewed) more quickly in a crisis, which then triggers domestic banks to cut down their loans to firms even for working capital. In addition, even though the interaction term between FDI and DEF_WK is significantly positive, if we multiply each flow component by its coefficient in Column 2, and sum them up together with the coefficient on DEF_WK itself (i.e., –5.345), we would recover the earlier results in Column 2 of Table 3 that a higher DEF_WK is on average associated with a greater decline in stock prices.

In Column 3 of Table 6, we add sector fixed effects to control for potentially omitted sector-level variables that are correlated with the indexes of financial dependence. This removes the financial dependence indexes and the demand sensitivity index from the regression as they are part of the sector fixed effects. But the interaction terms between financial dependence and capital flow components are preserved. This addition generally shows a sharpened asymmetric impact of different capital flow components on the severity of a financial shock.

In Column 4, we add firm-level controls and find similar results. Besides the three Fama-French factors, other firm-level factors may affect stock price movement. For example, firms with a higher pre-crisis leverage ratio may have more difficulty in rolling over their debt during a crisis. In addition, a higher leverage ratio may by itself trigger a larger decline in stock price for a given demand shock. Hence we include the leverage ratio as a control variable in Column 5. It turns out that the coefficient on the leverage ratio is significantly negative, confirming that a higher leverage ratio by itself is associated with a larger decline in stock prices. When we interact it with capital flow components in Column 6, the interaction term with FDI has a positive coefficient, and those with foreign portfolio and foreign bank loans are negative. Interestingly, it does not affect the results for our financial constraint indicators (DEF_INV and DEF_WK).

Since the dependence on external finance for long-term investment is not significant by itself (column 1 of Table 6), we also implement a regression that drops all terms involving DEF_INV, and report the result in Column 7 of Table 6. The qualitative results on DEF_WK are the same. In particular, firms in countries with a greater pre-crisis reliance on portfolio inflows and foreign bank loans experience greater liquidity constraints during the crisis. The point estimates for the interaction terms involving DEF_WK are somewhat larger than when the DEF_INV terms are in the regression.

The estimates are economically significant. For example, an increase in the reliance on foreign loans before the crisis by one standard deviation (4.41) would generate an extra decline in stock prices by 19.4 percentage points (=4.41*1.79*2.46). [The calculation uses the estimated coefficient of DEP_WK*Foreign Loan in Column 7 of Table 6 (-1.79) and the average value of the standardized DEP_WK (=2.46).] Since the standard deviation of the actual change in log stock prices across countries during the sample period was 66 percentage points, the cross-country variation in the pre-crisis reliance on foreign loans could account for about 30% of the cross-country variations in the declines in stock prices. Similarly, an increase in the pre-crisis reliance on foreign portfolio capital by one standard deviation (5.02) would generate an extra fall in stock prices by 9.0% (=5.02*0.729*2.46), or about another 14% of the cross-country variations in the declines in stock prices.

It is important to note that, for capital flows to affect a liquidity crunch, it is not necessary for manufacturing firms to borrow directly from international banks or to raise funds directly from the international capital market. In a study of the effect of capital controls on liquidity constraints in Chile, Forbes (2007) notes that borrowing by domestic banks from international banks and capital markets is enough to forge a connection between liquidity constraints on domestic manufacturing firms and a country's exposure to international capital flows. In particular, firm-level financial constraints could be affected by the global financial market, "whether the small firms received capital inflows directly, or whether they borrowed from banks (which experienced a lengthening of their maturities and attempted to match the maturities of their assets and liabilities)." In Figure 3, we plot the extent of the decline in banking stock prices in a country during the crisis against the country's pre-crisis volume of borrowing from international banks. The two are clearly related. Banks fare less well during the crisis in a country that relied relatively more on international bank loans before the crisis. Korea also offers another demonstration of an indirect but significant linkage between domestic firms and international financial markets. Before the crisis, Korean banks had developed a reliance on wholesale financing from the international capital market. Once the crisis hit, they suffered significantly when sources of foreign financing dried up. This induced them to cut down loans to domestic firms. According to an HSBC report on September 09, 2008, "Korean banks' high reliance on wholesale funding is transmitting higher funding costs from global credit markets into the leveraged Korean economy."[3]

[3] Mahendran (2008)

The effect of pre-crisis exposure to FDI on the financial constraint is worth noting. In normal times, having an internal capital market is considered a strength of multinational firms. This is shown by Aguiar and Gopinath (2005) and Desai, Foley, and Forbes (2008). Multinational firms use their relatively strong financial position to alleviate financial constraints in the foreign subsidiaries that they invest in. In a time of financial crisis, this is more of an open question since multinational firms could be in financial difficulties themselves. Indeed, the news about the financial difficulties faced by GM and Chrysler in 2009 points to this possibility. On the other hand, since many manufacturing firms in the U.S. had a high level of cash reserves just before the crisis (according to Bates, Kahle, and Stulz 2009), those firms that engage in FDI, which tend to be larger than average, may still be in a better position to weather a financial shock than other firms, especially firms in developing countries. The evidence here suggests that the internal capital market of multinational firms may very well be tapped in places where foreign subsidiaries experience financial difficulties and could not obtain financing from the host-country financial system.

The estimated effect of pre-crisis exposure to foreign portfolio inflows on financial constraint is also sensible. The withdrawal of international portfolio capital makes it more costly for firms to roll over their debt. For firms that wish to use seasoned stock offerings to raise new capital, the cost of capital also rises when less international capital is available to support the market. In either case, when international portfolio flows retreat, the extent of financial constraint experienced by firms in the recipient countries tightens.

3.3 Robustness Tests and Extensions

We have included country fixed effects to control for the impacts of country-level variables on average stock prices. We now examine whether some other country level variables, besides capital flows, may also affect stock prices through the channel of firm financial dependence. One prominent suspect is the degree of domestic financial development (see Prasad, Rajan, and Subramanian 2007). As a robustness check, we interact the country's level of domestic financial development with the sector's finance dependence. We measure domestic financial development by the ratio of private credit over GDP at the end of 2006. (The correlation between financial development and the average capital inflow is 0.54 in our sample of emerging economies.) The interaction between a country's domestic financial development and sector-level financial dependence is not significant for either DEF_INV or DEF_WK (see Column 1 of Table 7). Moreover, adding domestic financial development does not alter the results for capital flows. In Column 2 of Table 7, we experiment with a second proxy of domestic financial development: the sum of private credit and stock market capitalization over DP at the end of 2006. Again, this does not change our key results regarding the role of capital flows.

The composition of capital flows is known to vary systematically with the quality of institutions in a country (Wei 2001 and 2006; Faria and Majuro 2009). As another robustness check, we have added an interaction term between institutional quality and dependence on external finance. We measure

institutional quality in two different ways. First, we take the simple average of six institutional indicators (voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law, and control of corruption) in 2007, drawn from the World Bank's Governance Indicator dataset.[4] The interaction term is not statistically significant. The coefficients on the interaction terms between the capital flow components and the dependence on external finance are not affected (Column 3 of Table 7). Since institutional quality and income level are known to be highly correlated across countries, we also use per capital income in 2007 as a second proxy for a country's institutional quality. The interaction term is not statistically significant either (Column 4 of Table 7). This addition does not alter the inferences on the interactions between the capital flow composition and DEP_WK .

In all regressions, we measure pre-crisis capital inflows over the period 2002-2006. As robustness checks, we test two variations of this measure. First, we extend the pre-crisis window to include 2007. In this case, the results become stronger (Column 5 of Table 7). The multiplication of DEF_INV with FDI is positive and significant at the 1% level, with a larger magnitude than its counterpart in Table 6. FPI is still significantly negative at the 1% level, while foreign loan moves from insignificantly negative in Table 6 to significantly negative at the 5% level. Hence, by using a slightly longer window, the contrast between the effects of FDI and non-FDI flows on financial constraints becomes more pronounced.

3.4 A De Jure Measure of Exposure to Financial Globalization

So far, we measure exposure to financial globalization by a country's *de facto*, or realized, capital flows. The realized volume of capital flows may not reflect government policies. As an extension, we use a *de jure* measure based on a country's actual policies as recorded in the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER). A country's policies on cross-border capital flows are classified by the IMF into about 100 categories, covering FDI, portfolio flows, bank lending, and others. We use the policies in 2006 to construct three separate indicators of *de jure* openness for inward FDI, inward FPI (purchase of local shares and bonds by nonresidents), and foreign loans (commercial and financial credit from nonresidents to residents), respectively. The *de jure* indicators are listed in Appendix Table 1. The *de jure* classification and the *de facto* classification (based on realized inflows) are positively correlated but far from perfectly, with correlation coefficients of 0.38, 0.25 and 0.37, respectively, for direct investment, portfolio investment and foreign loans. This means that the *de jure* index can potentially provide an informative and independent check on the connection between the composition of capital flows and a liquidity crunch. The regression results are in the last column of Table 7. For DEF_INV, we find that pre-crisis FDI openness significantly alleviates financial constraint during this crisis; for DEF_WK, pre-crisis openness to FPI significantly worsens the financial constraint during the crisis. Between the *de facto* and the *de jure* measures, we put more weight on the *de facto* measure as different types of policy restrictions may not have the same intensity but *de facto* measures automatically assign more weight to

[4] Faria and Mauro (2009)

more important policy restrictions (see Kose et al. 2003 for a discussion on *de facto* versus *de jure* measures).

3.5 Contemporaneous Betas and Other Robustness Checks

We have used pre-crisis beta based on monthly stock returns from 2002 to 2006. The advantage of constructing the beta measure based on the recent past is that the regressor is then pre-determined. A potential disadvantage is that it may miss some time-varying aspect of the risk. As a robustness check, we construct a contemporaneous measure using a market model and weekly stock return data during July 31, 2007-December 31, 2008. We then multiply the contemporaneous beta by the local market return during this period as a control variable in our model. We first check if it affects the average liquidity crunch across countries (Column 1 of Table 8). The beta variable has a significant coefficient close to 0.93 with a t-stat of 11.42. This is not surprising given how the beta is calculated. It is important to note that the new measure does not alter our earlier results. In particular, DEF_WK still has a significant coefficient of -4.156. In Column 2 of Table 8, we find that the new measure does not alter the results on the composition of capital flows, either. In particular, the coefficients on the interaction terms between DEF_WK and pre-crisis portfolio inflows, and between DEF_WK and pre-crisis foreign loan, are still negative and statistically significant.

In Columns 3-4 of Table 8, we define the left-hand-side variable as $[P_{k,\,dec08} - P_{k,\,july07}] / (½)[P_{k,\,dec08} + P_{k,\,july07}]$. This leads to no change in the qualitative patterns reported earlier. As another robustness check, we exclude the five countries with fewer than 25 firms in the sample, and report the results in Column 5 of Table 8. The results are qualitatively the same as the benchmark regressions reported in Table 6.

So far we assign equal weights to all firms, but the number of stocks varies greatly across countries. To reduce undue influence from any particular country, we also perform a weighted least squares regression on the sample of countries with at least 25 stocks, with the weights proportional to the inverse of the square root of the number of manufacturing stocks in a country (Column 6 of Table 8). This does not change the qualitative results. For example, the coefficients on the interaction terms between DEF_WK and foreign portfolio inflows, and between DEF_WK and foreign loans, continue to be negative and significant.

We have focused on manufacturing firms thus far. We now expand the sample to all non-financial firms. While this change results in approximately a 50% expansion of the regression sample, the sign patterns of the coefficients are broadly the same, although the significance levels are somewhat weaker (Table 9). This could reflect the possibility that the dependence on external finance is not as well defined for service and agricultural firms.

As another extension, we investigate the possibility that capital flows affect stock prices through aggregate demand. Hence, we include an interaction of demand sensitivity with capital flows. We use two proxies for demand sensitivity: (a) a sector's degree of pro-cyclicality from the FTSE/JSE Global Classification System, and (b) a sector-level demand sensitivity index from Tong and Wei (2008). The FTSE system classifies sectors into resources, basic industries, general industrials, cyclical consumer goods, non-cyclical consumer goods, cyclical services, non-cyclical services, utilities, financials, and information technology. We construct a dummy which equals one if a manufacturing firm belongs to cyclical consumer goods or services, and interact the dummy with capital flows. In the specification with sector and country fixed effects, the pro-cyclicality dummy interacting with FDI inflow renders a significantly positive coefficient, while its interactions with FPI and loans render an insignificantly negative coefficient. More importantly, the results on financial constraint indicators (DEF_INV and DEF_WP) are not affected. Alternatively, when we apply the demand sensitivity index from Tong and Wei (2008), its multiplications with capital flow components do not turn out to be significant. Again, the results on financial constraint indicators are not affected (results not reported to save space).

Finally, as Fisman and Love (2007) suggest, the Rajan-Zingales index of external financial dependence may partly reflect cross-sector differences in global growth opportunities. To reduce potential measurement bias in DEF_INV, we control for shocks to global opportunity directly over the period from 1990 to 2006, which is the sample period we use to construct DEF_INV. Following Fisman and Love (2007), we first calculate the real annual growth rate for each U.S. firm in the COMPUSTAT dataset, then take the US SIC 3-digit-sector median of the firm-level growth rates as the growth potential for that sector (labeled as USGrowth). The correlation between USGrowth and the Rajan-Zingales index is 0.30 for the 120 manufacturing sectors. We winsorize USGrowth at the 1% level and interact it with capital flow components (FDI, FPI and foreign loans). It turns out the growth opportunity variable and its interactions with capital flow components are not significant (with p-values larger than 0.4). Most importantly, they do not affect the earlier results on the interactions involving DEF_INV and DEF_WK. That is, a liquidity crunch experienced by firms is more serious for firms that depend on external finance for capital investment, especially in countries with a high exposure to foreign loans before the crisis (Results not reported to save space).

3.6 A Placebo Test

All the robustness tests above are designed to see if the key results survive when we add variations to the basic specification, the variable definitions, or the sample. We now perform a placebo test by looking at a non-crisis period. In particular, we examine whether capital flows from 2002 to 2005 affect stock prices from January 1st 2006 to June 30, 2007. If the composition of capital flows generates vulnerability for the recipient country only in a time of crisis, then the patterns reported earlier would not be repeated in the placebo test.

In Column 1 of Table 10, we examine the average effect of financial constraints. We do not find any significant effect for either DEF_INV or DEF_WK. (Similarly, we do not find a significant effect for demand sensitivity.) In Column 2, we check for the effect of capital flow volume and do not find it to be significant. In Column 3, we examine the role of capital flow components by interacting flow components with DEF_INV and DEF_WK. The interaction of FDI and DEF_INV is significant at the 10% level, but none of the other five interaction terms is significant. In Column 4, we include sector fixed effects, then FDI*DEF_INV becomes insignificant. The placebo test hence suggests that the key pattern in our baseline case is a feature of the crisis but not a general feature of the normal times.

3.7 The Lehman Brothers Bankruptcy as an Event Study

The collapse of Lehman Brothers without a government bailout on September 15, 2008, came as a surprise to many, but has been regarded as a watershed event (as least *ex post*) that may have aggravated the global financial panic and tightened global liquidity. This means that the Lehman collapse could serve as an event study allowing us to investigate the research questions of this paper from another angle.

We check the relative movement in stock prices in the short period from the last trading day before the Lehman bankruptcy filing (Friday, September 12) to the day after the collapse (September 16) and pay special attention to any role played by the patterns in a country's pre-crisis capital flows. We estimate the same model as before, except for the now much narrower time window. The results are presented in Table 11. In the last column with sector fixed effects and firm level controls, we find that the interaction of pre-crisis FDI with DEF_INV is significantly positive at the 1% level, while the interactions of pre-crisis non-FDI flows with DEF_INV are negative. Moreover, the interactions of FPI and foreign loans with DEF_WK also generate significantly negative coefficients. These patterns confirm our earlier findings that FDI may alleviate the financial constraints, while pre-crisis reliance on non-FDI may tighten the constraints during a crisis.

4. Conclusion

In this paper, we propose a methodological framework to study the effect of capital flows on liquidity constraints and the role of the composition of pre-crisis capital inflows in the liquidity crunch. To investigate the presence of a liquidity constraint, we ask the question: if we classify manufacturing firms into different baskets, based on their *ex ante* sensitivity to shocks to external finance (in terms of investment and working capital needs), would this classification help us to forecast the *ex post* stock price performance of these firms? To investigate the role of capital inflows we embed both country-level capital flows, and their interactions with sector level dependence on external finance, into the regression framework.

If we just include total volumes of capital inflows, we do not find a connection between a country's exposure to capital flows and the extent of the liquidity crunch experienced by its manufacturing firms. However, this masks an important compositional effect. FDI and non-FDI flows have very different effects that may offset each other in the aggregate. When we disaggregate capital flows into three types (FDI, foreign portfolio flows, and foreign loans), a different but consistent pattern emerges. Liquidity shocks are more severe for emerging economies that have a higher pre-crisis exposure to foreign portfolio investments and foreign loans, but less severe for countries that have a higher pre-crisis exposure to foreign direct investments. This empirical pattern suggests that one should not lump together different capital flows when one wishes to understand the connection between capital flows and a liquidity crunch in a crisis.

It is important to point out that the current paper is not meant to be a comprehensive assessment of the welfare effects of the composition of capital flows. To do that, several additional pieces of information need to be examined, including how different forms of capital flows affect liquidity constraints and growth rates during a tranquil time. This would be a fruitful topic for future research.

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Table 1. Average Change in Log Stock Prices from 7/31/07 to 12/31/08 for Manufacturing Firms in 24 Emerging Economies

COUNTRY	Obs #	Median	Mean	Std Dev	Min	Max
ARGENTINA	28	-16.8	-31.6	56.0	-138.6	47.2
BRAZIL	90	-51.9	-56.3	70.7	-307.6	80.2
CHILE	47	-26.2	-28.2	49.0	-164.5	87.6
CHINA	893	-89.2	-89.1	51.3	-361.5	209.5
COLOMBIA	8	-16.5	-43.0	102.3	-268.9	67.3
CZECH REPUBLIC	5	-9.5	-22.1	30.0	-66.9	2.6
EGYPT	27	-36.4	-27.9	45.5	-99.9	107.3
HONG KONG	322	-112.2	-122.7	76.1	-454.7	119.3
HUNGARY	12	-84.9	-72.8	41.2	-124.6	0.1
INDIA	516	-71.6	-73.5	57.5	-244.0	221.9
INDONESIA	112	-39.9	-45.1	77.3	-321.6	225.8
ISRAEL	61	-117.2	-120.6	100.8	-462.8	18.6
KOREA (SOUTH)	624	-79.3	-89.5	77.1	-709.5	120.2
MALAYSIA	418	-53.2	-64.0	64.3	-366.1	60.5
MEXICO	38	-22.9	-34.4	62.9	-174.2	81.8
PAKISTAN	66	-57.0	-60.5	70.2	-209.4	144.1
PERU	19	-39.5	-39.8	61.4	-141.9	89.6
PHILIPPINES	32	-61.4	-69.4	69.4	-213.9	31.2
POLAND	84	-148.0	-147.2	77.8	-534.2	13.3
RUSSIAN FEDERATION	24	-143.7	-129.4	65.2	-216.5	18.8
SINGAPORE	242	-110.3	-111.3	75.1	-352.8	152.4
SOUTH AFRICA	57	-39.5	-47.6	62.1	-259.0	83.6
THAILAND	214	-34.7	-42.9	54.2	-214.7	71.8
TURKEY	120	-87.0	-82.2	59.2	-243.5	174.2

Table 2. Summary Statistics

	Obs#	Median	Mean	Std Dev	Min	max
Change in log stock price	3823	-77.8	-81.8	66.7	-347.2	55.4
DEF_INV	3796	0.2	0.2	0.3	0.0	1.0
DEF_WK	3823	86.8	88.5	28.5	22.3	169.2
Demand sensitivity	3819	1.4	1.5	0.7	-1.1	4.3
Company size	3823	14.5	15.0	2.7	9.0	25.1
Market/book	3823	1.5	2.4	2.8	0.3	23.6
Beta	3778	0.64	0.71	0.65	-1.42	3.45
Momentum	3823	20.77	26.45	37.54	-178.39	331.42

Note: DEF_INV denotes dependence on external finance for investment; and DEF_WK denotes dependence on external finance for working capital. Summary statistics are based on listed manufacturing firms in 24 emerging economies. Change in stock prices is from July 31, 07 to Dec 31, 08. All other variables are measured in end of 2006.

Table 2b. Correlation of Variables

	Stock return	DEF_INV	DEF_WK	Demand sensitivity	Company size	Market/book	Beta
DEF_INV	-0.05						
DEF_WK	-0.11	0.09					
Demand sensitivity	-0.15	0.05	0.10				
Company size	0.07	0.01	-0.08	-0.04			
Market/book	-0.06	0.05	0.03	-0.03	-0.04		
Beta	-0.16	0.02	0.03	0.08	0.01	0.02	
Momentum	-0.15	0.06	0.02	0.04	0.01	-0.05	-0.10

Table 3. The Average Effect of Liquidity Crunch across Countries

	1	2	3	4	5	6	7
DEF_INV	-0.841		-0.533	0.109	0.283	-0.029	0.167
	[2.915]		[2.407]	[2.330]	[2.083]	[1.980]	[2.080]
DEF_WK		-5.446**	-5.369**	-4.844**	-4.303**	-4.740***	-4.532**
		[2.188]	[2.251]	[2.157]	[1.904]	[1.782]	[1.801]
Beta*Market Return				0.326***	0.310***	0.303***	0.310***
				[0.044]	[0.044]	[0.043]	[0.044]
Firm size				1.622	1.295	2.643**	2.842**
				[1.078]	[1.078]	[1.093]	[1.090]
Market/Book				-1.166*	-1.250*	-0.973	-0.885
				[0.672]	[0.669]	[0.666]	[0.676]
Momentum				-0.145***	-0.144***	-0.132***	-0.128***
				[0.040]	[0.040]	[0.040]	[0.041]
Demand Sensitivity					-9.350***	-8.876***	-8.735***
					[2.062]	[2.059]	[2.204]
Leverage						-35.44***	-36.89***
						[4.453]	[4.605]
Trade sensitivity							-3.052
							[2.331]
Observations	3796	3823	3796	3751	3747	3743	3576
R-squared	0.14	0.144	0.145	0.175	0.184	0.198	0.191
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The dependent variable is the change in log stock prices from July 31, 07 to December 31, 08. Standard errors, clustered at the sector level, are in brackets. ***, **, and * denote statistically significant at the 1%, 5%, and 10%, respectively.

Table 4. Pre-Crisis Exposure to Capital Inflows (% of GDP; Averaged from 2002 to 2006)

Country	Total Inflow	FDI	FPI	Foreign Loans
Argentina	1.00	2.29	-3.21	1.92
Brazil	2.11	2.26	0.11	-0.26
Chile	8.41	5.61	1.43	1.38
China	5.13	3.11	0.78	1.24
Colombia	4.08	4.22	0.16	-0.31
Czech	5.77	6.24	-2.76	2.30
Egypt	4.17	3.95	0.57	-0.35
HK	24.31	15.53	-6.42	15.20
Hungary	11.31	5.02	2.05	4.24
India	3.68	1.16	1.08	1.44
Indonesia	1.48	0.96	1.34	-0.82
Israel	8.23	3.93	3.53	0.78
Korea	4.19	0.72	1.56	1.91
Malaysia	20.07	3.05	22.73	-5.71
Mexico	2.96	2.96	-0.13	0.13
Pakistan	0.53	1.36	0.13	-0.96
Peru	3.62	3.06	1.92	-1.36
Philippines	-1.70	1.55	0.29	-3.54
Poland	6.95	3.68	2.58	0.70
Russia	6.22	2.03	0.79	3.41
Singapore	30.45	14.11	3.89	12.46
South Africa	5.48	0.95	3.02	1.51
Thailand	2.99	3.77	1.59	-2.37
Turkey	6.55	1.52	1.90	3.13
Standard Deviation	7.63	3.69	5.02	4.41

Table 5. Role of Pre-Crisis Exposure to Capital Inflows in Emerging Economies (Volume Effect)

	1	2	3
DEF_INV	-1.284	-0.724	
	[2.969]	[2.646]	
DEF_INV*Inflow	0.0956	0.129	0.167
	[0.143]	[0.132]	[0.123]
DEF_WK	-3.761	-1.761	
	[2.696]	[2.465]	
DEF_WK*Inflow	-0.173	-0.272*	-0.295*
	[0.183]	[0.163]	[0.167]
Beta*market Index		0.312***	0.285***
		[0.044]	[0.043]
Firm size		1.281	1.317
		[1.072]	[1.136]
Market/Book		-1.285*	-1.404**
		[0.669]	[0.680]
Momentum		-0.145***	-0.144***
		[0.040]	[0.042]
Demand Sensitivity		-9.425***	
		[2.068]	
Country fixed effects	Yes	Yes	Yes
Industry fixed effects	No	No	Yes
Observations	3796	3747	3747
R-squared	0.145	0.185	0.239

Notes: The dependent variable is the change in log stock prices from July 31, 07 to December 31, 08. DEF_INV denotes dependence on external finance for long-term investment; DEF_WK denotes dependence on external finance for working capital. Standard errors, clustered at the sector level, are in brackets. ***, **, and * denote statistically significant at the 1%, 5%, and 10%, respectively.

Table 6. Role of Pre-crisis Exposure to Capital Inflows in Emerging Economies (Composition Effect)

	1	2	3	4	5	6	7
DEF_INV	-1.333						
	[3.631]						
DEF_INV*FDI	0.832		0.981**	0.942*	1.012**	1.050**	
	[0.544]		[0.473]	[0.483]	[0.467]	[0.481]	
DEF_INV*FPI	-0.473*		-0.437*	-0.403*	-0.436*	-0.460*	
	[0.264]		[0.230]	[0.232]	[0.228]	[0.237]	
DEF_INV* Foreign loan	-0.736		-0.725	-0.604	-0.659	-0.692	
	[0.480]		[0.486]	[0.523]	[0.514]	[0.535]	
DEF_WK		-5.345*					
		[2.856]					
DEF_WK*FDI		1.540**	1.421*	1.074	0.935	0.960	1.166
		[0.756]	[0.791]	[0.761]	[0.722]	[0.735]	[0.742]
DEF_WK*FPI		-0.764***	-0.762**	-0.690**	-0.616**	-0.646**	-0.729**
		[0.285]	[0.301]	[0.285]	[0.269]	[0.280]	[0.285]
DEF_WK* Foreign loan		-1.939***	-2.044***	-1.774***	-1.629**	-1.651**	-1.790***
		[0.601]	[0.681]	[0.669]	[0.637]	[0.647]	[0.637]
Beta*market index				0.280***	0.276***	0.274***	0.275***
				[0.043]	[0.042]	[0.042]	[0.042]
Firm size				1.260	2.616**	2.619**	2.560**
				[1.153]	[1.190]	[1.191]	[1.175]
Market/Book				-1.357**	-0.965	-0.974	-0.996
				[0.682]	[0.701]	[0.705]	[0.691]
Momentum				-0.148***	-0.140***	-0.143***	-0.135***
				[0.042]	[0.042]	[0.042]	[0.042]
Leverage					-34.40***	-32.60***	-32.05***
					[4.753]	[6.443]	[6.319]
Leverage*FDI						3.840	3.632
						[2.729]	[2.673]
Leverage*FPI						-2.833**	-2.752**
						[1.226]	[1.213]
Leverage*Foreign loan						-4.154	-4.119
						[2.739]	[2.687]
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector fixed effects	No	No	Yes	Yes	Yes	Yes	Yes
Observations	3796	3823	3796	3747	3747	3747	3774
R-squared	0.142	0.145	0.216	0.242	0.254	0.256	0.254

Notes: The dependent variable is the change in log stock prices from July 31, 07 to December 31, 08. DEF_INV and DEF_WK denote dependence on external finance for long-term investment and for working capital, respectively. Standard errors, clustered at the sector level, are in brackets. ***, **, and * denote statistically significant at the 1%, 5%, and 10% levels, respectively.

Table 7. Role of Pre-Crisis Exposure to Capital Inflows (Robustness Checks)

	Financial Development 1	Financial Development 2	Institution1	Institution2	Capital Flow from 02 to 07	De Jure Openness
DEF_INV*FDI	0.984*	1.123**	0.721	0.932**	1.217**	6.103***
	[0.501]	[0.519]	[0.549]	[0.463]	[0.509]	[2.285]
DEF_INV*FPI	-0.408*	-0.386	-0.127	-0.309	-0.449**	-2.543
	[0.239]	[0.247]	[0.336]	[0.230]	[0.178]	[2.185]
DEF_INV* Foreign loan	-0.615	-0.530	0.0966	-0.371	-0.599*	-2.492
	[0.517]	[0.567]	[0.834]	[0.517]	[0.357]	[3.385]
DEF_WK*FDI	1.292	1.419*	1.065	0.983	1.128	-0.0122
	[0.786]	[0.805]	[0.734]	[0.729]	[0.768]	[3.101]
DEF_WK*FPI	-0.611**	-0.605**	-0.726**	-0.720***	-0.534**	-5.194*
	[0.297]	[0.297]	[0.279]	[0.262]	[0.249]	[3.146]
DEF_WK* Foreign loan	-1.743**	-1.603**	-1.906**	-1.872***	-1.159**	2.937
	[0.669]	[0.681]	[0.755]	[0.652]	[0.489]	[3.367]
Beta*market index	0.279***	0.280***	0.276***	0.276***	0.281***	0.285***
	[0.0426]	[0.042]	[0.042]	[0.0423]	[0.0427]	[0.0433]
Firm Size	1.264	1.225	2.581**	2.612**	1.249	1.217
	[1.168]	[1.163]	[1.185]	[1.178]	[1.147]	[1.127]
Market/Book	-1.361**	-1.357**	-0.958	-0.956	-1.358**	-1.333*
	[0.678]	[0.681]	[0.698]	[0.709]	[0.680]	[0.685]
Momentum	-0.148***	-0.149***	-0.140***	-0.140***	-0.148***	-0.146***
	[0.042]	[0.042]	[0.042]	[0.0417]	[0.0418]	[0.0422]
FinDev *DEF_INV	-0.0087	-0.010				
	[0.035]	[0.014]				
FinDev *DEF_WK	-0.066	-0.020				
	[0.043]	[0.015]				
Institution*DEF_INV			-3.371	-1.057		
			[3.306]	[1.241]		
Institution*DEP_WK			1.036	1.087		
			[3.172]	[1.454]		
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Sector fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3747	3747	3747	3747	3747	3747
R-squared	0.243	0.243	0.255	0.255	0.242	0.24

Notes: The dependent variable is the change in log stock prices from July 31, 07 to December 31, 08. DEF_INV denotes dependence on external finance for long-term investment; DEF_WK denotes dependence on external finance for working capital. Financial Development 1 = domestic private credit over GDP, while Financial Development 2 = (domestic private credit+ market capitalization)/GDP. Institution 1 is the simple average of six institutional indicators (Voice and Accountability, Political Stability and Absence of Violence, Government Effectiveness, Regulatory Quality, Rule of Law, and Control of Corruption) in 2007, drawn from the World Bank's Governance Indicator dataset. Institution 2 is the log of GDP per capita in US dollar term in 2007. Standard errors, clustered at the sector level, are in brackets. ***, **, and * denote statistically significant at the 1%, 5%, and 10%, respectively.

Table 8. Role of Pre-Crisis Exposure to Capital Inflows (More Robustness Checks)

	1 Contemporary Beta	2 Contemporary Beta	3 Alternative Price Change	4 Alternative Price Change	5 Excluding countries with <25 firms	6 Weighted Regression
DEF_INV	0.0188		0.114			
	[1.655]		[1.623]			
DEF_INV*FDI		0.909*		0.855**	0.909**	0.512
		[0.474]		[0.407]	[0.401]	[0.636]
DEF_INV*FPI		-0.236		-0.399**	-0.430**	-0.413
		[0.260]		[0.194]	[0.197]	[0.300]
DEF_INV* Foreign loan		-0.587		-0.668	-0.742	-0.358
		[0.558]		[0.455]	[0.450]	[0.647]
DEF_WK	-4.156**		-3.810**			
	[1.732]		[1.560]			
DEF_WK*FDI		1.189		0.791	0.793	1.355*
		[0.724]		[0.608]	[0.627]	[0.778]
DEF_WK*FPI		-0.762***		-0.512**	-0.513**	-0.552*
		[0.279]		[0.235]	[0.239]	[0.318]
DEF_WK* Foreign loan		-1.926***		-1.299**	-1.291**	-1.844**
		[0.671]		[0.559]	[0.578]	[0.759]
Beta*Market Return	0.938***	0.913***	0.234***	0.209**	0.214**	0.251**
	[0.084]	[0.083]	[0.034]	[0.032]	[0.033]	[0.043]
Firm size	3.834***	3.369***	0.0136	-0.033	0.063	-2.589*
	[1.076]	[1.091]	[0.834]	[0.881]	[0.861]	[1.433]
Market/Book	-1.242**	-1.321**	-0.525	-0.638	-0.669	-0.778
	[0.607]	[0.629]	[0.482]	[0.484]	[0.485]	[0.610]
Momentum	-0.070*	-0.088**	-0.114***	-0.115**	-0.115**	-0.146**
	[0.038]	[0.041]	[0.027]	[0.028]	[0.029]	[0.040]
Demand Sensitivity	-9.151***		-6.995***			
	[2.061]		[1.600]			
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Sector fixed effects	No	Yes	No	Yes	Yes	Yes
Observations	3793	3797	3748	3748	3683	3683
R-squared	0.228	0.281	0.188	0.25	0.247	0.353

Notes: The dependent variables in all columns are the change in log stock prices from July 31, 07 to December 31, 08. Standard errors, clustered at the sector level, are in brackets; ***, **, and * denote statistically significant at the 1%, 5%, and 10%, respectively.

Table 9. Role of Pre-Crisis Exposure to Capital Inflows in Emerging Economies (Non-Financial Firms)

	1	2	3	4	5	6	7
DEF_INV	-3.299		-2.065				
	[3.096]		[2.638]				
DEF_INV*FDI	0.415		0.404	0.794**	0.774**	0.871**	0.885**
	[0.432]		[0.418]	[0.373]	[0.361]	[0.352]	[0.351]
DEF_INV*FPI	-0.370**		-0.335**	-0.450***	-0.406**	-0.426***	-0.475***
	[0.144]		[0.166]	[0.159]	[0.160]	[0.162]	[0.179]
DEF_INV* Foreign loan	-0.368		-0.328	-0.736*	-0.640	-0.716*	-0.731*
	[0.390]		[0.419]	[0.382]	[0.391]	[0.384]	[0.386]
DEF_WK		-4.100**	-3.458**				
		[1.997]	[1.591]				
DEF_WK*FDI		0.853*	0.525	0.859**	0.628	0.533	0.535
		[0.450]	[0.397]	[0.430]	[0.415]	[0.402]	[0.407]
DEF_WK*FPI		-0.215	-0.176	-0.215	-0.171	-0.134	-0.119
		[0.181]	[0.152]	[0.160]	[0.158]	[0.154]	[0.167]
DEF_WK* Foreign loan		-0.780*	-0.576	-0.826**	-0.671*	-0.567	-0.561
		[0.435]	[0.391]	[0.403]	[0.398]	[0.385]	[0.392]
Beta*market index			0.297***		0.274***	0.272***	0.269***
			[0.033]		[0.031]	[0.031]	[0.031]
size			2.237***		1.922**	3.354***	3.375***
			[0.842]		[0.887]	[0.906]	[0.900]
Market/Book			-1.293***		-1.381***	-0.966**	-1.005**
			[0.429]		[0.437]	[0.446]	[0.446]
Momentum			-0.213***		-0.201***	-0.187***	-0.187***
			[0.0284]		[0.029]	[0.030]	[0.0297]
Leverage						-34.64***	-31.22***
						[4.104]	[5.568]
Leverage*FDI							2.002
							[2.200]
Leverage*FPI							-2.307**
							[0.924]
Leverage*Foreign loan							-2.117
							[2.138]
Demand Sensitivity			-5.280***				
			[1.516]				
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector fixed effects	No	No	No	Yes	Yes	Yes	Yes
Observations	5997	6030	5917	5997	5917	5917	5917
R-squared	0.13	0.127	0.176	0.201	0.235	0.248	0.25

Notes: The dependent variable is the change in log stock prices from July 31, 07 to December 31, 08. DEF_INV denotes dependence on external finance for long-term investment; DEF_WK denotes dependence on external finance for working capital. Standard errors, clustered at the sector level, are in brackets. ***, **, and * denote statistically significant at the 1%, 5%, and 10%, respectively.

Table 10. Placebo Test (Stock Returns from Jan 1, 06 to June 30, 07)

	1	2	3	4
DEF_INV	-0.0408	-1.525	-2.008	
	[1.346]	[1.414]	[1.491]	
DEF_INV*Inflow Volume		0.216		
		[0.150]		
DEF_INV*FDI			0.883*	0.688
			[0.479]	[0.458]
DEF_INV*FPI			-0.0552	-0.117
			[0.351]	[0.339]
DEF_INV* Foreign loan			-0.662	-0.287
			[0.698]	[0.720]
DEF_WK	-1.790	-1.199	-1.884	
	[1.727]	[2.215]	[2.472]	
DEF_WK*Inflow Volume		-0.084		
		[0.173]		
DEF_WK*FDI			0.351	0.494
			[0.624]	[0.591]
DEF_WK*FPI			-0.324	-0.028
			[0.257]	[0.229]
DEF_WK* Foreign loan			-0.442	-0.345
			[0.643]	[0.596]
Beta*market index	0.143**	0.141**	0.143**	0.133**
	[0.0603]	[0.0599]	[0.0600]	[0.057]
Size	3.274***	3.250***	3.202***	2.812***
	[1.063]	[1.060]	[1.047]	[1.003]
Market/Book	1.735***	1.723***	1.756***	1.791***
	[0.552]	[0.556]	[0.554]	[0.535]
Leverage				-18.33***
				[6.256]
Leverage*FDI				3.785
				[20.40]
Leverage*FPI				2.079
				[11.62]
Leverage*Foreign loan				19.61
				[24.26]
Demand Sensitivity	0.0694	0.0835	0.065	
	[3.661]	[3.676]	[3.670]	
Country fixed effects	Yes	Yes	Yes	Yes
Sector fixed effects	No	No	No	Yes
Observations	3693	3693	3693	3693
R-squared	0.302	0.302	0.303	0.361

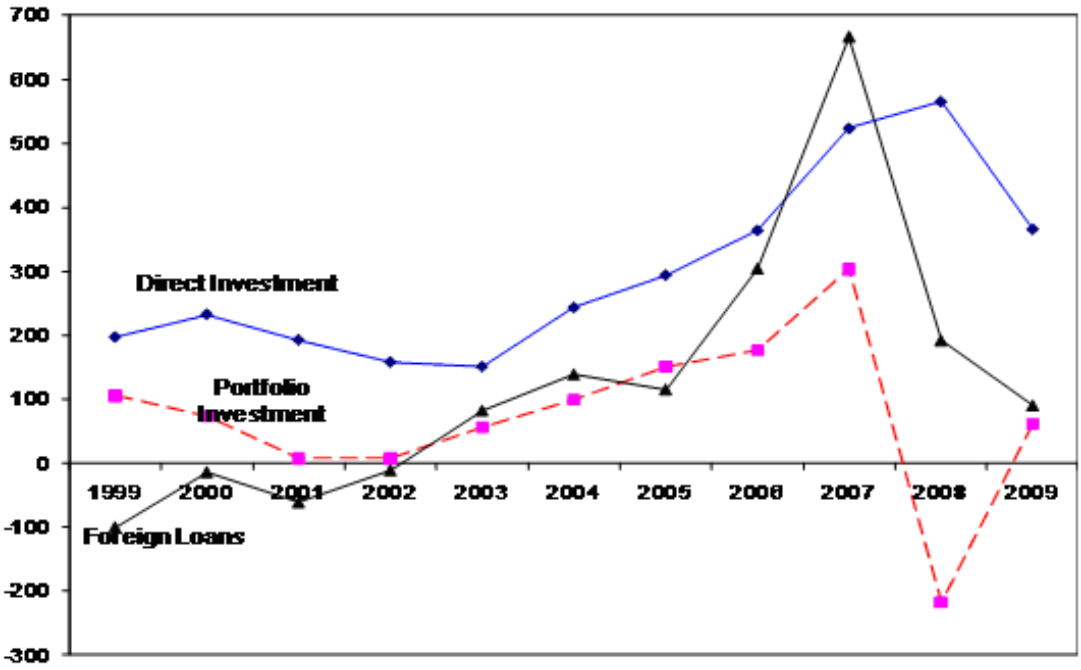
Notes: The dependent variables in all columns are the change in log stock prices from January 1, 2006 to July 31, 2007. Standard errors, clustered at the sector level, are in brackets; ***, **, and * denote statistically significant at the 1%, 5%, and 10%, respectively.

Table 11. Stock Returns around Lehman Brother Bankruptcy

	1	2	3	4	5	6
DEF_INV	-0.026		-0.032	-0.049		
	[0.181]		[0.174]	[0.116]		
DEF_INV*FDI	0.097**		0.082**	0.085**	0.0920***	0.096***
	[0.037]		[0.033]	[0.033]	[0.034]	[0.035]
DEF_INV*FPI	-0.042*		-0.034	-0.020	-0.020	-0.022
	[0.023]		[0.024]	[0.027]	[0.029]	[0.032]
DEF_INV* Foreign loan	-0.074*		-0.053	-0.052	-0.058	-0.066
	[0.039]		[0.037]	[0.043]	[0.045]	[0.049]
DEF_WK		-0.062	-0.044	0.104		
		[0.175]	[0.178]	[0.158]		
DEF_WK*FDI		0.099*	0.081	0.057	0.050	0.065
		[0.052]	[0.052]	[0.049]	[0.053]	[0.054]
DEF_WK*FPI		-0.045	-0.039	-0.040*	-0.044*	-0.057**
		[0.027]	[0.025]	[0.024]	[0.026]	[0.028]
DEF_WK* Foreign loan		-0.130**	-0.118**	-0.101*	-0.097	-0.123*
		[0.059]	[0.057]	[0.056]	[0.061]	[0.065]
Beta*market index				0.498***	0.485***	0.472***
				[0.028]	[0.030]	[0.032]
Firm size				0.370***	0.367***	0.405***
				[0.069]	[0.074]	[0.076]
Market/Book				-0.005	0.005	0.007
				[0.026]	[0.032]	[0.033]
Leverage					-1.424**	-1.596**
					[0.632]	[0.620]
Leverage*FDI					0.201	0.187
					[0.185]	[0.197]
Leverage*FPI					-0.055	-0.051
					[0.090]	[0.092]
Leverage*Foreign loan					-0.258	-0.250
					[0.192]	[0.204]
Demand Sensitivity				-0.0945		
				[0.107]		
Sector fixed effects	No	No	No	No	Yes	Yes
Observations	3775	3802	3775	3771	3771	3644
R-squared	0.151	0.15	0.152	0.227	0.252	0.252

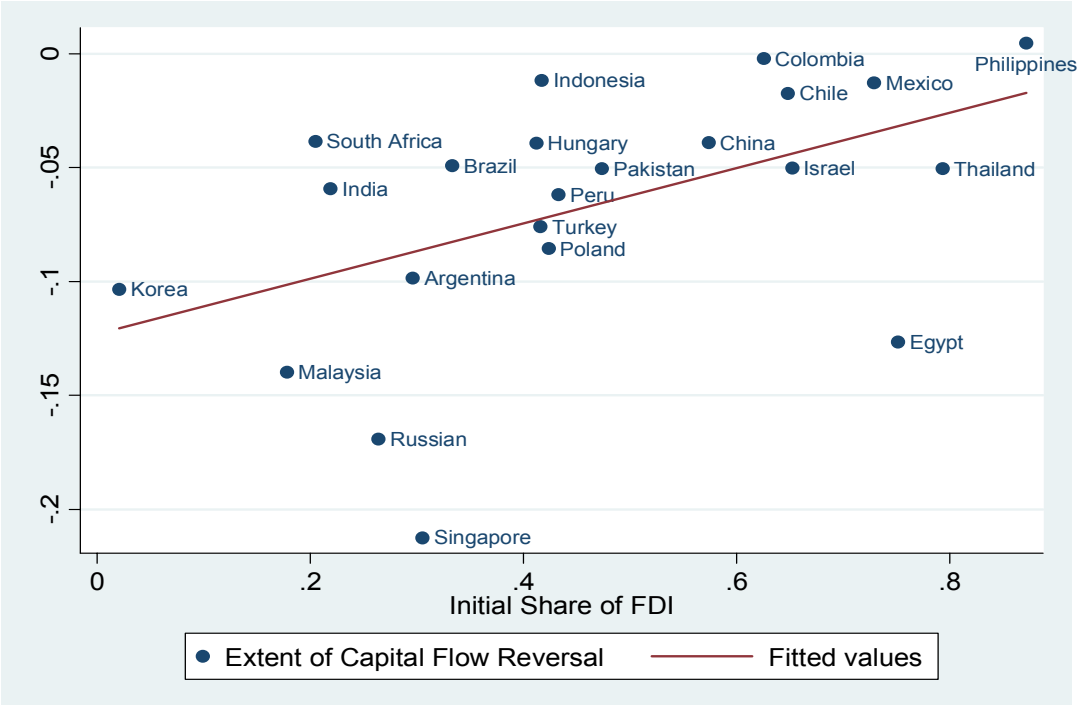
Notes: The dependent variable is the changes in log stock prices from September 12 to 16, 2008. ***, **, and * denote p-values less than 1%, 5%, and 10%, respectively. Standard errors are clustered at the sector level. Column 6 replicates Column 5 except that it excludes stocks with few than a total of five days of trading in July and August, 2008.

Figure 1. Capital Flows to Emerging Market Economies (In Billion US$)



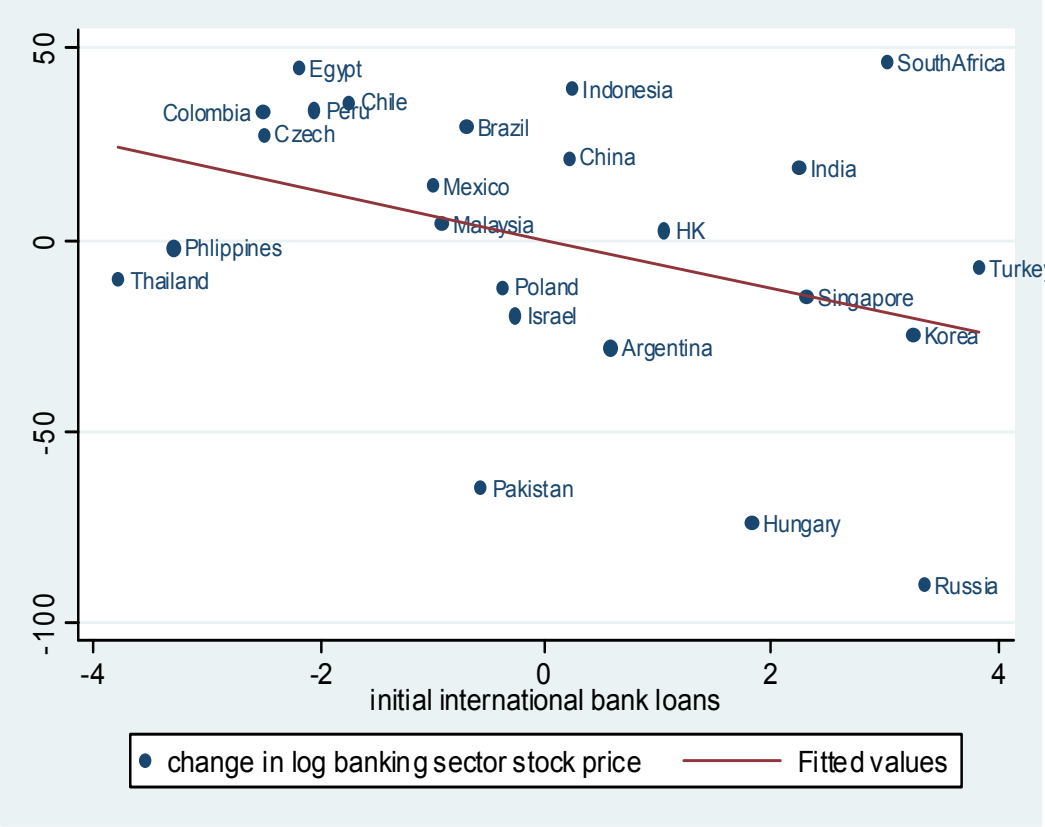
The sample includes 24 emerging economies listed in Table 4. Source: IMF's World Economic Outlook database.

Figure 2. The Extent of Capital Flow Reversal versus the Initial Share of FDI



On the vertical axis is the change in capital inflow/GDP from 2007 to 2009, and on the horizontal axis is the share of FDI inflow in the country's total inflows in 2007. The slope coefficient is 0.12 with a t-statistic of 2.53.

Figure 3. Change in Log Banking Stock Prices vs Pre-Crisis International Bank Loans (Conditional Scatter Plot)



Note: On the vertical axis is the change in log bank-sector stock price from July 1st, 2007 to December 31, 2008. On the horizontal axis is the pre-crisis inflow of loans/GDP averaged over 2002-2006. This partial scatter plot is conditioned on pre-crisis foreign direct investments and portfolio investments over GDP. The slope coefficient is -6.38 with a standard error of 3.24. Source: IMF's WEO database and Datastream.

Appendix Table 1. De Jure Financial Openness in Year 2006

Country	Stocks	Bonds	Commercial Credit	Financial credit	FDI
Argentina	0	0	1	0	0
Brazil	0	1	1	1	0
Chile	1	1	1	1	1
China	0	0	0	0	0
Colombia	0	0	0	0	0
Czech	0	1	1	1	0
Egypt	1	1	1	1	0
HK	1	1	1	1	1
Hungary	1	1	1	1	1
India	0	0	0	0	0
Indonesia	0	0	0	1	0
Israel	1	1	1	1	1
Korea	1	1	1	1	0
Malaysia	1	1	0	0	0
Mexico	0	1	1	0	0
Pakistan	1	1	1	1	0
Peru	1	1	1	1	1
Philippines	1	0	0	0	1
Poland	1	0	1	0	0
Russia	0	0	1	0	0
Singapore	1	1	1	1	1
South Africa	1	1	1	0	1
Thailand	0	0	0	1	1
Turkey	1	1	0	0	1

Source: The IMF's Annual Report on Exchange Arrangements and Exchange Restrictions in 2006.