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

*Hui Tong and Shang-Jin Wei*

**IMF Working Paper**

Research Department

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**Prepared by Hui Tong and Shang-Jin Wei<sup>1</sup>**

Authorized for distribution by Stijn Claessens

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**Abstract**

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We study whether capital flows affect the degree of credit crunch faced by a country's manufacturing firms during the 2007-09 crisis. Examining 3823 firms in 24 emerging countries, we find that the decline in stock prices was more severe for firms that are intrinsically more dependent on external finance for working capital. The volume of capital flows has no significant effect on the severity of the credit crunch. However, the composition of capital flows matters: pre-crisis exposure to non-FDI capital inflows worsens the credit crunch, while exposure to FDI alleviates the liquidity constraint. Similar results also hold surrounding the Lehman Brothers bankruptcy

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Author's E-Mail Address: [HTong@imf.org](mailto:HTong@imf.org) ; [shangjin.wei@columbia.edu](mailto:shangjin.wei@columbia.edu)

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*“The claim that disruptions to the banking system necessarily destroy the ability of non-financial businesses to borrow from households is highly questionable.”*

Chari, Christiano, and Kehoe (October 2008)

*“There is no clear evidence to date that supply constraints have cut off access to credit.”*

European Central Bank Monthly Bulletin (March 2009)

## I. INTRODUCTION

Financial globalization, in theory, can bring capital, knowledge, and discipline to a country, and therefore improve 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 and summarized in several survey articles (see Stulz, 2005; Henry, 2007; Kose, Prasad, Rogoff, and Wei, 2003 and 2009; 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.

While the crises discussed in previous empirical literature tend to be those associated with foreign currency debt or balance of payments problems, the global crisis of 2008-2009 offers a chance to check if the severity of an emerging market economy's credit crunch is systematically linked to the volume and the composition of its pre-crisis international capital inflows, since the crisis may have triggered a reversal of global capital flows. Non-financial firms may suffer from a liquidity crunch that is linked to a capital flow reversal even if they 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 for the liquidity crunch experienced by non-financial firms in a country to be linked 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 a thorough empirical testing. The 2007-2009 crisis started off in August 2007 in the United States as a subprime mortgage crisis but quickly morphed into a global financial crisis in which financial institutions teetered on the edge of bankruptcy in many countries. A global economic crisis ensued in which non-financial firms around the world appeared to spiral downward as well. Part of the reason is a contraction of demand for the output of these firms. Another key potential contributor to the plight of the non-financial firms was the financial crisis itself, in the form of a negative shock to the supply of external finance available to non-financial firms. That is, non-financial firms did not do well, simply

because they found themselves being cut off from the supply of working capital, even if they still had unfulfilled orders for their product.

However, it is far from self-evident that non-financial firms suffered from a liquidity crunch. As Bates, Kahle, and Stulz (2007) carefully document, non-financial firms held an abundance of cash prior to the crisis. According to them, “the net debt ratio (debt minus cash, divided by assets) exhibits a sharp secular decrease and most of this decrease in net debt is explained by an increase in cash holdings. The fall in net debt is so dramatic that the average net debt for US firms was negative in 2004. In other words, on average, firms could have paid off their entire debt[s] with their cash holdings.” Given the apparent secular upward trend in cash holdings, the net debt ratio was likely even further into negative territory by mid-2007, right before the start of the full-blown economic crisis. This at least suggests the possibility of no serious liquidity tightening outside the financial sector. Probably out of this belief, Federal Reserve Chairman Ben S. Bernanke called strong corporate balance sheets “a bright spot in the darkening forecast” during his testimony to the U.S. Congress regarding monetary policy on February 27, 2008. While there may have been increasing recognition over time of a credit supply shock to non-financial firms, this is still by no means a consensus view. For example, in a paper dated October 2008, 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.

This paper has two objectives. First, we assess whether manufacturing firms in emerging economies experienced a liquidity crunch (beyond falling demand). Second, we examine if the pre-crisis volume and composition of capital inflows systematically affect the severity of the credit crunch across countries. 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.

We construct a measure of intrinsic dependency on external finance for long-term investment (DEF\_INV) and another measure of intrinsic dependency on external finance for working capital (DEF\_WK). The DEF\_INV variable is based on Rajan and Zingales (1998) except that we compute the measure using data for a more recent period during 1990-2006 and for each 3-digit SIC sector as opposed to their use of 2-digit sectors. Thus, we have 253 sectors as opposed to their 36 sectors. Our measure of DEF\_WK is modified from Raddatz (2006) by using data from the recent period of 1990 to 2006 as well. Our key regressors, DEF\_INV and DEF\_WK, are statistically significant with a correct sign in most regressions.

We base the choice of our control variables on the Fama-French (1992) three-factor model, including beta, firm size, and book/market ratio, and, in some specifications, also including a measure of momentum suggested by Lakonishok, Shleifer, and Vishny (1994). These factors

are often but not always statistically significant. These control variables reduce the magnitude of DEF\_INV but have little impact on DEF\_WK. Our interpretation is that during the financial crisis period, our two variables of external finance dependence (particularly DEF\_WK) may reflect aspects of firm risk that are not completely captured by the three-factor or the four-factor model.

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 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 (more than half).

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 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 financial crisis, including work by 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 a financial 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 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 crisis. 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.

## II. SPECIFICATION AND KEY VARIABLES

### A. 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:

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

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  $\beta_j$  for all countries in order to estimate an average effect, but will allow for variations across countries later.

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 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.

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,

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

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,  $\beta_2$ , then captures the degree to which the extent of a credit crunch depends on patterns of capital inflows.

## B. 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 price for manufacturing firms from the 24 emerging countries and 20 developed economies over the period from the end of July 2007 to the end of December 2008. (Manufacturing sectors are those with U.S. SIC 3-digit codes ranging between 200 and 399). Among emerging economies (the focus of this paper), the log difference of 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 indices

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):

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

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 US 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 need 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. If a liquidity crunch makes it difficult for a firm to raise funds for working capital 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 by the concept of a “cash conversion cycle”, which has also been adopted by Raddatz (2006) and Kroszner, Laeven, Klingebiel, (2007). 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,<sup>2</sup>

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

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<sup>2</sup> Inventories, accounts receivable, and accounts payable are year-end numbers, while costs of goods and sales are aggregated over the year. Hence we follow the literature and multiply the ratio by 365, i.e., the number of days in a year.

The sector-level proxy is constructed as follows: First, for each U.S. firm from 1990 to 2006, we calculate the cash conversion cycle based on annual data from Compustat USA Industrial Annual. Then we calculate the median within each U.S. SIC 3-digit sector, and apply it as the sector's intrinsic dependence on external finance for working capital. The index for the U.S. firms is then extrapolated to other countries. As in Raddatz (2006), we rely on U.S. firm data in that the supply of liquid funds is much more elastic in the US, and hence observed differences in relative working capital levels across industries are mainly demand driven. The median and mean values of this index are both 71 days, and the standard deviation is 41 days.

### **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 explain much more time-series variation 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-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 US firm from September 10, 2001 to September 28, 2001. We then look at the mean of log stock price change for each three-digit SIC sector, and use it as 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 aggregated 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.

### III. EMPIRICAL ANALYSIS

#### A. The Extent of Financial Constraint

We examine percentage change in stock price (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, we have the dependence on external finance for investment (DEF\_INV) as the only regressor. Here, it has a negative but statistically insignificant coefficient. In Column 2, we use the dependence on external finance for working capital (DEF\_WK) as the only regressor. The 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 price is statistically larger for sectors with higher dependence on external finance for working capital. What about the economic significance? An increase in the dependence for external finance for working capital (DEF\_WK) from the 25<sup>th</sup> to the 75<sup>th</sup> percentile (i.e., from 35 to 95 days) leads an extra decline in the stock price to 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 case here since DEF\_INV is pre-determined (measured with pre-crisis data and based on US 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 stock price 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 firms with large size may have better access to credit 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 direct through the international channel, we further examine if the firm-level sensitivity to trade plays a significant role during the current crisis. We use a two-step procedure, to construct a measure of the sensitivity to trade. First, a firm's annual stock return is regressed onto a constant and the annual percentage change of its 3-digit SIC sector exports from its country over the period from 1992 to 2006. Second, the coefficient on the exports is then used to proxy the trade sensitivity of the firm. By adding this variable to the regressions in Table 3, the sample size shrinks by around 4.5%. In any case, the trade-sensitivity index does not turn out to be statistically significant (with a coefficient of 0.05 and a standard error of 1.76). When we reclassify the negative values of the trade sensitivity as zeros to reduce potential noises in the proxy, we obtain a negative but still insignificant coefficient (see the last column of Table 3). Importantly, adding trade sensitivity does not alter the earlier results for DEF\_WK.

## **B. The Role of Pre-crisis Exposure to International Finance**

So far we have documented the existence of a worsening financial constraint, 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 2007-08 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 theoretical model of Goldstein and Razin (2006) also predicts 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. The 2007-2009 crisis provides a fresh opportunity to examine the connection between a liquidity crunch and the composition 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 24 emerging economies in our sample, with the data collected 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. Because the number of countries is small, the slope coefficient (2.64) is statistically significant at the 15% level. 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 during the 2007-09 crisis is related to the components of pre-crisis capital flows. 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. That is, firms with needs for 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 statistically insignificant in both cases. 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. These 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 triggers domestic banks to cut down their loans to firms even for working capital needs. 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.,  $-0.153$ ), we would still back out the earlier results in Column 2 of Table 3 that a higher DEF\_WK is on average associated 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 financial dependence indexes. This drops financial dependence indices and the demand sensitivity index from the regression as they are part of the sector specific 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 the 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).

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 out. This induced them to cut down loans to domestic firms. According to an HSBC report on Sep 09, 2008: "Korean banks' high reliance on wholesale funding is transmitting higher funding costs from global credit markets into the leveraged Korean economy."<sup>3</sup>

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). The relatively strong financial position by multinational firms can be used by these firms to alleviate financial constraint 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 the GM and Chrysler 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, 2007), those firms that engage in FDI, which tend to be larger than average, may still be in a

<sup>3</sup> Mahendran, Devendran, (2008), "Korean banks: Increasing costs to the economy", HSBC Report (September 9, 2008). [http://www.rgemonitor.com/457?cluster\\_id=2263](http://www.rgemonitor.com/457?cluster_id=2263)

better position to weather a financial shock than other firms, especially than firms in developing countries. The evidence in the current paper 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 the 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 seasonal stock offerings to raise new capital, the cost of capital also increases 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.

### **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.

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 3 of Table 7). The multiplication of DEF\_INV with FDI is positive and significant at the 1%, with a larger magnitude than the 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 FDI and non-FDI flows on financial constraints becomes more pronounced.

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

### 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 -0.12. 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

$$[\log P_{k, \text{dec08}} - \log P_{k, \text{july07}}] / (1/2)[\log P_{k, \text{dec08}} + \log P_{k, \text{july07}}]$$
. This leads to no change in the qualitative patterns reported earlier.

The regressions so far assign equal weights to all firms, but different countries have a different number of stocks. As a robustness check, we use a weighted least squares regression specification, with the weights proportional to the inverse of the square root of the number of

manufacturing stocks in a country (Column 5 of Table 8). This does not change the pattern that the coefficients on the interaction terms between DEF\_WK and pre-crisis portfolio inflows, and between DEF\_WK and pre-crisis foreign loan, are negative and significant.

As some countries in our sample have very few manufacturing stocks, e.g. 5 for Czech Republic, and 8 for Colombia, it is difficult to generate enough variations in financial dependence across firms for them. As another check, we limit the sample to countries with at least 25 manufacturing stocks (resulting in 19 countries) and re-run the weighted least squares estimation. The results are in Column 6 of Table 8. Again, all the interaction terms involving FDI have positive coefficients while all those involving non-FDI components have negative coefficients. Of those coefficients, the interaction between FDI and DEF\_INV and that between FPI (or foreign loans) and DEF\_WK are statistically significant.

We have been focusing our sample on manufacturing firms thus far. We now expand the sample to all non-financial firms as a robustness check. While this change results in a 50% expansion of the regression sample, the sign patterns of the coefficients are the same, although the significance levels are generally weak. The weakening of the significance level could indicate that intrinsic dependence on external finance for working capital (DEF\_WK) is more readily measured for manufacturing firms than for other non-financial 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 of demand sensitivity: i) a sector's pro-cyclicality from the FTSE/JSE Global Classification System; ii) 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 then interact the dummy with capital flows. In the specification with sector and country fixed effects, the pro-cyclicality dummy interacted 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 US firm in the COMPUSTA dataset, then take the US SIC 3-digit-sector median of the firm-level growth rates as the USGrowth. The correlation between USGrowth and the

Rajan-Zingales index is around 0.30 for 120 manufacturing sectors. We then 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 important, they do not affect the earlier results on the interactions involving DEF\_INV. 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).

### **A placebo test**

All the robustness tests above are designed to see if key results survive if we add variations to the basic specification or variable definitions. 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 1<sup>st</sup> 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.

### **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.

#### IV. CONCLUSION

In this paper, we propose a methodological framework to study the effect of capital flows on liquidity constraints in a recipient country and the role of the composition of pre-crisis capital inflows in the liquidity crunch. To investigate the presence of 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 during 2007-09. 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 different capital flows together 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, one also needs to examine several additional pieces of information, 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 of Stock Price(log)  
from 7/31/07 to 12/31/08 for Manufacturing Firms

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
AUSTRALIA	225	-93.1	-102.3	87.9	-448.2	135.8
AUSTRIA	34	-105.7	-114.5	73.8	-384.5	0.8
BELGIUM	50	-80.5	-87.7	57.5	-220.9	28.7
CANADA	263	-104.4	-121.5	113.1	-642.9	264.4
DENMARK	52	-94.5	-105.9	76.9	-317.2	36.4
FINLAND	65	-84.9	-90.1	53.7	-266.5	19.8
FRANCE	222	-74.8	-84.3	73.0	-506.7	134.3
GERMANY	280	-63.2	-79.3	89.1	-521.3	89.7
GREECE	100	-101.0	-104.7	57.0	-336.1	30.2
IRELAND	17	-115.5	-118.1	84.9	-269.6	-7.0
ITALY	103	-93.1	-96.0	55.1	-214.7	58.2
JAPAN	1582	-69.0	-74.2	60.1	-764.0	151.4
NETHERLANDS	62	-76.9	-85.8	61.8	-265.2	39.3
NEW ZEALAND	30	-49.1	-54.5	73.9	-344.5	82.5
NORWAY	51	-84.7	-106.2	97.7	-434.7	39.8
PORTUGAL	18	-68.5	-75.9	52.6	-184.4	1.0
SPAIN	39	-83.2	-79.6	51.6	-198.1	12.9
SWEDEN	130	-90.4	-97.7	61.2	-263.7	37.7
SWITZERLAND	107	-58.2	-68.9	56.6	-313.5	16.1
UNITED KINGDOM	421	-87.8	-108.8	106.0	-619.1	80.0
Total	7911	-77.45	-84.95	73.98	-764.01	264.45

Table 2a. Summary Statistics

	Obs#	Median	Mean	Std Dev	Min	max
Change in stock price (log)	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 is the external financial dependence for investment; and DEF\_WK is the external financial dependence for working capital. Summary stats are based on listed manufacturing firms in 24 emerging economies. Change in stock price is from July 31, 07 to Dec 31, 08. All other variables are pre-crisis at year 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

Note: DEF\_INV is the external financial dependence for investment; and DEF\_WK is the external financial dependence for working capital. Correlations are based on listed manufacturing firms in 24 emerging economies. Change in stock price is from July 31, 07 to Dec 31, 08. All other variables are pre-crisis at year 2006.

Table 3. The Average Effect of Liquidity Crunch Across Countries

	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7
DEF_INV	-2.893		-1.832	0.374	0.973	-0.101	0.575
	[10.02]		[8.276]	[8.014]	[7.164]	[6.809]	[7.152]
DEF_WK		-0.156**	-0.154**	-0.139**	-0.123**	-0.136***	-0.130**
		[0.0627]	[0.0645]	[0.0618]	[0.0545]	[0.0510]	[0.0516]
Beta*Market Return				0.326***	0.310***	0.303***	0.310***
				[0.0440]	[0.0440]	[0.0426]	[0.0439]
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***
				[0.0399]	[0.0399]	[0.0397]	[0.0411]
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

Note: Dependent variable is the change of stock price (log) from July 31, 07 to December 31, 08. DEF\_INV is the external financial dependence for investment; and DEF\_WK is the external financial dependence for working capital. Number of emerging countries is 24 as listed in Table 2. Standard errors in brackets; \*\*\*, \*\*, and \* denote p-value less than 1%, 5%, and 10%, respectively. Standard errors are clustered at the sector level.

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

Country	Total Inflow	FDI	FPI	Foreign Loans	developed
Argentina	1.00	2.29	-3.21	1.92	0
Brazil	2.11	2.26	0.11	-0.26	0
Chile	8.41	5.61	1.43	1.38	0
China	5.13	3.11	0.78	1.24	0
Colombia	4.08	4.22	0.16	-0.31	0
Czech	5.77	6.24	-2.76	2.30	0
Egypt	4.17	3.95	0.57	-0.35	0
HK	24.31	15.53	-6.42	15.20	0
Hungary	11.31	5.02	2.05	4.24	0
India	3.68	1.16	1.08	1.44	0
Indonesia	1.48	0.96	1.34	-0.82	0
Israel	8.23	3.93	3.53	0.78	0
Korea	4.19	0.72	1.56	1.91	0
Malaysia	20.07	3.05	22.73	-5.71	0
Mexico	2.96	2.96	-0.13	0.13	0
Pakistan	0.53	1.36	0.13	-0.96	0
Peru	3.62	3.06	1.92	-1.36	0
Philippines	-1.70	1.55	0.29	-3.54	0
Poland	6.95	3.68	2.58	0.70	0
Russia	6.22	2.03	0.79	3.41	0
Singapore	30.45	14.11	3.89	12.46	0
South Africa	5.48	0.95	3.02	1.51	0
Thailand	2.99	3.77	1.59	-2.37	0
Turkey	6.55	1.52	1.90	3.13	0
Australia	12.99	2.25	9.12	1.62	1
Austria	24.96	6.14	10.85	7.97	1
Belgium	10.78	10.99		-0.21	1
Canada	5.69	2.23	2.07	1.38	1
Denmark	14.37	1.35	4.26	8.76	1
Finland	11.37	2.91	6.61	1.85	1
France	21.18	2.96	9.35	8.87	1
Germany	9.53	1.41	6.09	2.03	1
Greece	13.05	0.67	9.47	2.90	1
Ireland	151.06	2.89	93.81	54.36	1
Italy	9.39	1.30	5.13	2.95	1
Japan	0.76	0.09	2.87	-2.20	1
Netherlands	8.21	3.84	14.81	-10.45	1
New Zealand	9.86	3.36	2.88	3.62	1
Norway	20.53	1.33	6.88	12.32	1
Portugal	20.59	3.00	8.24	9.35	1
Spain	19.95	3.09	11.76	5.10	1
Sweden	3.61	3.94		-0.33	1
Switzerland	15.63	2.27	0.90	12.46	1
UK	39.56	4.00	8.89	26.67	1

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

	Case 1	Case 2	Case 3
DEF_INV	-4.414	-2.488	
	[10.21]	[9.098]	
DEF_INV*Inflow	0.329	0.442	0.576
	[0.492]	[0.455]	[0.424]
DEF_WK	-0.108	-0.0504	
	[0.0772]	[0.0706]	
DEF_WK*Inflow	-0.00495	-0.00778*	-0.00846*
	[0.00524]	[0.00468]	[0.00479]
Beta*market Index		0.312***	0.285***
		[0.0439]	[0.0432]
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***
		[0.0399]	[0.0422]
Demand Sensitivity		-9.425***	
		[2.068]	
Observations	3796	3747	3747
R-squared	0.145	0.185	0.239
Industry fixed effects	No	No	Yes

Note: Dependent variable is the change of stock price (log) from July 31, 07 to December 31, 08. DEF\_INV is the external financial dependence for investment; and DEF\_WK is the external financial dependence for working capital. Standard errors in brackets; \*\*\*, \*\*, and \* denote p-value less than 1%, 5%, and 10%, respectively. Standard errors are clustered at the sector level.

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

VARIABLES	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6
DEF_INV	-4.585 [12.49]					
DEF_INV*FDI	2.859 [1.870]		3.375** [1.627]	3.240* [1.661]	3.480** [1.606]	3.610** [1.653]
DEF_INV*FPI	-1.626* [0.909]		-1.503* [0.789]	-1.387* [0.799]	-1.499* [0.783]	-1.582* [0.814]
DEF_INV* Foreign loan	-2.531 [1.651]		-2.491 [1.670]	-2.076 [1.798]	-2.267 [1.768]	-2.38 [1.839]
DEF_WK		-0.153* [0.0818]				
DEF_WK*FDI		0.0441** [0.0216]	0.0407* [0.0226]	0.0308 [0.0218]	0.0268 [0.0207]	0.0275 [0.0211]
DEF_WK*FPI		-0.0219*** [0.00817]	-0.0218** [0.00862]	-0.0198** [0.00816]	-0.0176** [0.00770]	-0.0185** [0.00801]
DEF_WK* Foreign loan		-0.0555*** [0.0172]	-0.0585*** [0.0195]	-0.0508*** [0.0192]	-0.0466** [0.0182]	-0.0473** [0.0185]
Beta*market index				0.280*** [0.0429]	0.276*** [0.0422]	0.274*** [0.0424]
Size				1.26 [1.153]	2.616** [1.190]	2.619** [1.191]
Market/Book				-1.357** [0.682]	-0.965 [0.701]	-0.974 [0.705]
Momentum				-0.148*** [0.0419]	-0.140*** [0.0419]	-0.143*** [0.0419]
Leverage					-34.40*** [4.753]	-32.60*** [6.443]
Leverage*FDI						3.84 [2.729]
Leverage*FPI						-2.833** [1.226]
Leverage*Foreign loan						-4.154 [2.739]
Sector fixed effects	No	No	Yes	Yes	Yes	Yes
Observations	3796	3823	3796	3747	3747	3747
R-squared	0.142	0.145	0.216	0.242	0.254	0.256

Note: Dependent variable is the change of stock price (log) from July 31, 07 to December 31, 08 for manufacturing firms in 24 emerging economies. DEF\_INV is the external financial dependence for investment; and DEF\_WK is the external financial dependence for working capital. Standard errors in brackets; \*\*\*, \*\*, and \* denote p-value less than 1%, 5%, and 10%, respectively. Standard errors are clustered at the sector level.

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

	Financial Development 1	Financial Development 2	Capital Flow from 02 to 07	De Jure Openness
DEF_INV*FDI	3.384*	3.861**	4.186**	20.99***
	[1.724]	[1.786]	[1.751]	[7.856]
DEF_INV*FPI	-1.404*	-1.329	-1.543**	-8.745
	[0.821]	[0.850]	[0.612]	[7.515]
DEF_INV* Foreign loan	-2.116	-1.824	-2.059*	-8.568
	[1.779]	[1.951]	[1.228]	[11.64]
DEF_WK*FDI	0.037	0.0406*	0.0323	-0.00035
	[0.0225]	[0.0230]	[0.0220]	[0.0888]
DEF_WK*FPI	-0.0175**	-0.0173**	-0.0153**	-0.149*
	[0.00850]	[0.00850]	[0.00712]	[0.0901]
DEF_WK* Foreign loan	-0.0499**	-0.0459**	-0.0332**	0.0841
	[0.0192]	[0.0195]	[0.0140]	[0.0964]
Beta*market index	0.279***	0.280***	0.281***	0.285***
	[0.0426]	[0.0426]	[0.0427]	[0.0433]
Size	1.264	1.225	1.249	1.217
	[1.168]	[1.163]	[1.147]	[1.127]
Market/Book	-1.361**	-1.357**	-1.358**	-1.333*
	[0.678]	[0.681]	[0.680]	[0.685]
Momentum	-0.148***	-0.149***	-0.148***	-0.146***
	[0.0420]	[0.0420]	[0.0418]	[0.0422]
(Domestic Credit/GDP)*DEF_INV	-0.03			
	[0.121]			
(Domestic Credit/GDP)*DEF_WK	-0.00189			
	[0.00124]			
(Domestic Credit and Market Capitalization/GDP)*DEF_INV		-0.0334		
		[0.0463]		
(Domestic Credit and Market Capitalization/GDP)*DEF_WK		-0.000585		
		[0.000415]		
Sector and country fixed effects	Yes	Yes	Yes	Yes
Observations	3747	3747	3747	3747
R-squared	0.243	0.243	0.242	0.24

Note: Dependent variable is the change of stock price (log) from July 31, 07 to December 31, 08 for manufacturing firms in 24 emerging economies. DEF\_INV is the external financial dependence for investment; and DEF\_WK is the external financial dependence for working capital. Standard errors in brackets; \*\*\*, \*\*, and \* denote p-value less than 1%, 5%, and 10%, respectively. Standard errors are clustered at the sector level.

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

	Contemporary Beta	Contemporary Beta	Alternative Price Change	Alternative Price Change	Weighted Regression	Weighted Regression
DEF_INV	0.486 [5.623]		0.39 [5.583]			
DEF_INV*FDI		3.119* [1.672]		2.944** [1.399]	1.998 [1.579]	2.466* [1.491]
DEF_INV*FPI		-0.949 [0.870]		-1.373** [0.669]	-1.012 [0.708]	-1.340* [0.707]
DEF_INV* Foreign loan		-2.152 [1.968]		-2.3 [1.565]	-1.167 [1.614]	-1.859 [1.521]
DEF_WK	-0.122** [0.0503]		-0.109** [0.0447]			
DEF_WK*FDI		0.032 [0.0210]		0.0227 [0.0174]	0.0214 [0.0176]	0.027 [0.0181]
DEF_WK*FPI		-0.0212*** [0.00794]		-0.0147** [0.00673]	-0.0128* [0.00720]	-0.0150** [0.00690]
DEF_WK* Foreign loan		-0.0537*** [0.0197]		-0.0372** [0.0160]	-0.0373** [0.0165]	-0.0418** [0.0165]
Beta*Market Return	0.934*** [0.0837]	0.914*** [0.0813]	0.240*** [0.0346]	0.215*** [0.0334]	0.215*** [0.0366]	0.232*** [0.0346]
Firm size	3.845*** [1.076]	3.375*** [1.093]	0.00959 [0.834]	-0.0358 [0.880]	-1.57 [1.140]	-1.266 [1.055]
Market/Book	-1.186* [0.606]	-1.266** [0.631]	-0.524 [0.482]	-0.637 [0.484]	-0.611 [0.461]	-0.76 [0.481]
Momentum	-0.0729* [0.0393]	-0.0896** [0.0416]	-0.115*** [0.0271]	-0.115*** [0.0278]	-0.129*** [0.0293]	-0.131*** [0.0310]
Demand Sensitivity	-9.378*** [2.131]		-6.991*** [1.601]			
Sector fixed effects	No	Yes	No	Yes	Yes	Yes
Observations	3748	3748	3748	3748	3748	3683
R-squared	0.229	0.283	0.188	0.25	0.304	0.296

Note: Dependent variable is the change of stock price (log) from July 31, 07 to December 31, 08 for manufacturing firms in 24 emerging economies. DEF\_INV is the external financial dependence for investment; and DEF\_WK is the external financial dependence for working capital. Standard errors in brackets; \*\*\*, \*\*, and \* denote p-value less than 1%, 5%, and 10%, respectively. Standard errors are clustered at the sector level.



**Table 9. Role of Pre-crisis Exposure to Capital Inflows in Emerging Economies  
(Non-financial firms)**

VARIABLES	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7
DEF_INV	-11.34 [10.65]		-7.1 [9.070]				
DEF_INV*FDI	1.429 [1.487]		1.388 [1.437]	2.732** [1.282]	2.662** [1.240]	2.994** [1.211]	3.044** [1.206]
DEF_INV*FPI	-1.272** [0.496]		-1.153** [0.570]	-1.549*** [0.548]	-1.395** [0.552]	-1.464*** [0.558]	-1.632*** [0.615]
DEF_INV* Foreign loan	-1.267 [1.340]		-1.128 [1.442]	-2.530* [1.314]	-2.202 [1.344]	-2.462* [1.322]	-2.512* [1.328]
DEF_WK		-0.117** [0.0572]	-0.0990** [0.0456]				
DEF_WK*FDI		0.0244* [0.0129]	0.015 [0.0114]	0.0246** [0.0123]	0.018 [0.0119]	0.0153 [0.0115]	0.0153 [0.0116]
DEF_WK*FPI		-0.00615 [0.00518]	-0.00504 [0.00436]	-0.00617 [0.00457]	-0.00491 [0.00453]	-0.00384 [0.00441]	-0.0034 [0.00479]
DEF_WK* Foreign loan		-0.0223* [0.0125]	-0.0165 [0.0112]	-0.0237** [0.0115]	-0.0192* [0.0114]	-0.0162 [0.0110]	-0.0161 [0.0112]
Beta*market index			0.297*** [0.0330]		0.274*** [0.0312]	0.272*** [0.0306]	0.269*** [0.0306]
size			2.237*** [0.842]		1.922** [0.887]	3.354*** [0.906]	3.375*** [0.900]
Market/Book			-1.293*** [0.429]		-1.381*** [0.437]	-0.966** [0.446]	-1.005** [0.446]
Momentum			-0.213*** [0.0284]		-0.201*** [0.0293]	-0.187*** [0.0296]	-0.187*** [0.0297]
Leverage						-34.64*** [4.104]	-31.22*** [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]				
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

Note: Dependent variable is the change of stock price (log) from July 31, 07 to December 31, 08 for non-financial firms in 24 emerging economies. DEF\_INV is the external financial dependence for investment; and DEF\_WK is the external financial dependence for working capital. Standard errors in brackets; \*\*\*, \*\*, and \* denote p-value less than 1%, 5%, and 10%, respectively. Standard errors are clustered at the sector level.

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

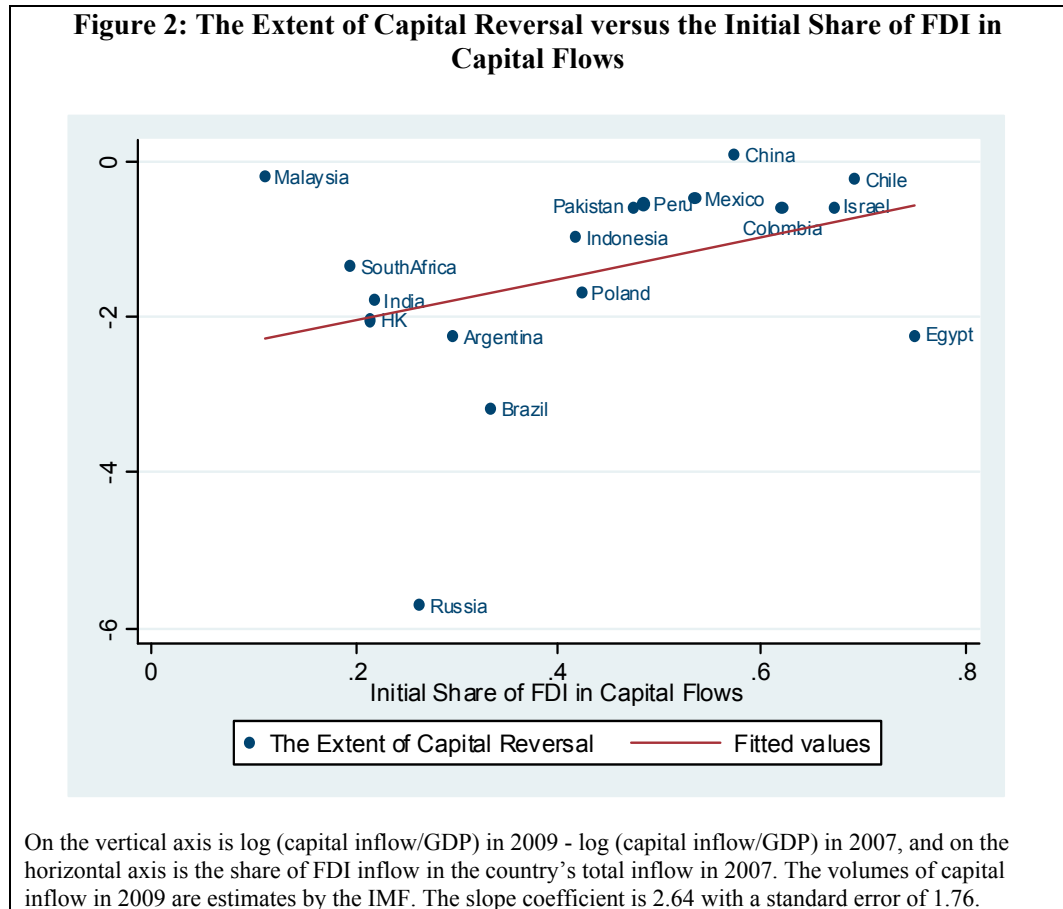
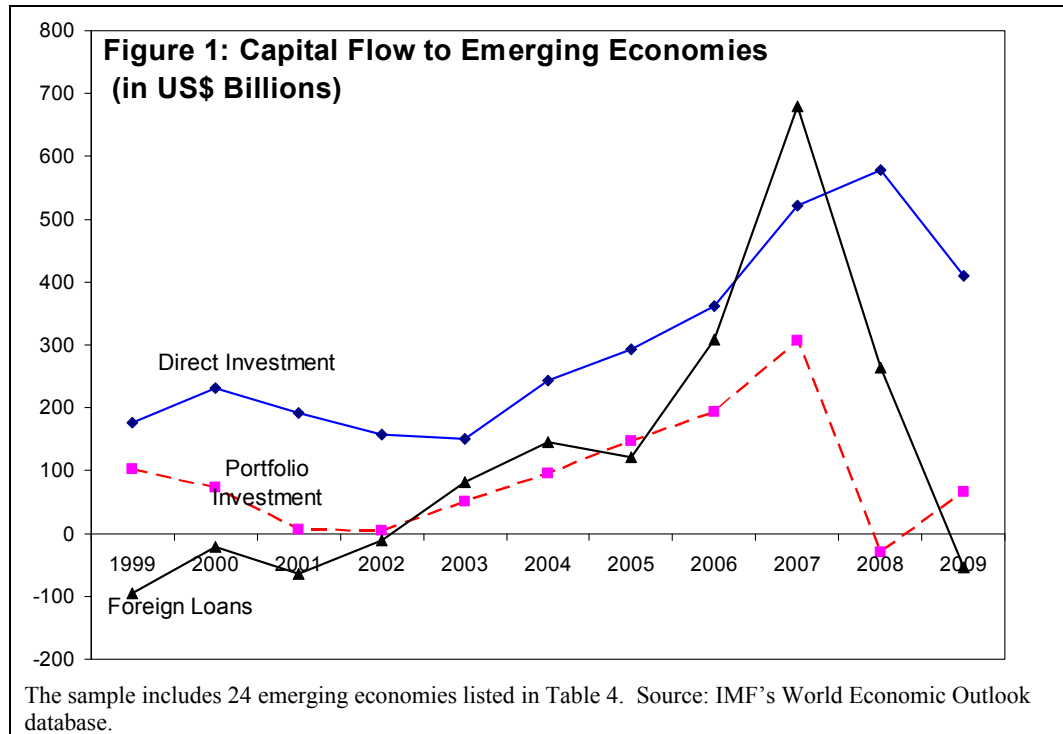
	Case 1	Case 2	Case 3	Case 4
DEF_INV	-0.14 [4.629]	-5.243 [4.861]	-6.905 [5.129]	
DEF_INV*Inflow Volume		0.742 [0.518]		
DEF_INV*FDI			3.037* [1.647]	2.366 [1.575]
DEF_INV*FPI			-0.19 [1.207]	-0.403 [1.165]
DEF_INV* Foreign loan			-2.277 [2.40]	-0.989 [2.477]
DEF_WK	-0.0513 [0.0495]	-0.0343 [0.0634]	-0.0539 [0.0708]	
DEF_WK*Inflow Volume		-0.00241 [0.00496]		
DEF_WK*FDI			0.01 [0.018]	0.014 [0.017]
DEF_WK*FPI			-0.0093 [0.0074]	-0.0008 [0.0066]
DEF_WK* Foreign loan			-0.013 [0.018]	-0.0099 [0.017]
Beta*market index	0.143** [0.0603]	0.141** [0.0599]	0.143** [0.0600]	0.133** [0.0574]
Size	3.274*** [1.063]	3.250*** [1.060]	3.202*** [1.047]	2.812*** [1.003]
Market/Book	1.735*** [0.552]	1.723*** [0.556]	1.756*** [0.554]	1.791*** [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 [3.661]	0.0835 [3.676]	0.065 [3.670]	
Sector fixed effects	No	No	No	Yes
Observations	3693	3693	3693	3693

Note: Dependent variable is the change of stock price (log) from Jan 1, 06 to July 30, 07 for manufacturing firms in 24 emerging economies. DEF\_INV is the external financial dependence for investment; and DEF\_WK is the external financial dependence for working capital. Standard errors in brackets; \*\*\*, \*\*, and \* denote p-value less than 1%, 5%, and 10%, respectively. Standard errors are clustered at the sector level.

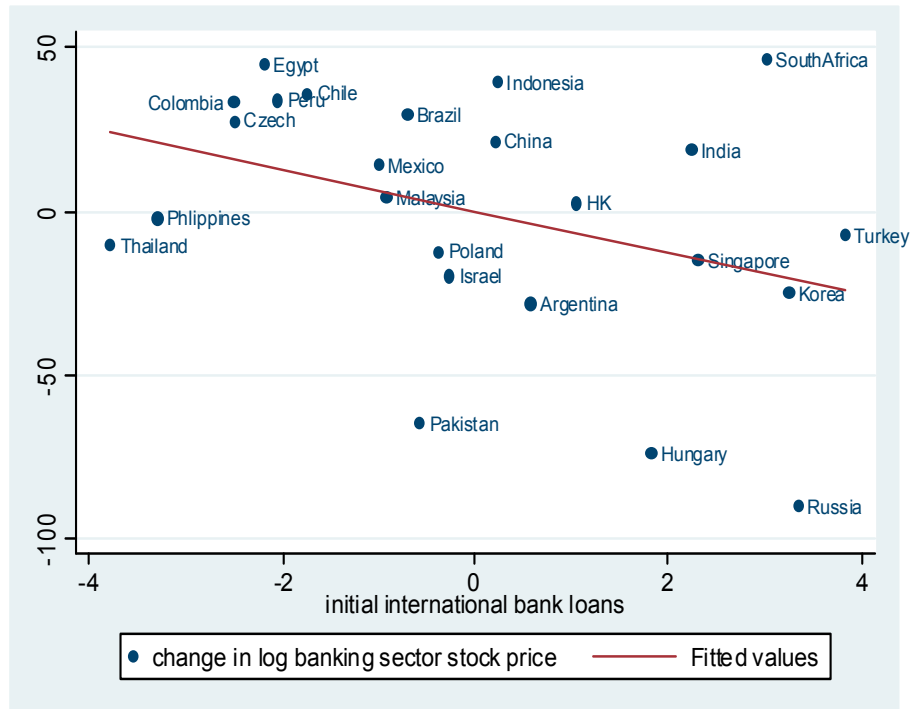
**Table 11. Stock Returns around Lehman Brothers Bankruptcy**

	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6
DEF_INV	-0.0895 [0.622]		-0.11 [0.597]	-0.164 [0.397]		
DEF_INV*FDI	0.332** [0.129]		0.284** [0.115]	0.291** [0.116]	0.316*** [0.117]	0.330*** [0.121]
DEF_INV*FPI	-0.144* [0.0784]		-0.118 [0.0814]	-0.0708 [0.0915]	-0.0715 [0.0993]	-0.0767 [0.108]
DEF_INV* Foreign loan	-0.255* [0.134]		-0.184 [0.126]	-0.182 [0.146]	-0.201 [0.153]	-0.226 [0.169]
DEF_WK		-0.00177 [0.00502]	-0.00127 [0.00509]	0.00297 [0.00452]		
DEF_WK*FDI		0.00283* [0.00149]	0.00233 [0.00148]	0.00163 [0.00143]	0.00143 [0.00152]	0.00187 [0.00155]
DEF_WK*FPI		-0.00128 [0.000775]	-0.0011 [0.000731]	-0.00113 [0.000703]	-0.00127* [0.000753]	-0.00163** [0.000810]
DEF_WK* Foreign loan		-0.00373** [0.00169]	-0.00338** [0.00164]	-0.00290* [0.00161]	-0.00278 [0.00174]	-0.00352* [0.00185]
Beta*market index				0.498*** [0.0283]	0.486*** [0.0302]	0.472*** [0.0315]
Firm size				0.371*** [0.0690]	0.368*** [0.0735]	0.405*** [0.0759]
Market/Book				-0.00513 [0.0265]	0.00548 [0.0318]	0.00728 [0.0331]
Leverage					-1.427** [0.632]	-1.596** [0.620]
Leverage*FDI					0.201 [0.185]	0.187 [0.197]
Leverage*FPI					-0.0545 [0.0900]	-0.0511 [0.0924]
Leverage*Foreign loan					-0.257 [0.191]	-0.25 [0.204]
Demand Sensitivity				-0.0941 [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

Note: Dependent variable is the change of stock price (log) from September 12 to 16, 2008. DEF\_INV is the external financial dependence for investment; and DEF\_WK is the external financial dependence for working capital. Standard errors in brackets; \*\*\*, \*\*, and \* denote p-value less than 1%, 5%, and 10%, respectively. Standard errors are clustered at the sector level. Case 6 replicates Case 5 but drops stocks with illiquid trading, which is defined as few than five days of trading in the two months of July and August, 2008, before Lehman's bankruptcy.



**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 1<sup>st</sup>, 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 for Year 2006

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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

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