# The Composition Matters: Capital Inflows and Liquidity Crunch during the 2007-09 Global Economic Crisis

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May 25, 2009

## Abstract

International capital flows, while potentially beneficial, are said to increase a country's vulnerability to crisis, especially if it is skewed to non-FDI types. This paper studies whether the volume and composition of capital flows affect a country's degree of credit crunch faced by its non-financial firms during the 2008-09 crisis. Using data on 14307 non-financial firms in 44 countries, we find that, on average, the decline in stock price was more severe for firms that are intrinsically more dependent on external finance for working capital and long-term investment. The volume of capital flows has no significant effect on credit crunch. However, the composition of capital flows matters: for emerging economies, the pre-crisis exposure to non-FDI capital inflows worsens credit crunch, while the exposure to FDI alleviates liquidity constraint.

Key words: financial crisis, spillover, liquidity constraint, financial globalization
JEL codes: F3, G2, G3

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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)

## 1. 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 so if the composition of capital inflows is skewed toward non-FDI types such bank lending and portfolio flows (Wei 2000 and 2006; Levchenko and Mauro, 2007) since international bank lending, and some smaller extent, are more likely to be reversed than FDI.

While the crises in the previous empirical literature tend to be those associated with foreign currency debt or balance of payments, 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 capital flow reversal even if they do not borrow directly from foreign banks. The liquidity of domestic banking sector is partially supported by domestic bank's borrowing from foreign banks. In principle, when foreign lending retrenches as it is prone to do in a global crisis, it may cause domestic banks to cut down lending to domestic non-financial firms. This creates a channel for the liquidity crunch experienced by non-financial firms in a recipient country to be linked to the country's pre-exposure to foreign lending. In comparison, if FDI flows are less cyclical, then 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 where financial institutions teeter on the edge of bankruptcy in many countries. A global economic crisis ensues in which non-financial firms around the world appear 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 is the financial crisis itself, in the form of a negative shock to the supply of external finance needed by non-financial firms. That is, non-financial firms do not do well, simply because they find themselves being cut off from the supply of working capital, even if they still have unfulfilled orders for their product.

However, it is far from being self-evident that non-financial firms suffer 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 with their cash holdings." Given the apparent secular downward 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 at the U.S. Congress on monetary policy on February 27, 2008. While there may have been an increase in the recognition over time of a credit supply shock to non-financial firms, it is still by no means a consensus view. For example, in a relatively recent paper dated October 2008, Chari, Christiano and Kehoe (2008) rejected the idea of a sharp decline in bank lending to non-financial firms or in commercial paper issuance by non-financial firms during the financial crisis.

This paper has two objectives. First, we assess if there is a liquidity crunch experienced by non-financial firms in emerging economies (beyond a falling demand). Second, we examine if the pre-crisis volume and composition of capital inflows affect

systematically the severity of the credit crunch across countries. We use data on 14,307 non-financial firms in 44 countries, and explore cross-firm as well as cross-country variations in the stock price responses to the crisis. The basic idea is that movement 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 non-financial firms that rely intrinsically heavily on external finance for investment and working capital versus those 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 2-digit sector. Thus, we have 253 sectors as opposed to their 36 sectors. Our measure of DEF_WK is modified from Raddatz (2006) by using the recent period 1990 to 2006 as well. Our key regressors: DEF_INV and DEF_WK, are statistically significant with a correct sign most of the times.

We base the choice of our control variables on the Fama-French (1992) three-factor model, by adding beta, firm size, and book/market ratio, and in some specification, 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 risks 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 non-financial 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? 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. An

increase in DEF_INV from the bottom quartile to the top quartile Relative to the firms whose intrinsic dependence for external finance for investment (DEF_INV) is at the bottom quartile, those firms whose DEF_INV is at the top quartile experienced a greater decline in their stock prices by at least five percentage points during July 31, 2007 – December 31, 2008. Similarly, relative to the firms whose intrinsic dependence for 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 seven percentage points during the same period.

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 total volume of pre-crisis capital inflows is not systematically related to the severity of credit crunch, but 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 credit crunch. This provides fresh evidence to the idea in the literature that different types of capital flows bring different benefits and costs to recipient countries.

This paper is linked to the two sets of literature. The first is on credit crunches (for example, Bernanke and Lown 1991; Borensztein, and Lee 2002; Kroszner, Laeven, 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 recent work by Mian and Sufi (2008), Reinhart and Rogoff (2008), Dell'Ariccia, Igan and Laeven (2008), and Greenlaw, Hatzius, Kashyap, and Shin (2008), and Ehrmann, Fratzscher and Mehl (2009). None of the papers examines the role of composition of the 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 possible different effects of composition of capital flows for economic growth or vulnerability to balance of payments crisis.. 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 (Berg, Borenzstein, and Pattillo, 2004). On the other hand, others doubt the relative destabilizing

properties of bank lending and portfolio flows.. 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, procyclicality, 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 was the subject of virtually all previous papers on financial crisis. Thus, while none of the previous papers studies if and how the extent of 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 (July 31, 2007) to Dec 31, 2008. To be precise, our specification is given by the following equation:

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

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 assumingthe 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 of assets), the ratio of the market to book values, and beta (the correlation of the firm's stock return with the overall market). We further control for sector-level intrinsic sensitivity to the demand contraction shock 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). The expanded specification is:

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 going through a factor model first. As 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 the pattern of pre-crisis exposure to capital flows affect the extent of liquidity crunch in a country, we now consider interaction between a country's pattern of financial integration and its non-financial firms' dependence on external finance. In other words,

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

where Pattern_of_Capital_Flow experience by country j is measured by either the total volume of pre-crisis capital inflows, or composition of capital inflows (FDI vs non-FDI). The slope coefficient of $\beta_2$ then captures the degree to which the extent of 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 price for non-financial firms from the 44 countries over the period from end of July 2007 to end of December 2008. The log difference of stock price index was 75% on average, with a standard deviation as large as 78%. It shows significant variation both across sectors within a country and across countries, with Ireland and Russia experiencing the largest decline of stock prices and Columbia and Peru the least.

*Financial dependence indices*

We develop two measures of intrinsic dependence for external finance.

- Intrinsic dependence on external finance for investment

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):

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

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. The original Rajan and Zingales (1998) paper covers only 40 (mainly SIC 2-digit) sectors. Here, we expand the number of sectors to around 250 SIC 3-digit sectors.

To calculate the demand for external financing for 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 capturethe economic concept of 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

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 line of credit, term loans or commercial papers to cover their working capital needs. If a liquidity crunch makes a firm difficult 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 larger decline of stock prices.

We construct a sector-level measure of intrinsic need of external finance for working capital by "cash conversion cycle", which has also been adopted by Raddatz (2006) and Kroszner, Laeven, Klingebiel (2007). It measures the time elapsed between the moment a firm pays for its inputs and the moment it receives payment for the goods it sells. It assumes that dependence for 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 firms in the United States during a non-crisis period, where supply of finance is abundant as any country, the relative values of cash conversion cycle across sectors reflect relative true needs for external finance for working capital. More specifically,[1]

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

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 Compusta USA. Then we calculate the median within each US SIC 3-digit sector, and apply it as the sector's intrinsic dependence on external finance for working capital. The index for the US 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 of the subsequent analyses, we add other variables meant to control for risks, such as the three factors from the Fama-French (1992), which includes 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

[1] Inventories, accountable receivables and payables tend to the accounting numbers at the year-end, while costs of goods and sales are aggregated over the year. Hence we follow the literature and multiple the ratio by the number of days in a year (365).

correlation between monthly firm stock price and the country-level market index over the past five years. We also include the momentum factor that is the stock return for the firm from January 31, 2007 to June 30, 2007.

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 a liquidity shock 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 US 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 constraint was small or at most short lived. In the 2001 episode, both the level of real interest rate and the TED spread (risk premium), after an initial spike, quickly returned to a level that was only moderately higher than the pre-9/11 level. This suggests that the market likely 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 over September 10-28, 2001, is unlikely to also reflect a firm's reaction 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.

## 3. Empirical Analysis

### 3.1 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 non-financial firms in 44

countries. In Column 1 of Table 3, we have the dependence on external finance for investment (DEF_INV) as the only regressor. It has a negative coefficient and statistically significant at the 10%. In Column 2, we use the dependence on external finance for working capital (DEF_WK) as the only regressor. It is also negative and significant at the 1% level. In Columns 3, we put DEF_INV and DEF_WK together in the regression and find they maintain their earlier magnitudes and signs. 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 financial.

Columns 1 to 3 show that the fall in stock price is statistically larger for sectors with higher dependence on external finance. What about the economic significance? An increase in the dependence for external finance for investment (DEF_INV) from the 25$^{th}$ to the 75$^{th}$ percentile (i.e., from zero to 0.65) results in an additional decrease in stock price by 5 percentage points. Similarly, an increase in the dependence for external finance for working capital (DEF_WK) from the 25$^{th}$ to the 75$^{th}$ percentile (i.e., from 35 to 95 days) leads an extra decline in the stock price to by 7 percentage points. Both are economically significant although not overwhelming on average.

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. Adding beta reduces the magnitude and significance of DEF_INV, suggesting that part of the financial constraint on DEF_INV is correlated with beta. But beta has no significant impact on DEF_WK. In Column 5, we 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 significant, as firms with large size may have more access to credit in the times of crisis. Firms with a high market to book ratio experience a greater decline in price. Controlling these factors reduce the point estimates for DEF_INV, but has no effect on DEF_WK.

In the last column, we control for a sector's intrinsic sensitivity to aggregated demand. It is significantly negative, verifying that a demand contraction is part of the reason for the deteriorating performance of non-financial firms. At the same time, we continue to find a significant effect for DEF_WK but not for DEF_INV.

3.2 The role of pre-crisis exposure to international finance

So far we have documented the existence of 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 credit crunch is related to a country's pre-crisis exposure to international capital flows.

International capital flows had increased rapidly since 2002, peaking in 2007. Since 2008, however, world capital inflow has 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 & Mejia (2007).

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 of capital flow reversal is more severe for emerging markets that are more integrated with the global financial market (see Kose, Rogoff, Prasad and Wei, 2009). Most such evidence is based on country level date. In this paper, we combine firm-level financial data with country-level capital flows to study whether and how 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 as 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 still smaller than a typical developed country.

We multiply volume of capital inflow by the two indexes of financial constraints indexes (DEP_INV and DEP_WK), respectively, and add these interaction terms to the econometric model. We separate emerging markets from developed countries as literature has documented asymmetric effect of financial integration on these two groups of countries (Kose, Rogoff, Prasad and Wei, 2009). We focus on emerging markets in our baseline case and examine developed countries for comparison.

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 companies in 24 emerging markets. Column 1 presents the average severity of liquidity crunch in emerging markets. We find that stock prices declined more in sectors with a large DEP_WK or a large DEP_INV. In Column 2, 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 liquidity crunch across countries does not appear to be linked to a country's pre-crisis volume of capital inflows. In Column 3, we controls for firm level factors; and in Column 4, we add sector fixed effects. Across these specifications, the volume of capital flow does not turn out to affect the degree of liquidity crunch during the 2007-08 crisis.

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 for currency and balance of payments crisis (Wei, 2000, 2008, and Kim and Wei, 2002). The 2007-2009 crisis provides a fresh opportunity to examine the connection between liquidity crunch and composition capital flows. Hence we separate capital inflows into three components: foreign direct investment (FDI), foreign portfolio investment (FPI), and foreign loans (FL). The breakdown follows the definition in the IMF International Financial Statistics dataset. Each component is then 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 DEP_INV with FPI is significantly negative. That is, firms with needs for external finance for long-term investment suffer more from liquidity crunch in countries with a large exposure to FPI. Meanwhile, foreign loans generate a negative coefficient and FDI generates a positive coefficient, although insignificant. In Column 2, we add DEP_WK and the interaction terms. We find similar sign patterns. While FDI has a positive coefficient that is significant at the 10% level; foreign loan has a negative and significant coefficient. FPI is an intermediate case, with a negative but insignificant coefficient on the interaction term. Moreover, foreign loan generates a coefficient four times the size of FPI, consistent with the story that foreign loans are reversed more quickly in the crisis, which triggers domestic banks to cut down loans to firms even for working capital needs. In Column 3, we include DEP_INV, DEP_WK, the sensitivity of stock price to a contraction of aggregated demand, and firm-level factors, including firm size, beta, market over book ratio and momentum. We find the magnitudes for

working capital and capital investments are similar to the cases when they are examined separately. This reinforces the idea that DEP_INV and DEP_WK capture different aspects of financial dependence, and that a country's pre-crisis exposure to international bank borrowing exacerbates non-financial firms' financial constraints for both long-term capital investment and short-term daily operations. When we add more controls, we find that smaller firm sizes, larger beta and smaller market to book ratio are associated with a larger decline of stock prices. Demand sensitivity generates a significantly negative coefficient, confirming the existence of demand contraction during this crisis. More importantly, capital flow components and their interactions with measures of external finance needs keep their earlier significance levels.

In Column 4 of Table 6, we add sector fixed effects to control for potentially omitted sector-level variables that are correlated with financial dependence indexes. It drops financial dependence indexes and the demand sensitivity index from the regression as they are sector specific. But the interaction terms of financial dependence and capital flow components are preserved. Adding sector effects sharpens the asymmetric impacts of capital flow components. For the case of DEP_INV, FDI now doubles its impact in Column 3, with smaller standard errors; FPI increases it effects by around 20%; while foreign loan doubles its magnitude without inflated standard errors. As the coefficient for FDI moves in a direction opposite to that of FPI and foreign loan, we now see an even larger contrast between flow components. In Column 5, 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 6. It turns out that the leverage ratio is significantly negative, confirming that a higher leverage ratio by itself is indeed associated with a larger decline in stock prices. When we interact it with capital flow components in Column 7, the interaction term with FDI is positive, and those with foreign portfolio and foreign bank loans are negative. Interestingly, it does not affect the results for our financial constraint indicators (DEP_INV and DEP_WK).

It is important to note that, for capital flows to affect liquidity crunch, it is not necessary for non-financial firms to borrow directly from international banks or raise funds

from the international capital market. In a study of the effect of capial controls on liquidity constraint in Chile, Forbes (2007) notes that borrowing by domestic banks from international banks and capital market is enough for a connection between liquidity constraint by domestic non-financial firms and a country's exposure to international capital flows. In particular, firm-level financial constraint could be affected by 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 the 2007-09 crisis, Korea offers another example for an indirect but significant linkage between domestic firms and international financial market. 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 the foreign financing sources dried out. This may trigger them to cut down loans to domestic firms.

### 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 DEP_INV and DEP_WK (see Column 1 of Table 7). Moreover, adding domestic financial development does not alter the results for capita 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 GDP at the end of 2006. Again, it does not change our key results regarding the role of capital flows.

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 square regression, with the weights proportional to the inverse of the square root of the number of stocks in a

country. The results are in Column 3 of Table 7. We find the interaction terms involving FDI still generate positive coefficients, while the interactions involving either FPI or foreign loans generate negative ones. Moreover, the interaction term between FPI and DEP_INV is significant at the 5% level. As some countries have very few stocks, for example, 7 for Czech, and 12 for Columbia, it is difficult to general enough variation in financial dependence across firms in these countries. As another robustness check, we limit the sample to countries with at least 50 stocks (resulting in 18 countries) and re-run the weighted least square estimation. The results are in Column 4 of Table 7. Again, all the interaction terms involving FDI have positive coefficients while all those involving NON-FDI have negative coefficients. Of those coefficients, the interaction between FPI and DEP_INV and that between foreign loan and DEP_WK are statistically significant.

In all regressions, we measure pre-crisis capital inflows over the period 2002-2006. As robustness checks, we have checked two variations. First, we extend the pre-crisis window to include 2007. In this case, the results get stronger. 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 debt moves from insignificant in Table 6 to significantly negative the 5% level. Hence, by using a slightly longer window, the contrast between FDI and Non-FDI flows on financial constraints become more pronounced. As a second variation, we look at total capital flows (the sum of inflows and outflows) over GDP, rather than just capital inflows, averaged from 2002 to 2006. The results are comparable to that in Table 6. In the case with sector fixed effects and firm-level factors, both DEP_INV*FPI and DEP_INV*ForeignLoan generate significantly negative coefficients. (These regressions are not tabulated to save space).

So far, we measure exposure to financial globalization by a country's de facto or realized capital flows. These may or may not reflect policies. As an extension, we now 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 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 loan (commercial and financial credit from nonresidents to residents), respectively. The de jure indicators are listed in Table 8.

The de jure classification and the de facto classification (based on realized inflows) are positively correlated but far from perfectly, with a correlation coefficient 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 composition of capital flows and liquidity crunch. The regression results are in Table 9. To save space, we focus on the case when sector fixed effects are included (Column 6 of Table 9). For DEP_INV, we find that FDI openness significantly alleviates financial constraint during this crisis; openness on FPI significantly worsens the financial constraint; while openness on foreign debt is not significantly associated with financial constraint. However, 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 and 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).

We restrict our sample to manufacturing firms as a robustness check. Manufacturing sectors have U.S. SIC 3-digit code ranging between 200 and 399. The results, reported in Table 10, show that for manufacturing sectors, the interaction of DEP_INV with FDI is statistically positive while the interaction of DEP_INV with FPI is statistically negative. More importantly, the interaction terms of DEP_WK with FPI and foreign loans now have negative coefficients significant at the 5% (while they were insignificant for the sample of non-financial firms). Hence, by restricting the sample to manufacturing sectors, the aggravation effect of non-FDI flows on liquidity crunch becomes more pronounced.

As an extension, we investigate the possibility that capital flows affect stock prices through affecting aggregated demand. Hence we include the interaction of demand sensitivity with capital flows. We use two proxies of demand sensitivity: i) sector's procyclicality from the FTSE/JSE Global Classification System; ii) the 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 non-financial firm belongs to cyclical consumer goods or services. We then interact the dummy with capital flows. In the specification with sector and country fixed effects, the procyclicality dummy interacted with FDI inflow is significantly positive, while its interactions with FPI and loans are insignificantly negative. More importantly, the results

on financial constraint indicators (DEV_INV and DEV_WP) are not affected. Alternatively, 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.

3.4 Placebo test

All the robustness tests are designed to see if the key results disappear if we add twists to the specification. We now perform a placebo test by looking at a non-crisis period. In particular,, we examine whether capital flows from year 2002 to 2005 affect the stock prices from January 2006 to June 2007. Again, we interact capital flow components (FPI, FDI and loans) with DEP_INV and DEP_WK. For the sample of non-financial firms, we find that the interaction of FDI and DEP_INV is significantly positive; however, none of the other interaction terms are significant. For the sample of manufacturing firms, none of the interaction terms are significant. The placebo test hence suggests that the pattern in Table 6 (i.e., positive coefficient for FDI*DEP_INV and negative coefficients for FPI*DEP_INV and Loan* DEP_INV) are a feature of this crisis and not a general feature in normal times.

Finally, as Fisman and Love (2007) suggest, the Rajan-Zingales index on external financial dependence may partly reflect cross-sector differences in global growth opportunity. To reduce potential measurement bias in DEP_INV, we dontrol for shocks to global opportunity directly over the period from 1990 to 2006, which is the sample period we use to construct DEP_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 are around 0.27 for 253 non-financial sectors and 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 no significant (with p-values larger than 0.4). Most important, they do not affect the earlier results on the interactions involving DEP_INV. That is, liquidity crunch experienced by non-financial firms is more serious for firms that depend on external finance for working capital, especially in countries with a high exposure to foreign loans before the crisis.

## 4. Conclusion

In this paper, we propose a methodological framework to study the effect of capital flows on liquidity constraint in a recipient country. . In particular, we are interested in documenting and quantifying the importance of tightening liquidity constraints on non-financial firms across the world. To investigate the presence of liquidity constraint, we ask the question: If we classify non-financial 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 in the regression framework.

If we just include total volume of capital inflows, we do not find a connection between a country's exposure to capital flows and the extent of liquidity crunch experienced by its firms during 2008-09. 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 liquidity crunch in a crisis.

It is important to point out that the current paper does not represent a comprehensive assessment of the welfare effects of the composition of capital flows. To do that, one also needs to examine several additional pieces, including how different forms of capital flows affect liquidity constraint and growth rates during a tranquil time. Such would be a fruitful topic for future research.

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***Table 1a. Summary Statistics***

| | Obs# | Median | Mean | Std Dev | Min | max |
|---|---|---|---|---|---|---|
| Stock return | 13841 | -75.71 | -84.92 | 72.03 | -347.20 | 55.45 |
| DEF_INV | 13773 | 0.23 | 0.33 | 0.36 | 0.00 | 1.00 |
| DEF_WK | 13841 | 71.31 | 71.44 | 40.68 | 0.00 | 169.20 |
| Demand sensitivity | 13814 | 1.45 | 1.60 | 0.86 | -1.06 | 4.85 |
| Company size | 13841 | 14.20 | 14.28 | 3.22 | 3.18 | 25.12 |
| Market/book | 13841 | 1.81 | 2.82 | 3.40 | 0.31 | 23.62 |
| Beta*Market Return | 13696 | -37.64 | -43.41 | 42.27 | -383.58 | 164.93 |
| Momentum | 13838 | 7.86 | 12.73 | 35.57 | -197.83 | 377.85 |

Note: DEF_INV is the external financial dependence for investment; and DEF_WK is the external financial dependence for working capital.

***Table 1b. Correlation***

| | Stock return | DEF_INV | DEF_WK | Demand sensitivity | Company size | Market/book |
|---|---|---|---|---|---|---|
| DEF_INV | -0.06 | 1.00 | | | | |
| DEF_WK | -0.05 | 0.04 | 1.00 | | | |
| Demand sensitivity | -0.07 | 0.06 | -0.15 | 1.00 | | |
| Company size | 0.14 | -0.16 | 0.06 | -0.03 | 1.00 | |
| Market/book | -0.10 | 0.10 | -0.06 | 0.01 | -0.18 | 1.00 |
| beta | -0.14 | 0.11 | 0.00 | 0.09 | 0.02 | 0.08 |

***Table 2: Average Chang of Stock Price(log) from 7/31/07 to 12/31/08 for Non-financial Firms***

| COUNTRY | Obs # | Median | Mean | Std Dev | Min | Max |
|---|---|---|---|---|---|---|
| ARGENTINA | 46 | -31.93 | -35.90 | 52.57 | -138.63 | 47.19 |
| AUSTRALIA | 715 | -90.25 | -104.65 | 91.29 | -490.86 | 135.81 |
| AUSTRIA | 57 | -87.56 | -102.87 | 75.78 | -384.53 | 36.86 |
| BELGIUM | 97 | -61.68 | -71.73 | 61.68 | -291.21 | 28.66 |
| BRAZIL | 178 | -53.01 | -55.55 | 79.03 | -328.32 | 270.81 |
| CANADA | 621 | -90.43 | -109.13 | 109.75 | -642.85 | 264.45 |
| CHILE | 99 | -22.48 | -29.63 | 47.19 | -164.53 | 87.57 |
| CHINA | 1303 | -87.28 | -86.92 | 51.27 | -361.53 | 209.50 |
| COLOMBIA | 12 | -10.60 | -28.25 | 87.57 | -268.91 | 67.31 |
| CZECH REPUBLIC | 7 | -11.82 | -43.79 | 66.77 | -184.36 | 2.63 |
| DENMARK | 98 | -90.92 | -104.91 | 71.01 | -317.24 | 36.38 |
| EGYPT | 36 | -36.64 | -34.53 | 49.43 | -139.92 | 107.25 |
| FINLAND | 109 | -81.41 | -86.08 | 52.02 | -266.48 | 19.79 |
| FRANCE | 574 | -73.16 | -81.82 | 72.35 | -529.29 | 210.90 |
| GERMANY | 594 | -60.18 | -73.79 | 81.45 | -521.34 | 151.74 |
| GREECE | 237 | -101.19 | -104.71 | 62.69 | -336.08 | 39.56 |
| HONG KONG | 717 | -115.97 | -124.97 | 83.96 | -462.10 | 171.48 |
| HUNGARY | 24 | -86.27 | -85.13 | 62.91 | -298.70 | 14.32 |
| INDIA | 741 | -77.39 | -80.09 | 60.86 | -290.63 | 221.86 |
| INDONESIA | 218 | -47.21 | -55.89 | 87.97 | -374.16 | 313.15 |
| IRELAND | 43 | -106.24 | -133.76 | 113.65 | -427.19 | 13.09 |
| ISRAEL | 130 | -104.22 | -115.30 | 90.86 | -462.85 | 75.73 |
| ITALY | 193 | -97.69 | -97.50 | 61.02 | -315.53 | 64.65 |
| JAPAN | 3370 | -61.84 | -72.68 | 68.26 | -764.01 | 151.45 |
| KOREA (SOUTH) | 901 | -83.66 | -91.48 | 74.14 | -709.51 | 120.16 |
| MALAYSIA | 791 | -56.82 | -67.10 | 65.69 | -366.17 | 91.48 |
| MEXICO | 84 | -29.70 | -46.62 | 63.36 | -229.57 | 81.83 |
| NETHERLANDS | 139 | -79.25 | -85.05 | 71.31 | -325.41 | 53.45 |
| NEW ZEALAND | 91 | -46.41 | -59.78 | 76.40 | -412.92 | 82.54 |
| NORWAY | 124 | -85.15 | -98.67 | 85.56 | -434.73 | 57.23 |
| PAKISTAN | 78 | -58.50 | -63.58 | 69.24 | -209.36 | 144.08 |
| PERU | 35 | -39.48 | -28.46 | 98.02 | -169.50 | 294.78 |
| PHILIPPINES | 91 | -53.35 | -64.99 | 71.07 | -338.69 | 71.46 |
| POLAND | 177 | -126.76 | -128.76 | 79.16 | -534.25 | 21.96 |
| PORTUGAL | 41 | -67.40 | -72.95 | 54.65 | -184.43 | 9.91 |
| RUSSIAN FEDERATI | 54 | -140.62 | -133.45 | 83.81 | -433.23 | 50.33 |
| SINGAPORE | 498 | -109.91 | -111.36 | 72.60 | -352.79 | 152.39 |
| SOUTH AFRICA | 176 | -39.37 | -42.12 | 66.66 | -258.96 | 467.63 |
| SPAIN | 87 | -84.95 | -86.18 | 57.17 | -266.17 | 12.93 |
| SWEDEN | 284 | -87.25 | -94.31 | 72.57 | -403.98 | 75.38 |
| SWITZERLAND | 165 | -58.90 | -72.17 | 83.06 | -757.71 | 106.04 |
| THAILAND | 379 | -41.17 | -50.19 | 56.44 | -289.68 | 120.24 |
| TURKEY | 160 | -85.40 | -80.10 | 57.99 | -243.47 | 174.19 |
| UNITED KINGDOM | 1239 | -90.55 | -108.19 | 101.64 | -663.62 | 181.85 |
| Total | 15818 | -75.64 | -85.79 | 78.13 | -764.01 | 467.63 |

***Table 3: The Average Effect of Liquidity Crunch Across Countries***

| | Case 1 | Case 2 | Case 3 | Case 4 | Case 5 | Case 6 |
|---|---|---|---|---|---|---|
| DEF_INV | -8.324* | | -7.766* | -4.588 | -0.486 | 0.147 |
| | [5.017] | | [4.550] | [4.176] | [4.481] | [4.406] |
| DEF_WK | | -0.119*** | -0.115*** | -0.114*** | -0.119*** | -0.134*** |
| | | [0.0330] | [0.0288] | [0.0268] | [0.0290] | [0.0290] |
| Beta*Market Return | | | | 0.274*** | 0.279*** | 0.270*** |
| | | | | [0.0230] | [0.0240] | [0.0232] |
| Firm size | | | | | 3.809*** | 3.748*** |
| | | | | | [0.691] | [0.680] |
| Market/Book | | | | | -1.126*** | -1.141*** |
| | | | | | [0.248] | [0.247] |
| Momentum | | | | | -0.0335 | -0.0334 |
| | | | | | [0.0247] | [0.0246] |
| Demand Sensitivity | | | | | | -4.879*** |
| | | | | | | [1.405] |
| Observations | 13773 | 13841 | 13773 | 13628 | 13628 | 13602 |
| R-squared | 0.076 | 0.078 | 0.08 | 0.101 | 0.113 | 0.116 |
| Country fixed effects | 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 countries is 44 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 | Case 4 |
|---|---|---|---|---|
| DEF_INV | -11.04 | -10.79 | -6.929 | |
| | [7.331] | [9.652] | [8.551] | |
| DEF_INV*Inflow | | -0.025 | 0.0243 | 0.135 |
| | | [0.332] | [0.300] | [0.280] |
| DEF_WK | -0.0675** | -0.0801* | -0.0768* | |
| | [0.0337] | [0.0470] | [0.0428] | |
| DEF_WK*Inflow | | 0.00121 | -0.00059 | -0.00041 |
| | | [0.00272] | [0.00268] | [0.00273] |
| Beta*market Index | | | 0.300*** | 0.278*** |
| | | | [0.0331] | [0.0313] |
| Firm size | | | 2.270*** | 1.960** |
| | | | [0.837] | [0.882] |
| Market/Book | | | -1.310*** | -1.388*** |
| | | | [0.429] | [0.436] |
| Momentum | | | -0.211*** | -0.198*** |
| | | | [0.0287] | [0.0298] |
| Demand Sensitivity | | | -5.363*** | |
| | | | [1.509] | |
| Observations | 5997 | 5997 | 5917 | 5917 |
| R-squared | 0.13 | 0.13 | 0.175 | 0.233 |
| Industry fixed effects | No | 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 | Case 7 |
|---|---|---|---|---|---|---|---|
| DEF_INV | -11.34 | | -7.1 | | | | |
| | [10.65] | | [9.070] | | | | |
| DEF_INV*FDI | 1.429 | | 1.388 | 2.732** | 2.662** | 2.994** | 3.044** |
| | [1.487] | | [1.437] | [1.282] | [1.240] | [1.211] | [1.206] |
| DEF_INV*FPI | -1.272** | | -1.153** | -1.549*** | -1.395** | -1.464*** | -1.632*** |
| | [0.496] | | [0.570] | [0.548] | [0.552] | [0.558] | [0.615] |
| DEF_INV*Debt | -1.267 | | -1.128 | -2.530* | -2.202 | -2.462* | -2.512* |
| | [1.340] | | [1.442] | [1.314] | [1.344] | [1.322] | [1.328] |
| DEF_WK | | -0.117** | -0.0990** | | | | |
| | | [0.0572] | [0.0456] | | | | |
| DEF_WK*FDI | | 0.0244* | 0.015 | 0.0246** | 0.018 | 0.0153 | 0.0153 |
| | | [0.0129] | [0.0114] | [0.0123] | [0.0119] | [0.0115] | [0.0116] |
| DEF_WK*FPI | | -0.00615 | -0.00504 | -0.00617 | -0.00491 | -0.00384 | -0.0034 |
| | | [0.00518] | [0.00436] | [0.00457] | [0.00453] | [0.00441] | [0.00479] |
| DEF_WK*Debt | | -0.0223* | -0.0165 | -0.0237** | -0.0192* | -0.0162 | -0.0161 |
| | | [0.0125] | [0.0112] | [0.0115] | [0.0114] | [0.0110] | [0.0112] |
| Beta*market index | | | 0.297*** | | 0.274*** | 0.272*** | 0.269*** |
| | | | [0.0330] | | [0.0312] | [0.0306] | [0.0306] |
| 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] | | [0.0293] | [0.0296] | [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] | | | | |
| 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. 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 in Emerging Economies (Composition Effect; Robustness Check)**

| | Case 1 | Case 2 | Case 3 | Case 4 |
|---|---|---|---|---|
| DEF_INV*FDI | 2.647** | 3.213** | 1.974 | 2.386 |
| | [1.230] | [1.270] | [1.460] | [1.526] |
| DEF_INV*FPI | -1.401** | -1.285** | -1.210** | -1.384** |
| | [0.583] | [0.542] | [0.588] | [0.628] |
| DEF_INV*Foreign Loan | -2.207 | -1.869 | -1.513 | -1.99 |
| | [1.381] | [1.317] | [1.516] | [1.624] |
| DEF_WK*FDI | 0.0195* | 0.0189 | 0.0128 | 0.0214 |
| | [0.0117] | [0.0123] | [0.0152] | [0.0148] |
| DEF_WK*FPI | -0.00373 | -0.00465 | -0.00328 | -0.00602 |
| | [0.00487] | [0.00460] | [0.00489] | [0.00504] |
| DEF_WK*Foreign Loan | -0.0179 | -0.0186 | -0.0148 | -0.0227* |
| | [0.0117] | [0.0114] | [0.0138] | [0.0137] |
| Beta*market Index | 0.274*** | 0.276*** | 0.292*** | 0.301*** |
| | [0.0313] | [0.0311] | [0.0347] | [0.0338] |
| size | 1.926** | 1.890** | 0.176 | 0.754 |
| | [0.891] | [0.891] | [1.021] | [1.021] |
| Market/Book | -1.386*** | -1.387*** | -1.248** | -1.329*** |
| | [0.436] | [0.437] | [0.480] | [0.489] |
| Momentum | -0.201*** | -0.200*** | -0.215*** | -0.219*** |
| | [0.0293] | [0.0294] | [0.0309] | [0.0326] |
| (Domestic Credit/GDP)*DEP_INV | 0.00706 | | | |
| | [0.0768] | | | |
| (Domestic Credit/GDP)*DEP_WK | -0.000711 | | | |
| | [0.000721] | | | |
| (Domestic Credit and Market Capitalization/GDP)*DEP_INV | | -0.035 | | |
| | | [0.0238] | | |
| (Domestic Credit and Market Capitalization/GDP) *DEP_WK | | -6.00E-05 | | |
| | | [0.000244] | | |
| Sector fixed effect | Yes | Yes | Yes | Yes |
| Observations | 5917 | 5917 | 5917 | 5778 |
| R-squared | 0.235 | 0.235 | 0.278 | 0.254 |

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. Case 1 and 2 add indicators of domestic financial development measured at the year of 2006. Column 3 uses the weighted regression, with the weight equal to the inverse of the square root of the number of stocks in each country. Column 4 is similar to column 4 but drops countries with stock number less than 50.

***Table 8. De Jure Financial Openness for 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.

***Table 9. Role of Pre-crisis Financial Integration in Emerging Economies —De Jure Classification of Financial Openness***

| | Case 1 | Case 2 | Case 3 | Case 4 | Case 5 | Case 6 |
|---|---|---|---|---|---|---|
| DEF_INV | -6.121 | | -5.835 | -3.834 | -2.688 | |
| | [11.16] | | [11.11] | [11.02] | [10.27] | |
| DEF_INV*FDI | 6.454 | | 6.962 | 9.464 | 8.724 | 15.39*** |
| | [6.716] | | [6.403] | [6.011] | [5.925] | [5.477] |
| DEF_INV*FPI | -14.90** | | -14.33* | -11.76 | -12.61* | -12.47** |
| | [6.792] | | [7.291] | [7.370] | [7.057] | [5.844] |
| DEF_INV*Foreign Loan | 1.266 | | 0.622 | -0.0815 | 0.134 | -0.551 |
| | [7.448] | | [8.130] | [7.954] | [7.866] | [8.460] |
| DEF_WK | | -0.0503 | -0.0452 | -0.0237 | -0.0358 | |
| | | [0.0583] | [0.0558] | [0.0503] | [0.0468] | |
| DEF_WK*FDI | | 0.0309 | 0.0371 | 0.00501 | -0.00997 | 0.00787 |
| | | [0.0551] | [0.0528] | [0.0517] | [0.0515] | [0.0526] |
| DEF_WK*FPI | | -0.085 | -0.0778 | -0.106* | -0.112* | -0.0746 |
| | | [0.0599] | [0.0596] | [0.0585] | [0.0571] | [0.0581] |
| DEF_WK*Foreign Loan | | 0.025 | 0.0149 | 0.0261 | 0.0402 | 0.00836 |
| | | [0.0580] | [0.0601] | [0.0585] | [0.0580] | [0.0553] |
| Beta*Market | | | | 0.311*** | 0.299*** | 0.277*** |
| | | | | [0.0333] | [0.0330] | [0.0313] |
| size | | | | 2.346*** | 2.234*** | 1.912** |
| | | | | [0.831] | [0.826] | [0.873] |
| Market/Book | | | | -1.284*** | -1.311*** | -1.379*** |
| | | | | [0.430] | [0.429] | [0.438] |
| Momentum | | | | -0.212*** | -0.213*** | -0.201*** |
| | | | | [0.0296] | [0.0289] | [0.0299] |
| Demand Sensitivity | | | | | -5.446*** | |
| | | | | | [1.510] | |
| Observations | 5997 | 6030 | 5997 | 5924 | 5917 | 5917 |
| R-squared | 0.129 | 0.126 | 0.131 | 0.172 | 0.176 | 0.234 |
| Industry fixed effects | N | N | N | N | N | 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; DEF_WK is the 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. Role of Pre-crisis Exposure to Capital Inflows in Emerging Economies (Manufacturing v.s. Non-manufacturing)***

| | **Manufacturing Firms** | **Non-manufacturing** | **Manufacturing firms** | **Non-manufacturing** |
|---|---|---|---|---|
| DEF_INV*FDI | 3.240* | 0.426 | 3.384* | 0.437 |
| | [1.661] | [2.092] | [1.724] | [2.062] |
| DEF_INV*FPI | -1.387* | -1.332 | -1.404* | -1.309 |
| | [0.799] | [0.807] | [0.821] | [0.844] |
| DEF_INV*Foreign Loan | -2.076 | -1.371 | -2.116 | -1.33 |
| | [1.798] | [2.094] | [1.779] | [2.130] |
| DEF_WK*FDI | 0.0308 | 0.0403** | 0.037* | 0.0403** |
| | [0.0218] | [0.0199] | [0.0225] | [0.0198] |
| DEF_WK*FPI | -0.0198** | 0.00146 | -0.0175** | -0.00041 |
| | [0.00816] | [0.00671] | [0.00850] | [0.00752] |
| DEF_WK*Foreign Loan | -0.0508*** | -0.0157 | -0.0499** | -0.0188 |
| | [0.0192] | [0.0177] | [0.0192] | [0.0187] |
| Beta*Market | 0.280*** | 0.287*** | 0.279*** | 0.287*** |
| | [0.0429] | [0.0466] | [0.0426] | [0.0465] |
| size | 1.26 | 2.651** | 1.264 | 2.620** |
| | [1.153] | [1.255] | [1.168] | [1.259] |
| Market/Book | -1.357** | -1.467*** | -1.361** | -1.455** |
| | [0.682] | [0.552] | [0.678] | [0.551] |
| Momentum | -0.148*** | -0.265*** | -0.148*** | -0.266*** |
| | [0.0419] | [0.0417] | [0.0420] | [0.0418] |
| (Domestic Credit/GDP)*DEP_INV | | | -0.03 | -0.0143 |
| | | | [0.121] | [0.0908] |
| (Domestic Credit/GDP)*DEP_WK | | | -0.00189 | 0.00085 |
| | | | [0.00124] | [0.000982] |
| Sector fixed effects | Yes | Yes | Yes | Yes |
| Observations | 3747 | 2170 | 3747 | 2170 |
| R-squared | 0.242 | 0.243 | 0.243 | 0.243 |

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. Manufacturing firms have the U.S. SIC 3-digit number between 200 and 399. Column 3 and 4 add the indicator of domestic financial development measured at the year of 2006.

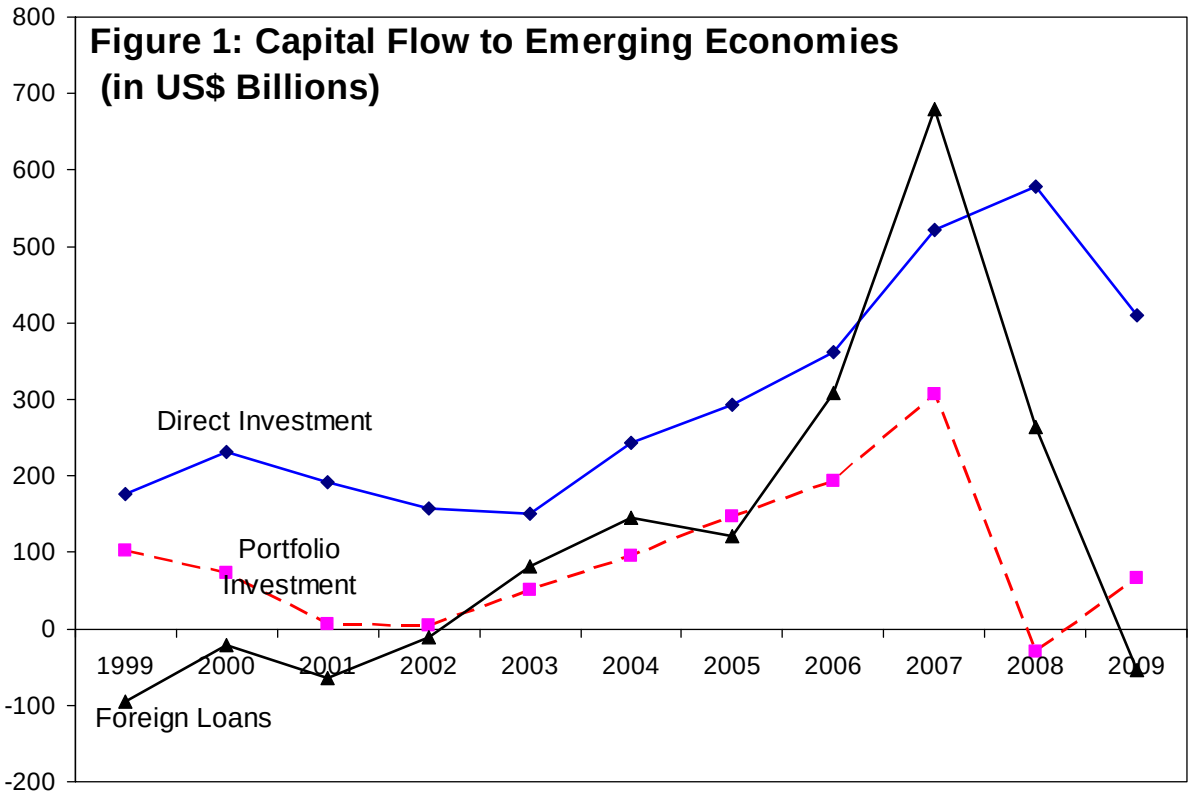
Figure 1: Capital Flow to Emerging Economies
(in US$ Billions)
800
700
600
500
400
300
200
100
0
-100
-200
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
Direct Investment
Portfolio
Investment
Foreign Loans