Firms as Surrogate Intermediaries:
Evidence from Emerging Economies[*]

Hyun Song Shin[†]   Laura Yi Zhao[‡]

December 2013

Abstract

A firm can finance investment either by borrowing or by drawing on cash balances, so that financial asset and liability changes tend to have opposite signs. In contrast, financial intermediaries borrow in order to lend, so that financial asset and liability changes have the same sign. Large non-financial firms in China and India behave like intermediaries rather than textbook non-financial firms. We explore the role of non-financial firms in the shadow banking system. The evidence from China and India is in contrast to US non-financial firms, which conform to the textbook predictions.

[†]Corresponding author: Bendheim Center for Finance, Princeton University, 26 Prospect Avenue, Princeton, NJ 08540, USA; hsshin@princeton.edu
[‡]Asian Development Bank; yzhao.consultant@adb.org

1   Introduction

The market stresses faced by many emerging economies in the face of tighter global monetary conditions in 2013 have focused renewed attention on the transmission of financial conditions across borders. One conceptual challenge is to reconcile the small net external debt positions of many emerging economies with the apparently disproportionate impact of tighter global monetary conditions on their currencies and financial markets. Indeed, some commentators have wondered aloud why emerging economies with low net external debt positions are experiencing such severe stresses.[1]

The purpose of our paper is to offer one missing piece in the puzzle, highlighting the role of non-financial corporations as surrogate financial intermediaries that operate across borders. When corporate activity straddles the border, measuring exposures at the border itself may not capture the strains on corporate balance sheets. For instance, if the London subsidiary of the company has taken on US dollar debt but the company is holding domestic currency financial assets at its headquarters, then the company as a whole faces a currency mismatch and will be affected by currency movements, even if no cross-border exposures are registered in the official net external debt statistics. Nevertheless, the firm's fortunes (and hence its actions) will be sensitive to currency movements. In the case of firms that straddle borders, it may be more illuminating to look at the consolidated balance sheet that motivates corporate treasurers, rather than the balance of payments statistics that are organized according to residence.

One aspect of firms' access to international capital markets is the offshore issuance of debt securities sold to international investors. If the debt securities issued offshore are in foreign currency, offshore issuance would mirror currency mismatches on the consolidated balance sheet. Hence, offshore issuance goes beyond just a measurement issue on the size of the company's debt and instead addresses the fundamental issue of how firms will fare when

---

[1]For instance, Krugman (2013) "Asian Vulnerability, Then and Now"
http://krugman.blogs.nytimes.com/2013/08/29/asian-vulnerability-then-and-now/
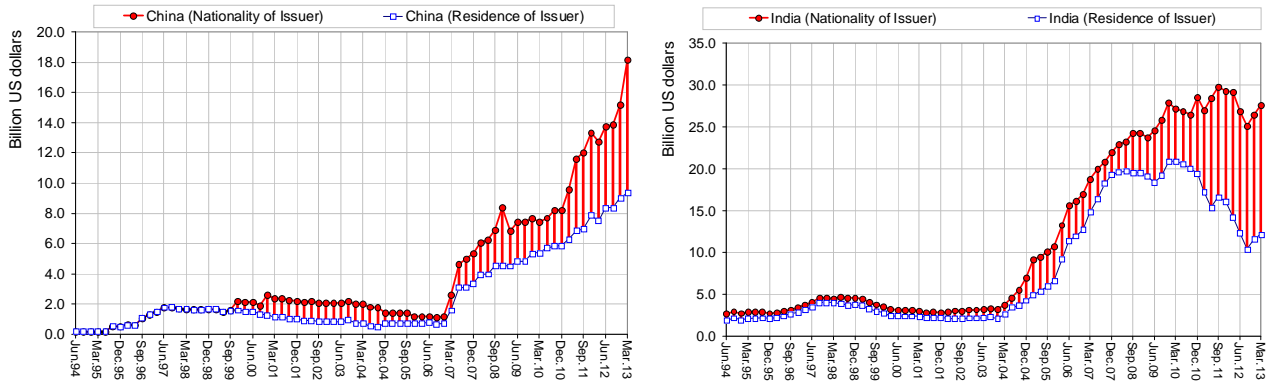
Figure 1: **China (left) and India (right):** International debt securities outstanding for non-financial corporates by nationality and by residence (Source: BIS Debt Securities Statistics, Table 11D and 12D)

global financial conditions and exchange rates change.

Figure 1 shows BIS statistics on the amounts outstanding of international debt securities issued by non-financial corporate borrowers in China (left) and India (right) by residence of the borrower (blue) and the nationality of the borrower (red). The difference between the red and blue series reflects the offshore issuance of corporate debt securities. We see from Figure 1 that offshore issuance activity was small until the 2008 crisis, but subsequently grew strongly. The period after 2010 has seen a particularly steep increase so that by 2013, the offshore amounts outstanding are equal in size to the onshore issuance outstanding. McCauley, Upper and Villar (2013) describe the recent trend of offshore issuance of corporate debt securities.[2]

Our paper examines the role of the firm as a surrogate financial intermediary that transmits financial conditions across borders. The hallmark of banks and other financial intermediaries is that they borrow in order to lend. As such, when their financial assets increase through new lending or purchases of securities, their financial liabilities, such as deposits, also increase. In this way, a distinctive feature of financial intermediaries is that the change in their financial assets has the same sign as the change in their financial liabilities.

In contrast, textbook non-financial firms behave in a very different way. When a non-

---

[2]Robert N McCauley, Christian Upper and Agustín Villar "Emerging market debt securities issuance in offshore centres" BIS Quarterly Review, September 2013, Box 2, pp 23-24.
http://www.bis.org/publ/qtrpdf/r_qt1309b.pdf

financial firm undertakes an investment, it can finance it either by drawing on its existing financial resources or by external borrowing, or a combination of both. A prediction of the "pecking order" theory of corporate finance (Myers (1984)) is that the firm will draw on internal funds first as the cheapest form of financing, and only tap outside funding when internal funds are inadequate. A prediction from such behavior would be that changes in financial assets and changes in financial liabilities will have opposite signs, capturing those firms that raise outside funding while drawing down internal funds.

We show that non-financial firms in emerging economies behave like financial intermediaries in that co-movements in financial assets and financial liabilities have a positive sign. This is true both in the cross-section, as well as in the time series. In other words, firms that borrow more also hold more cash, and firms that increase their borrowing also increase their cash holding. To the extent that firms' cash holdings are claims on the domestic banking sector, the firms would be performing a financial intermediation role by making funding available indirectly to other domestic borrowers.

Our paper has a close parallel with Hattori, Shin and Takahashi (2009), who describe the role of non-financial corporates as surrogate intermediaries in Japan in the 1980s. Hattori et al. (2009) show how the financial liberalization of the 1980s enabled large manufacturing firms in Japan to gain access to funding by issuing securities, especially from international investors who sought yen exposure. As new funding sources opened up, firms recycled yen funding through the banking system in the form of bank time deposits. Through this channel, the financial assets of non-financial firms increased in step with their financial liabilities in the 1980s. Banks in Japan suffered a reversal of roles in which corporate borrowers became corporate depositors, and banks were pushed to seek borrowers in riskier sectors such as in commercial real estate. The parallel between Japan in the 1980s and the emerging economies in 2013 lies in the role of non-financial corporates as surrogate intermediaries.

The evidence in our paper comes from a large panel of non-financial firms emerging economies in the Compustat Global database in which we examine both the cross-section

patterns in corporate balance sheets, as well as the *growth* of individual firms' financial assets and liabilities with firm fixed effects. The evidence from the major emerging economies is especially noteworthy given its contrast to US non-financial firms. US firms are seen to conform to the textbook prescription for corporate financing choices in which financial assets and liabilities move in the *opposite* directions, consistent with the pecking order theory of financing (Opler et al. (1999)).

Our paper has a point of contact with the many studies that have explored the trends and implications of corporate cash holdings. Traditional studies focus on firm value, merges and acquisitions, and dividend issuance. Harford (1999) shows that cash-rich firms are more likely to attempt acquisition and their mergers tend to be followed by a decline in operating performance. Lie (2000) finds that a large increase of dividends mitigates the agency problem associated with excess cash-holdings. Denis and Sibilkov (2010) show that as due to costly external financing, greater cash holdings increase the value of constrained firms. Our paper contributes to this literature by exploring the implications of the non-financial firms' cash holdings for the liquidity in the banking system.

Given the importance of corporate liquidity, many works explore its determination. Opler et al. (1999) and Ferreira and Vilela (2004) find supportive evidence for a static trade-off theory using data from the United States and European countries respectively. Bates et al. (2009) argues that precautionary motives explain the rise of US industrial firms' cash-to-asset ratio. The role of corporate governance is also explored. As an example, Dittmar et al. (2003) finds that the agency problem is an important determinant of corporate cash holdings, and that firms in countries with poor shareholder rights hold twice as much cash as firms in countries with good shareholder protection. Other factors are also found to affect corporate liquidity: tax cost for multinational companies to repatriate foreign income (Foley et al. (2007)), the predation risk (Haushalter et al. (2007)), the diversification of investment opportunities (Duchin (2010)), and the incentive to hedge cash flow shocks during bad times (Lins et al. (2010)). Adding to this line of literature, our paper explores a new perspective

to understand non-financial firms' cash holdings through their role as surrogate financial intermediary.

Our paper is also related to the studies on the financing decisions of firms, in particular the use of debt financing. This line of literature focuses on two competing theories: the trade-off theory and the pecking order theory. The empirical evidence is mixed. Shyam-Sunder and Myers (1999) argues that the basic pecking order model has more explanatory power than the static trade-off theory in explaining the financing patterns of public and mature firms in the United States. On the other hand, Frank and Goyal (2003) and Fama and French (2005) find pervasive evidence contradicting the pecking order theory. Later on, Leary and Roberts (2010) show that the pecking order theory performs better in explaining firms' financing decisions only when factors typically attributed to other theories are simultaneously accounted for. These two theories focused mainly on the traditional explanations for corporate use of debt, for example taxes, bankruptcy cost, transaction costs, adverse selection and agency conflicts. Our paper, by investigating the surrogate financial intermediary roles of the non-financial firms, suggests that the non-financial firms in China borrows in order to invest, especially in the form of deposit and other short-term investments.

Before documenting the key facts, we delve deeper into the institutions that underpin the empirical results. In particular, we explore how the availability of financing from international capital markets induces large non-financial firms to engage in financial transactions in the shadow banking system that have the tell-tale attributes of financial intermediation. The institutional backdrop of the shadow banking system in China is a tightly regulated formal banking sector, which sits alongside a highly open and trade-dependent economy. Even if capital account transactions through banks can be tightly regulated, the current account transactions of thousands of firms generated in the course of international trade will be much harder to monitor and regulate.

By its nature, shedding light on the shadow banking system and firms' roles in the system presents formidable challenges in measurement and for data availability. However,
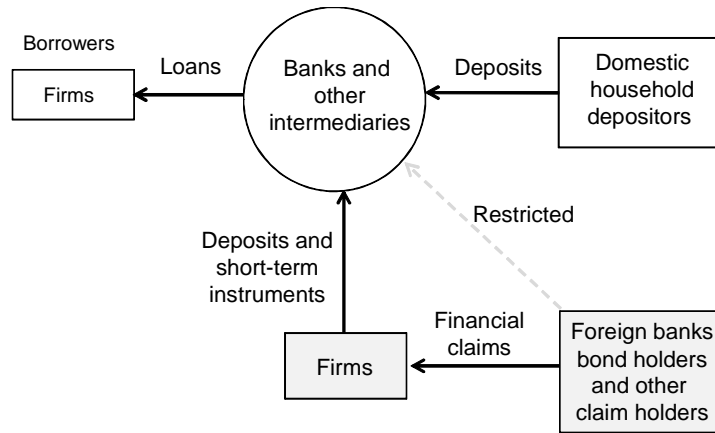
Figure 2: **Non-financial firms as intermediary.** In this diagram, firms with access to international capital markets act as an intermediary for outside funding when the banking sector has restricted access to international capital markets.

the advantage of our approach is that, however the firms managed to change their financial claims and liabilities, the consequences of their actions will be captured in the snapshot of the consolidated balance sheet at the reporting period. As such, for the purpose of gauging the scale of intermediation performed by non-financial firms, we can simply read off the financial assets and liabilities, without having to capture in detail all the specific practices that the firms engage in reaching their final position.

When the availability of external financing from international capital markets varies with global liquidity conditions, a prediction of our approach is that the surrogate financial intermediation activity of non-financial firms in emerging economies will reflect (at least in part) the ebb and flow of global liquidity conditions themselves. Consistent with this hypothesis, we find that the extent of intermediation activity of non-financial firms co-moves strongly with indicators of credit availability at the global level. We contrast the evidence from emerging economy firms and firms from the United States. While US firms conform closely to the textbook model, firms from emerging economies exhibit the distinctive positive co-movement of financial assets and liabilities. We conclude with some broader lessons for the operation of the financial system in a tightly regulated economy.
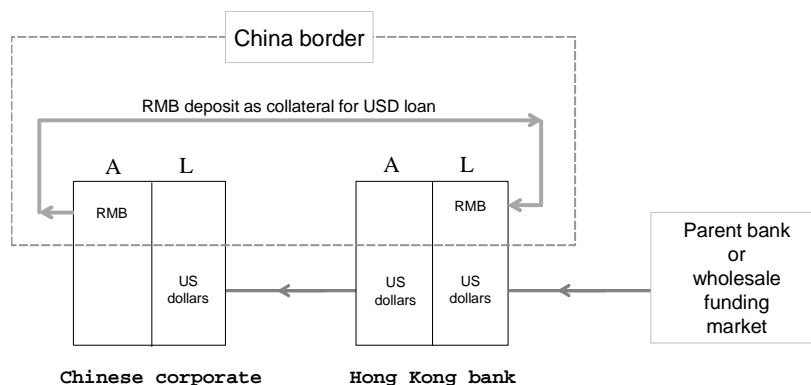
Figure 3: Offshore borrowing by a non-financial corporate in foreign currency

2 Background

An economy with an open financial sector and convertible capital account will be sensitive to global financial conditions, but the sensitivity to external financial conditions also applies to economies that are tightly regulated and whose capital accounts are closed. Just as water will find cracks to trickle through a rock, so will international capital find ways into an open economy when it has a large volume of transactions associated with trade. This is so even when the financial sector is tightly regulated and external borrowing is restricted by regulations that govern capital inflows. The role of non-financial firms is crucial in this respect as the channel through which capital inflows take place.

Figure 2 depicts an economy with a banking sector that has restricted access to wholesale funding in international capital markets, but where a subset of firms have access both to the domestic financial system as well as international capital markets through trade financing or the operation of overseas offices. Although non-financial firms are subject to regulations in their use of international capital markets, the sheer number of such firms as well as the complexity of their transactions make them much harder to regulate than the banks.

As well as the corporate bond market, global banks provide another channel to the international capital markets.

Figure 3 is a schematic illustration of the activities of a non-financial firm from China
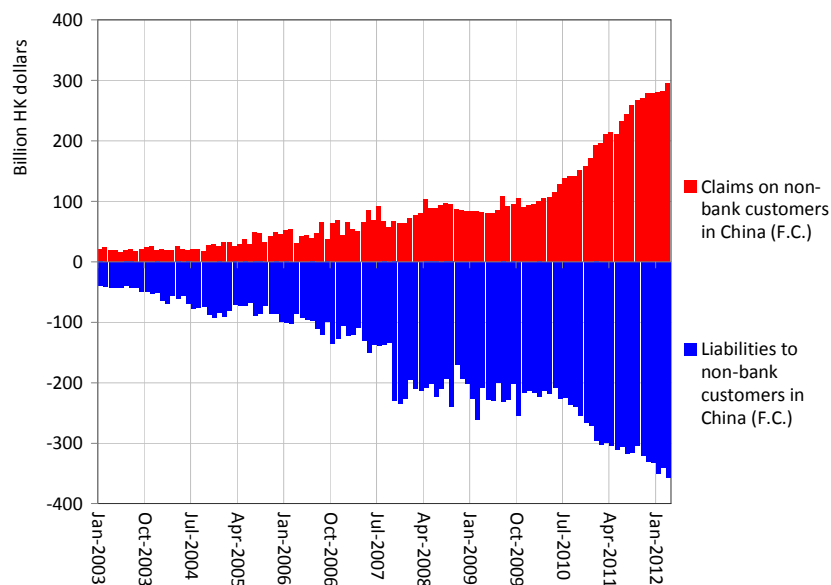
Figure 4: Hong Kong banks' claims and liabilities to non-bank customers in China in currencies other than Hong Kong dollars (Source: Hong Kong Monetary Authority)

with operations in Hong Kong, who borrows in US dollars from an international bank in Hong Kong and posts Renminbi deposits as collateral. The transaction would be akin to a currency swap, except that the settlement price is not chosen at the outset. The transactions instead resemble the operation of the old London Eurodollar market in the 1960s and 70s. For the Chinese corporate, the purpose of having US dollar liabilities and holding the proceeds in Renminbi may be to hedge their export receivables, or simply to speculate on Renminbi appreciation.

Figure 4 provides some aggregate evidence for the transactions depicted in Figure 3. Figure 4 plots the claims and liabilities of Hong Kong banks in foreign currency to customers in China. Foreign currency, in this case, would be US dollars mainly for the assets and Renminbi mainly for the liabilities. Both have risen dramatically in recent years, reflecting the rapidly increasing US dollar funding of non-financial corporates from China.

As well as channeling capital flows into China, non-financial firms play a more direct role as a financial intermediary through the institution of "entrusted loans". Entrusted
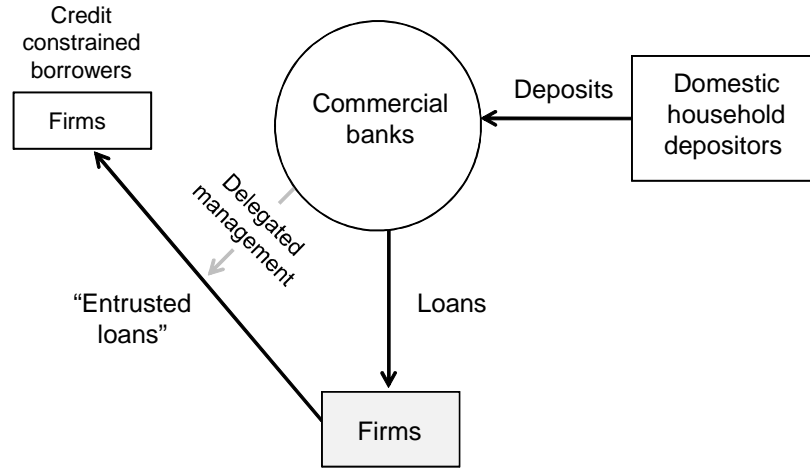
Figure 5: **Non-financial firms as intermediary through "entrusted loans".** This diagram depicts the operation of "entrusted loans" where non-financial firms lend to other non-financial firms with limited access to bank lending. The bank acts as delegated manager of the loan contract.

loans are loans granted by one firm to another firm directly. However, a commercial bank administers the loan as a delegated manager. Figure 5 illustrates the operation of an entrusted loan, where a large firm with access to bank loans recycles the loan by granting an entrusted loan to another firm - typically a smaller firm with restricted access to bank lending, or a property-related firm. The commercial bank administers the entrusted loan, and the entrusted loan stays off the bank's balance sheet, and hence does not count against lending limits set for the commercial bank by the bank regulators. From Figure 5, we see that the lending firm in the entrusted loan relationship behaves like a financial intermediary, simultaneously borrowing and lending. Increased incidence of such intermediation activity will be captured in a snapshot of the lending firm's balance sheet as the simultaneous increase in both financial assets and financial liabilities.

Quantitatively, the intermediation conducted through entrusted loans is large relative to the lending through the formal banking sector. Figure 6 plots the quarterly flow of entrusted loans and domestic currency bank loans in China, as published by the People's Bank of China statistics on all systems financing (also called total social financing). We see that the flow of entrusted loans have increased in recent quarters, reaching 25% to 30% of
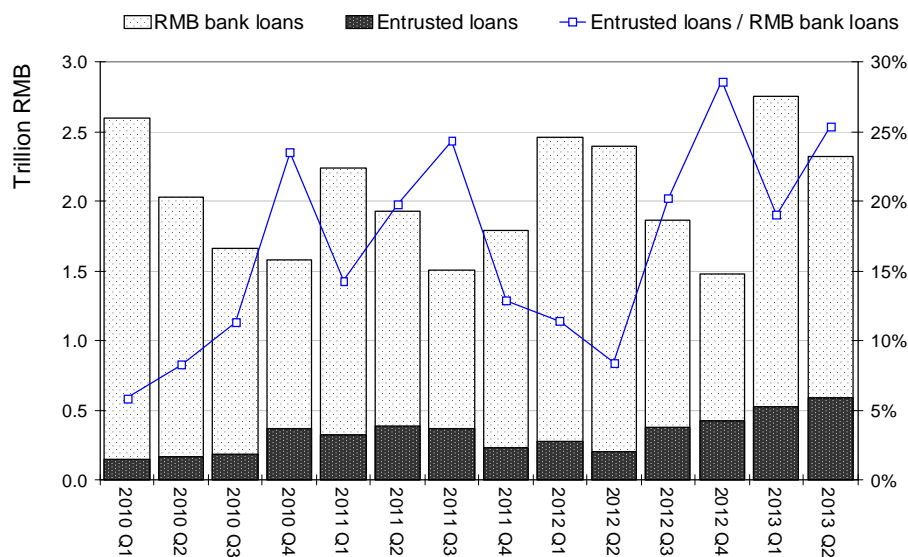
Figure 6: Quarterly flow of entrusted loans and Renminbi bank loans (Source: People's Bank of China, http://www.pbc.gov.cn/publish/diaochatongjisi/4032/index.html)

formal bank lending in China.

3 Data

We now turn to our empirical analysis, starting with a description of the data used in our study. The activities illustrated in Figures 5 and 2 suggest that the transactions underlying the surrogate intermediation done by non-financial firms can be complex and not easy to disentangle. Nor are these transactions easily measured or monitored. Our strategy, therefore, is to focus on the snapshot of the balance sheet at the end of the year, and investigate the co-movement in financial assets and financial liabilities of the firms, both in the cross-section and over time for each firm individually.

Our firm level data comes from Compustat Global. The advantage of this data is two-fold. First, the database includes listed firms in China, which would include the large non-financial firms that would be candidates for the intermediation activity described so far. Since we are interested in the firms engaged in the surrogate intermediation rather than the small and medium sized enterprises that are the ultimate borrowers, confining attention to

the large firms will not miss the bulk of the surrogate intermediation.

Second, Compustat Global imposes accounting classifications that are designed to ensure that cross-country comparisons are possible. Cross-country comparability is important for our purpose, as one of the checks to our main investigation is to compare the empirical results for China with that for the United States. For such an exercise, cross-country comparability is crucial, and Compustat Global ensures broad comparability.

3.1   Firm level data for China

Our sample of firms from China in Compustat Global covers those firms with Global Industry Classification Standard (GICS) sector codes not equal to 40. The sample period is from 1990 to 2012, with data cutoff date as November 30, 2013. For our benchmark regressions, we exclude the firms which are outliers in terms of the ratio of cash and short-term investments to sales (above the 99.5 or below the 0.5 percentiles). After the sample selection, there are 1532 firms in our sample.

As our focus is on the surrogate intermediation activity of firms, our focus is on the cash and short-term investment position of the firms, as well as other financial assets. In what follows, "cash" is taken to mean cash and short-term investments. Financial liabilities are defined as the sum of the short–term debt and the long-term debt, which includes bank loans. Firm leverage is defined as financial liabilities divided by total assets. The summary statistics are presented in Table 1.

We note the following features. First, cash-holdings of Chinese firms grew rapidly over the sample period. The average cash-holding increased more than five-fold from RMB 248.6 million in 1990 to RMB $1,488.3$ million in 2012.

Second, the growth of cash holdings was skewed to large firms in the later periods, as suggested by the faster growth of the mean cash holding relative to the 25 and 75 percentiles. Therefore, the rapid growth of the average financial liabilities seems mainly to have been driven by large firms.

Table 1: Description of variables for the 1990 - 2012 Compustat sample for publicly traded Chinese non-financial companies. Cash includes short-term investments; financial liabilities are defined as the sum of the short–term debt and the long-term debt; firm leverage is defined as financial liabilities devided by total assets.N is the number of observations. Unit for cash, financial liabilites and sales is RMB million.

Variables	Mean	25th per-centile	Median	75th per-centile	N	No. of firms
			A. 1990 - 2012			
cash	879.8	71.4	198.4	501.1	17993	1532
financial liabilities	1,911.1	119.0	318.1	893.0	17993	1532
sales	5,374.2	351.1	832.9	2,252.6	17993	1532
firm leverage	27.1%	15.1%	25.3%	36.7%	17993	1532
cash/sales	31.5%	10.4%	19.9%	37.9%	17993	1532
financial liabilities/sales	59.3%	19.0%	39.2%	72.4%	17993	1532
			B. 1990 - 2001 (Period 1)			
cash	248.6	23.9	79.1	205.8	4919	775
financial liabilities	607.7	74.3	170.0	390.4	4919	775
sales	1,226.7	192.2	388.4	838.3	4919	775
firm leverage	26.7%	16.3%	25.6%	35.6%	4919	775
cash/sales	31.1%	7.3%	17.1%	38.4%	4919	775
financial liabilities/sales	63.9%	24.0%	45.6%	78.3%	4919	775
			C. 2002 - 2007 (Period 2)			
cash	662.6	86.5	206.1	455.2	5873	1260
financial liabilities	1,533.5	164.0	382.8	915.3	5873	1260
sales	4,509.0	395.5	878.1	2,214.6	5873	1260
firm leverage	28.6%	17.1%	27.0%	38.0%	5873	1260
cash/sales	30.0%	10.8%	19.9%	36.5%	5873	1260
financial liabilities/sales	64.6%	21.0%	43.2%	79.7%	5873	1260
			D. 2008 - 2012 (Period 3)			
cash	1,488.3	135.6	354.0	838.3	7201	1499
financial liabilities	3,109.5	149.8	447.2	1,450.0	7201	1499
sales	8,912.8	587.8	1,393.4	3,799.1	7201	1499
firm leverage	26.1%	12.8%	23.7%	36.0%	7201	1499
cash/sales	33.0%	12.0%	21.2%	38.7%	7201	1499
financial liabilities/sales	51.9%	15.2%	32.3%	62.0%	7201	1499
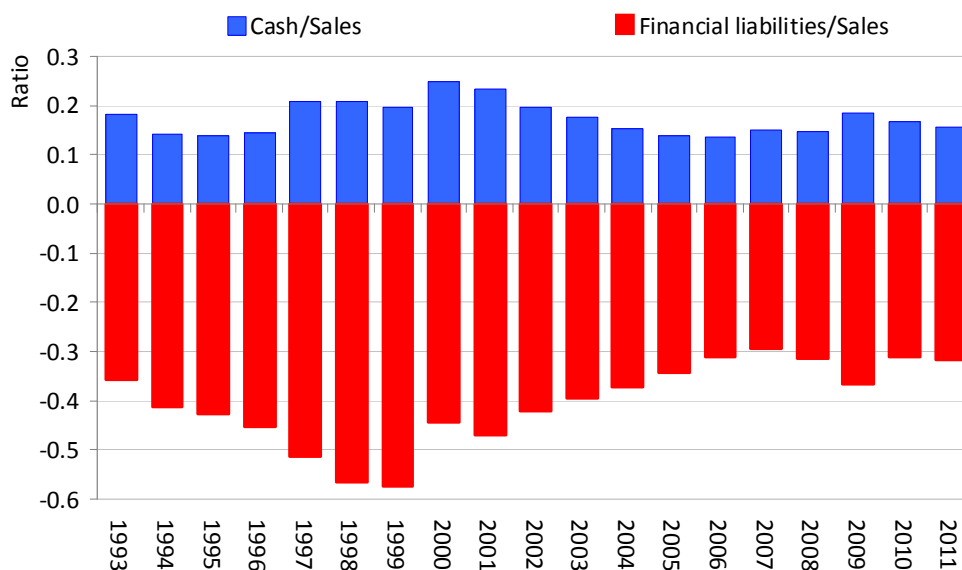
Figure 7: **China:** Ratio of aggregate cash to aggregate sales of firms in sample (positive bars) and ratio of aggregate financial liabilities to aggregate sales (negative bars)

Third, cash holdings grew faster than sales, which in turn grew more rapidly than financial liabilities. As a result, the ratio of cash to sales ratio has increased during the sample period, while the ratio of financial liabilities to sales has fallen in the sample period.

Figure 7 shows the cash to sales ratio and financial liabilities to sales ratio of the sample Chinese firms. The chart indicates that the cash to sales ratio co-moved with the financial liability to sales ratio Figure 8 is the scatter plot of cash holdings versus sales, plotted in log scale. The slope of the scatter is close to 1, suggesting that there is a roughly proportional relationship between cash holdings and sales, so that sales are a good normalizing variable for firm size. A roughly proportion relationship between cash and sales would be consistent with a "buffer stock" view of cash holdings, where firms hold cash to serve as a buffer against shocks to cash flows.

13
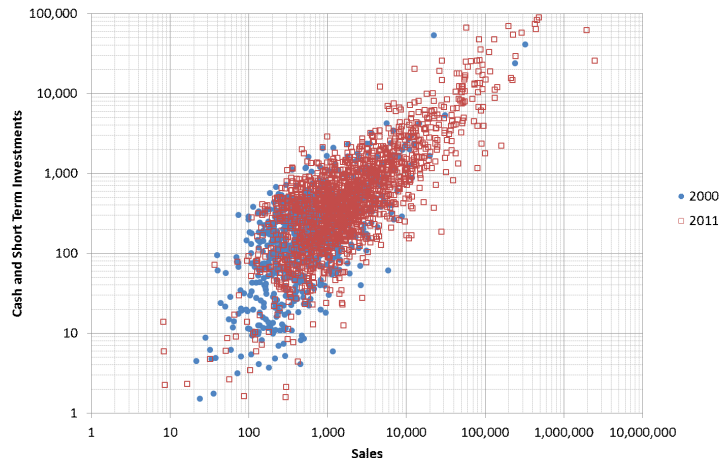
Figure 8: Scatter plot of cash vs sales in log scale for sample firms in 2000 and 2011.

3.2 Bond Issuance

As well as firm-level data, we will also employ aggregate corporate bond issuance series for non-financial firms from China as an aggregate explanatory variable in the panel regressions. Aggregate corporate bond issuance serves as an indicator of the availability of credit through debt markets. When the corporate bond is issued in foreign currency, the issuance series also serves as an indicator of global capital market conditions and the availability of credit to firms in China from international investors.

Figure 11 shows the total outstanding amounts of bonds for different sectors in China. The chart uses total depository data from China Central Depository and Clearing Co. Corporate bonds grew from literally nothing to RMB 5 trillion between 1997 and 2012. Even when the amounts are normalized relative to China's GDP, we see from Figure 10 that the corporate bonds outstanding has increased very rapidly from only 1% in 2005 to 10% of China's GDP by 2012.

Figure 11 shows the breakdown of total corporate bonds by instrument. The corporate bonds category encompasses commercial paper (CP) and medium-term notes (MTN), both of which are shorter maturity instruments. Medium-term notes (MTNs) have grown most

14
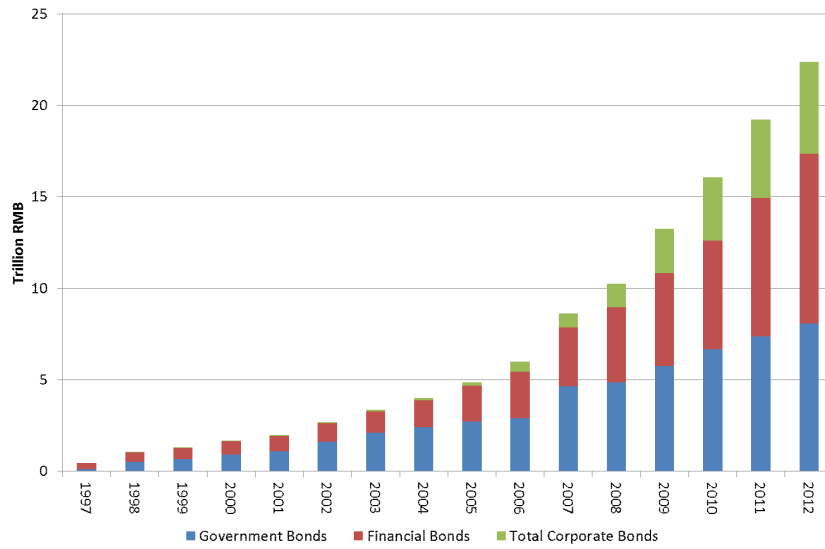
Figure 9: Total bond depository amount of China. Source: China Central Depository and Clearing Co..
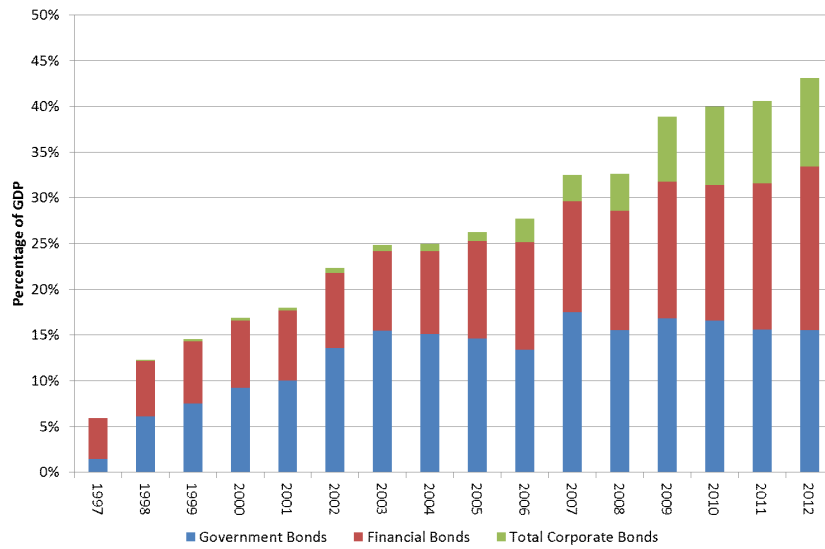
Figure 10: Total bond depository amount to GDP ratio in China. Source: China Central Depository and Clearing Co..
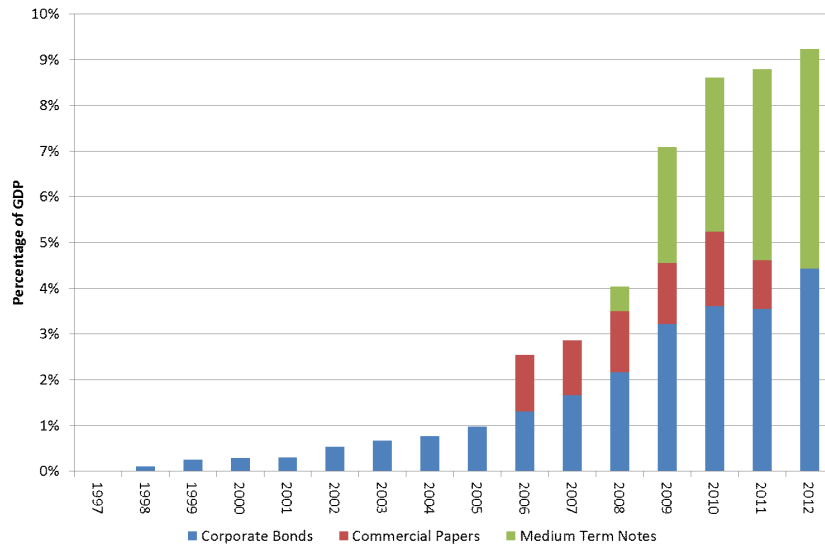
Figure 11: Breakdown of total corporate bond depository amount. Source: China Central Depository and Clearing Co..

significantly since their inception in 2008, indicating the increasing need for medium- term financing for Chinese firms By 2012, MTNs accounted for over half of the total corporate bonds.

Foreign currency bond issuance by Chinese firms has also increased rapidly in recent years. The outstanding balance increased from USD 4.7 billion in 2001 to USD 81.7 billion in 2012. Figure 12 plots the foreign currency bond outstanding relative to China's GDP by sector. We see that private issuance by firms was lower than the issuance by the government sector, but private issuance overtook government sector issuance in 2008 and has pulled away further since. As of 2012, foreign currency corporate bonds outstanding is around 1% of China GDP, while government bonds accounted for only 0.25%.

4 Panel Regressions for China

We proceed to examine panel regressions that ascertain how financial asset holdings vary with the firm's financial liabilities.
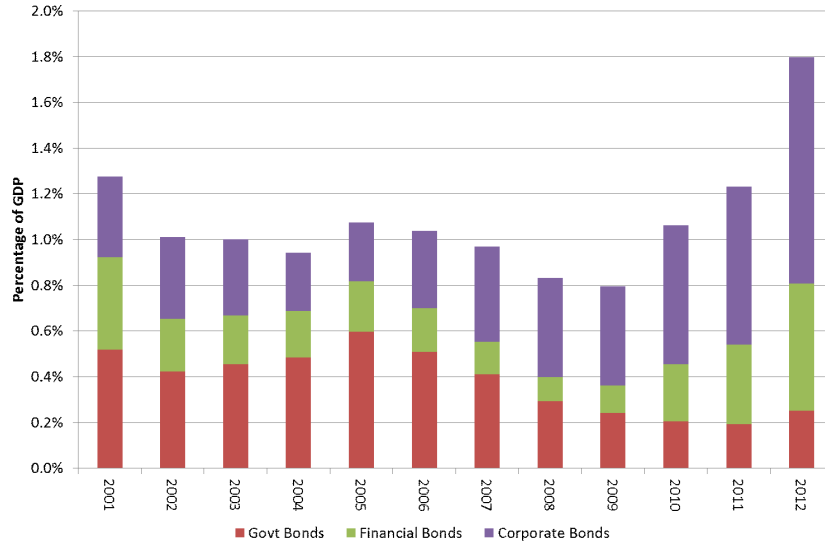
Figure 12: Foreign currency bond outstanding to GDP ratio by government, financial institutions and other corporates. Source: Asian Development Bank.

4.1 Panel regressions in log ratios

Our first set of panel regressions are for log of cash (including short-term investments) to sales ratio regressed on log of financial liabilities to sales ratio. Our interest is in the sign of the coefficient on log of financial liabilities to sales ratio. We include log sales and firm leverage, defined as financial liabilities to total assets, as control variables. We also include the full set of year fixed effects and firm fixed effects. Table 2 presents the regression results. We present results below on the case where we have dropped observations for firms that have zero financial liability at any date in the sample. Qualitatively, the results are unchanged when we include firms with zero debt, although the coefficient is smaller.

Column (1) is for the full sample. We see that the sign on ln(fin liab) is positive and significant at the 1% level. The coefficient of 0.209 implies that a 1% increase in financial liabilities to sales ratio in the cross-section translates into a 0.21% increase in cash and short-term investment holdings to sales ratio.

In columns (2) to (5), we examine subgroups of firms arranged into four size quartiles based on the average sales of the firms over the period. As large firms may have better

Table 2: **Chinese non-financial firms: panel regressions in log ratios (1990 - 2012).** Cash includes short-term investments; financial liabilities are defined as the sum of the short–term debt and the long-term debt; firm leverage is defined as financial liabilities devided by total assets. Quartiles are for average sales over the sample period. Robust t-statistics in parentheses. *** p¡0.01, ** p¡0.05, * p¡0.1

Dependent variable: ln(cash to sales)	(1)	(2)	(3)	(4)	(5)
	Full sample	Quartile 1	Quartile 2	Quartile 3	Quartile 4
ln(fin liab to sales)	0.209***	0.218***	0.0858	0.351***	0.425***
	(3.407)	(2.672)	(1.163)	(3.713)	(8.003)
ln(sales)	-0.160***	-0.131***	-0.151***	-0.163***	-0.121***
	(-5.544)	(-2.688)	(-3.271)	(-3.388)	(-3.200)
firm leverage	-1.353***	-1.372***	-0.735	-2.373***	-3.333***
	(-2.656)	(-2.636)	(-1.444)	(-3.780)	(-12.22)
manufacturing dummy×	0.0185	-0.0234	0.0487	0.0689	0.0249
ln(fin liab to sales)	(0.611)	(-0.377)	(0.789)	(1.016)	(0.439)
year fixed effects	yes	yes	yes	yes	yes
firm fixed effects	yes	yes	yes	yes	yes
constant	-2.075***	-0.201	-2.739***	-2.116***	-0.755***
	(-6.603)	(-0.510)	(-10.84)	(-6.935)	(-3.125)
Observations	17,993	3,974	4,373	4,752	4,894
R-squared	0.188	0.236	0.165	0.261	0.223
Number of firms	1,532	383	383	383	383

access to the capital market and are more likely to be engaging surrogate intermediation, we would expect that large firms to exhibit more of a positive association between their financial liabilities and cash holdings. This is indeed what we find. Except for Quartile 2, the coefficient on financial liabilities is significantly positive at the 1% level. We also see that larger firms have larger positive coefficients, implying a higher cross-section elasticity of cash holdings with respect to financial liabilities. For the highest quartile, the coefficient is 0.425, implying an elasticity of 42.5% for the increase in cash and short-term investments relative to financial liabilities.

Table 3 is also in log ratios, but replaces the time fixed effects with the aggregate corporate bond levels, given by the depository series of CCDC (China Central Depository and Clearing Co.). We would expect a positive coefficient on the corporate bond series, indicating intermediary activity of the firms leading to a positive association between bond financing and financial asset holding. We restrict the sample in Table 3 to firms with average sales above the median (i.e. firms in Quartile 3 and 4), and divide the sample period into three sub-periods: $1990 - 2001$, $2002 - 2007$, and $2008 - 2012$.

Table 3: **Chinese non-financial firms: panel regressions in log ratios (1990 - 2012).** Cash includes short-term investments; financial liabilities are defined as the sum of the short–term debt and the long-term debt; firm leverage is defined as financial liabilities devided by total assets. Aggregate corporate bond is the total depository number from China Central Depository and Clearing Co. Robust t-statistics in parentheses. *** p¡0.01, ** p¡0.05, * p¡0.1

Dependent variable: ln(cash to sales)	(1)	(2)	(3)	(4)
	1990-2012	1990-2001	2002-2007	2008-2012
ln(fin liab to sales)	0.345***	0.209*	0.396***	0.284***
	(5.168)	(1.803)	(5.687)	(3.456)
ln(sales)	-0.137***	-0.297***	-0.135**	-0.220***
	(-4.075)	(-3.130)	(-2.505)	(-4.673)
firm leverage	-2.420***	-1.655*	-3.663***	-1.478**
	(-4.710)	(-1.747)	(-10.57)	(-2.474)
manufacturing dummy×	0.0211	-0.0140	0.105	-0.136**
ln(fin liab to sales)	(0.488)	(-0.127)	(1.540)	(-2.310)
ln(aggregate corp bond)	0.0446***	0.523***	-0.0522**	0.196***
	(3.453)	(8.853)	(-2.370)	(6.908)
year fixed effects	no	no	no	no
firm fixed effects	yes	yes	yes	yes
constant	0.177	-0.597	1.140***	-0.781**
	(0.998)	(-1.238)	(3.903)	(-2.421)
Observations	8,519	1,621	3,266	3,632
R-squared	0.143	0.184	0.233	0.100
Number of firms	766	438	664	751

Table 3 shows that the positive relationship between financial liabilities and cash holdings is most pronounced in the period of $2002 - 2007$, consistent with the rapid growth of the corporate bond market in this period. Corporate bonds have positive impacts on firms' cash holdings with the exception of the $2002 - 2007$ period.

4.2 Panel regressions in growth rates

So far, we have examined panel regressions in log ratios that are designed to capture cross-section differences across firms in their surrogate intermediation activity.

An alternative approach is to examine panel regressions where the dependent variable is the log difference of cash holdings, and where explanatory variables are the log difference of sales and the log difference of financial liabilities. The rationale for the panel regressions in growth rates is to capture the direction of co-movement in the growth of cash holdings over time for individual firms with the growth in financial liabilities. The growth in sales plays

Table 4: **Chinese non-financial firms: panel regressions in log differences (1990 - 2012).** Cash includes short-term investments; financial liabilities are defined as the sum of the short–term debt and the long-term debt; firm leverage is defined as financial liabilities devided by total assets. Quartiles are for average sales over the sample period. Robust t-statistics in parentheses. *** p¡0.01, ** p¡0.05, * p¡0.1

Dependent variable: dln(cash)	(1)	(2)	(3)	(4)	(5)
	Full Sample	Quartile 1	Quartile 2	Quartile 3	Quartile 4
dln(fin liab)	0.268***	0.242***	0.225**	0.315***	0.342***
	(5.707)	(3.365)	(2.468)	(3.432)	(3.765)
dln(sales)	0.750***	0.807***	0.847***	0.707***	0.586***
	(18.74)	(13.13)	(10.73)	(9.608)	(7.795)
d(firm leverage)	-1.706***	-1.304**	-1.453*	-2.075***	-2.563***
	(-4.062)	(-2.250)	(-1.793)	(-2.796)	(-2.896)
manufacturing dummy×	0.0231	-0.0288	0.0180	0.0378	0.0636*
dln(fin liab)	(1.044)	(-0.646)	(0.413)	(0.714)	(1.722)
year fixed effects	yes	yes	yes	yes	yes
firm fixed effects	yes	yes	yes	yes	yes
constant	-1.146*	0.375	-0.000359	-3.014***	-0.762*
	(-1.912)	(0.937)	(-0.00189)	(-15.83)	(-1.877)
Observations	17,992	3,974	4,373	4,752	4,893
R-squared	0.512	0.499	0.522	0.525	0.542
Number of firms	1,532	383	383	383	383

the role of the scaling variable for firm size. All these panel regressions should include firm fixed effects, so that the coefficients reflect the time series changes only.

Table 4 presents our benchmark panel regressions where we also include the full set of time fixed effects to capture common shifts in the growth rates. Column (1) gives the panel regression results for the full sample, while Columns (2) to (5) present results for the size-sorted subsamples.

We see from Table 4 that the coefficient on dln(fin liab) is significantly positive for the full sample with coefficient at 0.268. For the size-sorted subsamples, firms in all the quartiles are significantly positive, and with much higher coefficients for the larger firms (0.315 for Quartile 3 and 0.342 for the largest quartile). These results lend further credence to the proposition that large non-financial firms engage in surrogate financial intermediation.

Interestingly, the interaction dummy between dln(fin liab) and the manufacturing sector dummy is significant for the largest firms.

Table 5 presents another set of panel regressions in log differences, but where we replace the time fixed effects with the growth of corporate bond levels, and where we examine

Table 5: **Chinese non-financial firms: panel regressions in log differences (1990 - 2012).** Cash includes short-term investments; financial liabilities are defined as the sum of the short–term debt and the long-term debt; firm leverage is defined as financial liabilities devided by total assets. Robust t-statistics in parentheses. *** p¡0.01, ** p¡0.05, * p¡0.1

Dependent variable: dln(cash)	(1)	(2)	(3)	(4)
	1990-2012	1990-2001	2002-2007	2008-2012
dln(fin liab)	0.349***	0.304**	0.438***	0.203**
	(5.284)	(2.189)	(6.061)	(2.254)
dln(sales)	0.529***	0.583***	0.501***	0.567***
	(10.54)	(4.718)	(8.053)	(8.708)
d(firm leverage)	-2.387***	-2.209*	-3.378***	-1.541**
	(-4.253)	(-1.941)	(-10.70)	(-2.242)
manufacturing dummy×	-0.0398	0.0517	-0.0148	-0.0420
dln(fin liab)	(-0.999)	(0.459)	(-0.215)	(-0.738)
dln(aggregate corp bond)	0.170***	0.233***	0.0903***	0.519***
	(8.307)	(5.239)	(3.984)	(9.176)
year fixed effects	no	no	no	no
firm fixed effects	yes	yes	yes	yes
constant	-0.0238***	0.125***	-0.0706***	-0.118***
	(-4.070)	(14.17)	(-7.367)	(-5.895)
Observations	8,172	1,274	3,266	3,632
R-squared	0.397	0.460	0.432	0.248
Number of firms	766	437	664	751

different subperiods. We see from Table 5 that the growth in the aggregate corporate bonds outstanding has a strongly positive coefficient and is significant at the 5% level for all the subperiods, and the coefficient reached as high as 0.438 in the period of $2008 - 2012$.

5 Comparison with US Non-Financial Firms

We have interpreted our results for firms in China as the consequence of surrogate intermediation activity of non-financial firms. A useful reality check on the interpretation of our results is to show that the results fail when we examine firms from an economy with an open financial sector that do not have the preconditions that lead firms to behave as intermediaries as they do in China.

With such a rationale in mind, we examine data from the United States and run exactly analogous panel regressions as those we have examined so far for China. The hypothesis is that the positive co-movement between financial assets and financial liabilities that we have

Table 6: **Compustat data for US non-financial firms (1987 - 2012).** Cash includes short-term investments; financial liabilities are defined as the sum of short–term debt and long-term debt; firm leverage is defined as financial liabilities divided by total assets. Cash, financial liabilities and sales are in USD millions.

Variables	Mean	25th percentile	Median	75th percentile	N	No. of firms
			A. 1987 - 2012			
cash	162.8	1.2	8.1	48.8	91536	10644
financial liabilities	868.3	6.0	55.9	400.0	91536	10644
sales	2,044.6	31.6	209.5	1,042.5	91536	10644
firm leverage	50.4%	17.3%	31.9%	48.0%	91536	10644
cash/sales	33.8%	1.3%	4.3%	13.6%	91536	10644
financial liabilities/sales	76.4%	13.0%	30.6%	69.8%	91536	10644
			B. 1987 - 2001 (Period 1)			
cash	73.4	0.8	5.0	27.0	62061	9029
financial liabilities	554.1	4.5	35.0	240.0	62061	9029
sales	1,304.7	23.8	139.6	666.0	62061	9029
firm leverage	40.4%	17.4%	32.4%	47.8%	62061	9029
cash/sales	30.7%	1.1%	3.6%	11.9%	62061	9029
financial liabilities/sales	69.0%	12.7%	29.1%	64.4%	62061	9029
			C. 2002 - 2007 (Period 2)			
cash	274.6	2.7	19.2	105.9	17601	4142
financial liabilities	1,276.4	10.9	149.7	694.3	17601	4142
sales	2,997.0	61.5	435.7	1,770.7	17601	4142
firm leverage	58.7%	17.0%	31.3%	49.0%	17601	4142
cash/sales	41.3%	1.6%	5.5%	15.7%	17601	4142
financial liabilities/sales	88.5%	13.7%	33.3%	77.7%	17601	4142
			D. 2008 - 2012 (Period 3)			
cash	464.4	5.3	39.4	209.2	11874	3128
financial liabilities	1,905.3	17.6	265.6	1,280.3	11874	3128
sales	4,499.8	105.3	729.4	2,815.0	11874	3128
firm leverage	90.5%	16.9%	30.8%	48.0%	11874	3128
cash/sales	38.5%	2.2%	7.3%	18.7%	11874	3128
financial liabilities/sales	97.2%	14.1%	36.3%	88.4%	11874	3128

confirmed for China fail to exist for US non-financial firms.

The data we use come from Compustat North America for the period of 1987 to 2012. Non-financial firms are defined as the firms with the GICS sector code does not equal to 40. We drop outliers, defined as firms with cash-to-sales ratio and financial liability-to-sales ratio below the 0.5 percentile and above the 99.5 percentile. After this sample selection, we have 10644 firms. Table 6 presents the summary statistics of the US sample.

Several features are worthy of note, especially in comparison to non-financial firms in China.

Mean cash holdings is larger than the 75 percentile, suggesting that cash and short–term
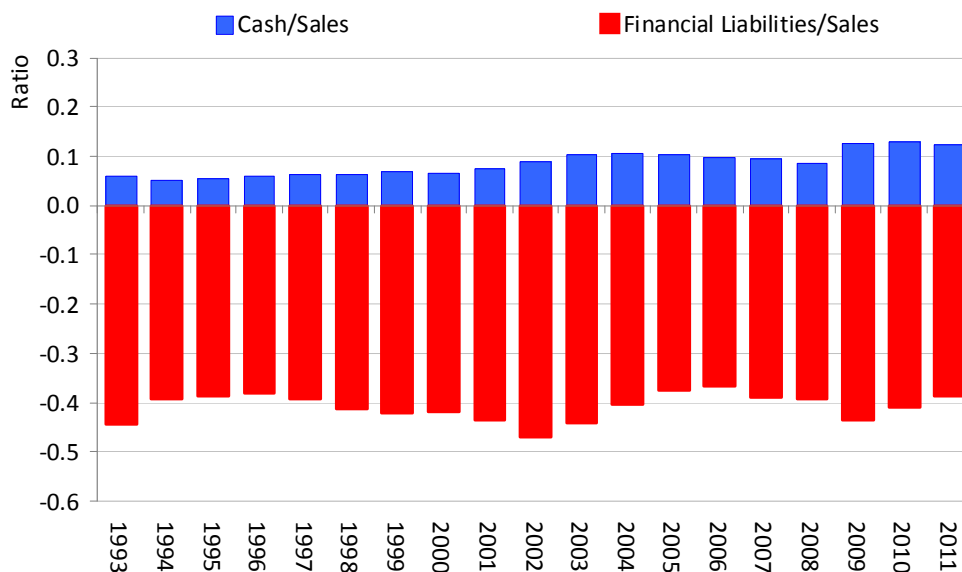
Figure 13: **United States:** Ratio of aggregate cash to aggregate sales of firms in sample (positive bars) and ratio of aggregate financial liabilities to aggregate sales (negative bars)

investments are concentrated in large firms, just as in China. The average cash holdings increased from \$73.4 million in the period $1987 - 2001$ to \$274.6 million in the period $2002 - 2007$.

US firms have much higher leverage than Chinese firms, but the average cash to sales ratio are similar between the samples for US and China. Taken together, the cash holdings as a fraction of financial liabilities is smaller in the US than in China. Figure 13 shows the cash to sales ratio and financial liabilities to sales of the sample US firms. Compared to Chinese firms, US firms demonstrated lower cash to sales ratios at below 10% level prior to 2008 and increased to above 10% level after 2009.

Figure 14 is the scatter plot of cash against sales in log scale at two snapshots in time - in 2000 and 2011. The scatter plot more dispersed than for China, especially for the smaller firms.

The key to the comparison between the US and China is to run the analogous panel regressions in both log ratios and for log differences that we ran for the China sample.
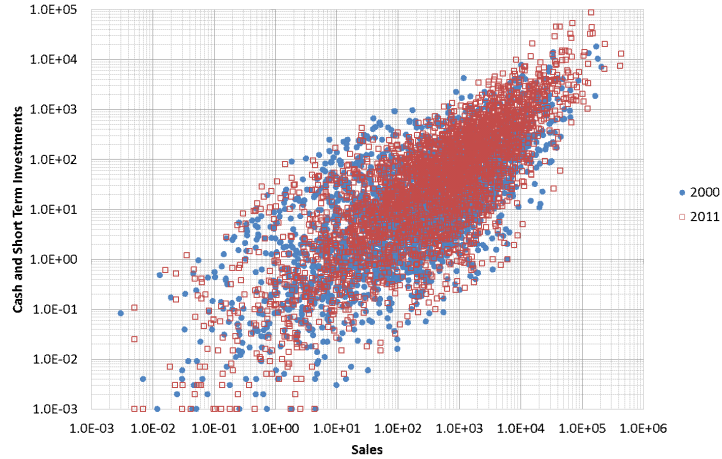
Figure 14: Scatter plot of cash vs. sales for the sample US firms in year 2000 and 2011. Unit: Million USD.

Table 7 shows the panel regressions in log levels, where we also divide the sample into size quartiles based on sales, and then run the main regression for each quartile separately.

We notice immediately the key difference between US firms and Chinese firms. The coefficient on log of financial liabilities to sales ratio in Table 7 is strongly negative for the overall sample. The only significantly positive coefficient is the one for the largest firms. However, the magnitude is only 0.0637, which is significantly smaller than its Chinese counterpart, which stands at 0.425. Thus, Table 7 suggests that firms in the US behave in line with the textbook pecking order theory of corporate financing where the cash holding and financial liabilities are negatively related except for the very large firms. There is no clear evidence that the US non-financial firms engage in surrogate financial intermediation that Chinese firms evidently do.

Table 8 is also in log ratios, but where the time fixed effects are replaced by aggregate corporate bond levels outstanding of the non-financial, corporate business sector (Table L102) of the US Flow of Funds. In addition, we present results for subperiods. Here again, in contrast to the results for Chinese firms, none of the columns in Table 8 show the positive coefficient on ln(fin liab) that we encountered for the panel results for Chinese firms. Taken

24

Table 7: **US non-financial firms: panel regressions in log ratios(1987- 2012).** Cash includes short-term investments; financial liabilities are defined as the sum of short–term debt and long-term debt; firm leverage is defined as financial liabilities divided by total assets. Quartiles are defined by the mean of sales for the sample period.

Dependent variable: ln(cash to sales)	(1)	(2)	(3)	(4)	(5)
	Full sample	Quartile 1	Quartile 2	Quartile 3	Quartile 4
ln(fin liab to sales)	-0.0389***	-0.0780***	-0.0384*	-0.0108	0.0637**
	(-3.631)	(-3.803)	(-1.715)	(-0.342)	(2.504)
ln(sales)	-0.415***	-0.604***	-0.453***	-0.349***	-0.327***
	(-31.62)	(-23.43)	(-18.31)	(-11.95)	(-13.29)
firm leverage	-0.00232**	-0.00193***	-0.0996**	-0.308*	-0.727***
	(-2.507)	(-2.718)	(-2.333)	(-1.850)	(-6.148)
manufacturing dummy×	-0.0821***	-0.0272	-0.132***	-0.119***	-0.0621*
ln(fin liab to sales)	(-4.891)	(-0.864)	(-3.692)	(-3.652)	(-1.901)
year fixed effects	yes	yes	yes	yes	yes
firm fixed effect	yes	yes	yes	yes	yes
constant	-1.169***	-1.263***	-1.315***	-1.415***	-1.009***
	(-19.01)	(-16.68)	(-14.30)	(-9.006)	(-5.704)
Observations	91,536	13,256	19,228	22,970	36,082
R-squared	0.070	0.133	0.088	0.060	0.086
Number of firms	10,644	2,661	2,661	2,661	2,661

Table 8: **US non-financial firms: panel regression in log ratios (1987- 2012).** Cash includes short-term investments; financial liabilities are defined as the sum of short–term debt and long-term debt; firm leverage is defined as financial liabilities divided by total assets. Quartiles are defined by the mean of sales for the sample period. Robust t-statistics from claustered standard errors at the firm level are in parentheses. *** p¡0.01, ** p¡0.05, * p¡0.1

Dependent variable: ln(cash to sales)	(1)	(2)	(3)	(4)
	1987-2012	1987-2001	2002-2007	2008-2012
ln(fin liab to sales)	0.0150	-0.0271	0.0459	0.0382
	(0.553)	(-0.910)	(1.597)	(1.089)
ln(sales)	-0.334***	-0.312***	-0.421***	-0.625***
	(-17.89)	(-13.71)	(-9.833)	(-10.70)
firm leverage	-0.412**	-0.308*	-0.562***	-0.426**
	(-2.353)	(-1.739)	(-5.065)	(-2.019)
manufacturing dummy×	-0.0906***	-0.0652**	-0.129***	-0.00841
ln(fin liab to sales)	(-3.890)	(-2.362)	(-3.192)	(-0.197)
ln(aggregate corp bond)	0.544***	0.0701*	0.632***	0.588***
	(17.25)	(1.727)	(4.201)	(6.853)
year fixed effects	no	no	no	no
firm fixed effects	yes	yes	yes	yes
constant	-5.279***	-2.137***	-5.216***	-3.190***
	(-23.99)	(-8.152)	(-4.801)	(-4.079)
Observations	59,052	37,739	12,526	8,787
R-squared	0.048	0.040	0.030	0.044
Number of firms	5,322	4,558	2,696	2,095

Table 9: **US non-financial firms: panel regression in log differences (1987- 2012).** Cash includes short-term investments; financial liabilities are defined as the sum of short–term debt and long-term debt; firm leverage is defined as financial liabilities divided by total assets. Quartiles are defined by the mean of sales for the sample period. Robust t-statistics from claustered standard errors at the firm level are in parentheses. *** p¡0.01, ** p¡0.05, * p¡0.1

Dependent variable: dln(cash)	(1)	(2)	(3)	(4)	(5)
	All firms	Quartile 1	Quartile 2	Quartile 3	Quartile 4
dln(fin liab)	0.0227**	0.0709***	-0.00859	-0.0162	0.0389**
	(2.426)	(3.552)	(-0.475)	(-0.886)	(2.078)
dln(sales)	0.682***	0.575***	0.684***	0.766***	0.719***
	(65.72)	(30.74)	(31.20)	(32.59)	(33.44)
d(firm leverage)	-0.00215***	-0.00153	-0.0666***	-0.00238***	-0.0276
	(-2.738)	(-1.459)	(-2.580)	(-14.90)	(-1.331)
manufacturing dummy ×	0.0119	-0.00792	0.0326	0.00736	0.00546
dln(fin liab)	(0.954)	(-0.303)	(1.321)	(0.300)	(0.240)
year fixed effects	yes	yes	yes	yes	yes
firm fixed effects	yes	yes	yes	yes	yes
constant	0.197***	-0.311***	-0.0662	0.156*	0.380***
	(4.874)	(-2.697)	(-0.759)	(1.883)	(5.448)
Observations	91,535	13,256	19,227	22,970	36,082
R-squared	0.255	0.305	0.244	0.210	0.275
Number of firms	10,644	2,661	2,661	2,661	2,661

together, the evidence from the panel regressions in log levels is that there is no systematic positive co-movement in cash holdings and financial liabilities that we saw for Chinese firms.

Table 9 presents the panel regressions in growth rates. The dependent variable is the log difference of cash and short-term investments, and the key explanatory variables are the log difference in financial liabilities, log difference in sales and firm leverage.

The coefficient on the log difference of financial liabilities is positive and significant for the smallest and largest firms. However, compared with the previous results, there is no consistent evidence of a positive co-movement of financial assets and liabilities that was a very strong and consistent feature of the China sample.

Finally, we run the panel regressions in log differences for the Quartile 3 and Quartile 4 firms of the US sample for different subperiods, with firm fixed effects. Table 10 presents the results. The coefficient on dln(fin liab) is positively significant for the post-crisis period. However, such relationship doesn't show for in the ratio regressions.

Table 10: **US non-financial firms: panel regression in log differences (1987- 2012).** Cash includes short-term investments; financial liabilities are defined as the sum of short–term debt and long-term debt; firm leverage is defined as financial liabilities divided by total assets. Quartiles are defined by the mean of sales for each subperiod. We drop firms with zero financial liabilities at any date. Robust t-statistics from claustered standard errors at the firm level are in parentheses. *** p¡0.01, ** p¡0.05, * p¡0.1

Dependent variable: dln(cash)	(1)	(2)	(3)	(4)
	1985-2012	1985-2001	2002-2007	2008-2012
dln(fin liab)	0.00945	-0.00325	0.0561*	0.104***
	(0.730)	(-0.209)	(1.718)	(2.886)
dln(sales)	0.758***	0.808***	0.476***	0.584***
	(49.44)	(44.63)	(10.42)	(10.89)
d(firm leverage)	-0.00255***	-0.00295***	-0.250***	-0.193**
	(-8.486)	(-8.323)	(-3.575)	(-2.470)
manufacturing dummy×	-0.00182	-0.00199	-0.0554	-0.0645
dln(fin liab)	(-0.108)	(-0.101)	(-1.230)	(-1.225)
dln(aggregate corp bond)	0.274***	0.232***	1.109***	1.297***
	(7.678)	(6.371)	(4.481)	(3.926)
year fixed effects	no	no	no	no
firm fixed effects	yes	yes	yes	yes
constant	0.00534***	-0.0128***	0.0184*	-0.0558*
	(2.599)	(-4.751)	(1.717)	(-1.901)
Observations	59,052	37,739	12,526	8,787
R-squared	0.242	0.280	0.082	0.151
Number of firms	5,322	4,558	2,696	2,095

Taken together with the results for China, the body of evidence from our panel regressions is that non-financial firms in China are quite different from those in the United States. Whereas firms in China display the tell-tale positive co-movement of financial assets and liabilities that is characteristic of financial intermediaries, there is no such evidence when we examine US firms.

Finally, in results not reported here, we find that the main conclusions we obtain are not driven by dropping firms with financial liabilities ever reaching zero. Even if we run the regressions for the whole sample, we still find that financial liabilities tend to have significantly positive effects on cash holdings for Chinese non-financial firms, just the magnitude would be smaller when we include the firms with zero financial liabilities. The relationship between cash holdings and financial liabilities does not exist for the US firms when we include all the firms.

6   Evidence for Firms from India

This section uses Indian firm-level data to test our theory. Data come from Compustat Global for the period of 1988 to 2012. Non-financial firms are defined as the firms with the GICS sector code does not equal to 40. We drop firms with cash-to-sales ratio and financial liability-to-sales ratio below the 0.5 percentile and above the 99.5 percentile. After the sample selection, there are 2379 firms. Table 11 shows the summary statistics of the sample firms.

Compared to Chinese firms, Indian firms tend to hold much less cash. The 25 percentile, 50 percentile and 75 percentile of cash to sales ratios of Indian firms are 1.5%, 3.5%, and 8.4% respectively. In contrast, their Chinese counterparts are 10.4%, 19.9%, and 37.9%.

Indian firms' distribution of leverage is more skewed to the right than the Chinese firms. The mean of financial liabilities to sales ratio of Indian firms is much higher than that of Chinese firms, while the 25, 50and 75 percentiles are similar to the percentile of the Chinese

Table 11: Description of variables for the 1988 - 2012 Compustat sample for publicly traded Indian non-financial companies. Data as of Nov. 30, 2013. Cash includes short-term investments; financial liabilities are defined as the sum of the short–term debt and the long-term debt; firm leverage is defined as financial liabilities devided by total assets. N is the number of non-missing observations in the sample for each variable. Cash, financial liabilites and sales are in INR millions.

Variables	Mean	25th percentile	Median	75th percentile	N	No. of firms
A. 1988 - 2012						
cash	1,601.5	8.8	36.3	187.7	23730	1963
financial liabilities	5,264.5	102.8	414.8	1,767.4	23730	1963
sales	12,293.6	347.8	1,182.3	4,213.2	23730	1963
firm leverage	35.5%	20.5%	34.9%	48.5%	23730	1963
cash/sales	9.7%	1.5%	3.5%	8.4%	23730	1963
financial liabilities/sales	91.3%	18.7%	36.9%	70.2%	23730	1963
B. 1988 - 2001 (Period 1)						
cash	87.5	3.5	10.3	32.7	4939	1386
financial liabilities	798.2	48.6	146.1	466.9	4939	1386
sales	1,984.5	139.7	390.5	1,035.3	4939	1386
firm leverage	36.5%	22.6%	37.2%	50.4%	4939	1386
cash/sales	7.5%	1.4%	3.0%	5.9%	4939	1386
financial liabilities/sales	98.5%	21.0%	40.1%	74.8%	4939	1386
C. 2002 - 2007 (Period 2)						
cash	995.2	9.4	35.6	162.2	9792	1892
financial liabilities	3,048.4	100.2	371.1	1,374.8	9792	1892
sales	8,408.2	357.6	1,100.4	3,379.1	9792	1892
firm leverage	34.2%	20.3%	34.1%	47.4%	9792	1892
cash/sales	9.7%	1.6%	3.6%	8.6%	9792	1892
financial liabilities/sales	86.7%	18.0%	35.5%	65.7%	9792	1892
D. 2008 - 2012 (Period 3)						
cash	3,092.2	19.4	90.3	467.6	8999	1913
financial liabilities	10,127.2	217.1	939.8	3,775.4	8999	1913
sales	22,179.6	769.1	2,586.5	9,200.8	8999	1913
firm leverage	36.2%	19.7%	34.8%	48.6%	8999	1913
cash/sales	11.0%	1.6%	3.9%	9.9%	8999	1913
financial liabilities/sales	92.3%	18.1%	36.5%	72.8%	8999	1913

Table 12: **Indian non-financial firms: panel regressions in log ratios (1988- 2012).** Cash includes short-term investments; financial liabilities are defined as the sum of short–term debt and long-term debt; firm leverage is defined as financial liabilities divided by total assets. Quartiles are defined by the mean of sales for the sample period.

Dependent variable: ln(cash to sales)	(1)	(2)	(3)	(4)	(5)
	Full sample	Quartile 1	Quartile 2	Quartile 3	Quartile 4
ln(fin liab to sales)	0.109***	0.0907**	0.0851	0.232***	0.209***
	(3.737)	(2.119)	(1.456)	(4.013)	(2.905)
ln(sales)	-0.208***	-0.377***	-0.241***	-0.0913**	-0.131***
	(-10.07)	(-10.11)	(-5.690)	(-2.511)	(-2.752)
firm leverage	-0.204	-0.330**	-0.0614	-1.824***	-1.708***
	(-1.362)	(-2.103)	(-1.045)	(-5.427)	(-6.105)
manufacturing dummy×	0.0143	-0.0188	-0.0346	0.136**	0.0945
ln(fin liab to sales)	(0.483)	(-0.428)	(-0.514)	(2.152)	(1.209)
year fixed effects	yes	yes	yes	yes	yes
firm fixed effect	yes	yes	yes	yes	yes
constant	-1.514***	-0.175	-2.066***	-1.768***	-0.202
	(-12.63)	(-0.971)	(-7.938)	(-6.789)	(-0.528)
Observations	23,520	6,199	6,147	5,955	5,219
R-squared	0.064	0.124	0.054	0.084	0.114
Number of firms	1,963	490	491	491	491

firms.

Indian firms' cash holdings relative to sales have experienced an upward trend from 1995 to 2012, an experience shared by Chinese firms.

We run similar regressions for India as we did for China and US. We first look at the regressions in log ratios, where the dependent variable is the natural logarithm of the firm's cash holdings divided by its sales. We divide the entire sample into four different sales quartiles and run the main regression for each quartile. Table 12 shows the results. Similar to China, the correlation between cash holdings to sales ratio and financial liabilities to sales ratio are positively significant. When we look at the subsamples by sales, the regression coefficients of financial liabilities on cash are significantly positive for all but Quartile 2. Firm leverage exhibits negatively significant correlation with cash holdings, except for the Quartile 2 firms.

Table 13 shows the results when we divide the sample period into different sub-periods and run the main regression for each period for the large firms (Quartile 3 and 4 firms). The

Table 13: **Indian non-financial firms: panel regressions in log ratios (1988- 2012).** Cash includes short-term investments; financial liabilities are defined as the sum of short–term debt and long-term debt; firm leverage is defined as financial liabilities divided by total assets. Quartiles are defined by the mean of sales for the sample period. Robust t-statistics from claustered standard errors at the firm level are in parentheses. *** p¡0.01, ** p¡0.05, * p¡0.1

Dependent variable: ln(cash to sales)	(1)	(2)	(3)	(4)
	1988-2012	1988-2001	2002-2007	2008-2012
ln(fin liab to sales)	0.227***	0.231*	0.349***	0.107*
	(4.992)	(1.765)	(5.839)	(1.679)
ln(sales)	-0.0995***	-0.250**	-0.00924	-0.304***
	(-3.496)	(-2.441)	(-0.165)	(-4.899)
firm leverage	-1.785***	-2.056***	-2.128***	-0.979***
	(-7.824)	(-3.722)	(-7.041)	(-3.530)
manufacturing dummy×	0.118**	0.249*	0.154**	0.109
ln(fin liab to sales)	(2.382)	(1.916)	(2.161)	(1.418)
year fixed effects	yes	yes	yes	yes
firm fixed effects	yes	yes	yes	yes
constant	-0.741***	-0.537	-2.101***	0.198
	(-3.619)	(-0.685)	(-4.761)	(0.374)
Observations	11,174	1,717	4,887	4,570
R-squared	0.092	0.129	0.108	0.080
Number of firms	982	625	954	960

results show that the coeffient of financial liabilities to sales ratio is significantly positive for all the subperiods and it is particularly strong at 0.349 for the $2002 - 2007$ period. This suggests that during the market boom period, the non-financial firms hoarded cash from financial liabilities.

Under the alternative specification, where we run the regression of the growth rate, the coefficient on dln(fin liab) is positively significant for all the quartiles, as shown in Table 14. Such result is consistent with the ratio regression results, suggesting that similar to Chinese firms, Indian firms also behave as surrogate financial intermediation.

Regressions for different time periods, for the large firms, as shown in Table 15, further confirms our hypothesis that the cash and financial liabilities of the Indian firms comove with each other. The regression coefficient of financial liabilities is positively significant for all the subperiods.

Table 14: **India non-financial firms: panel regressions in log differences (1988- 2012).** Cash includes short-term investments; financial liabilities are defined as the sum of short–term debt and long-term debt; firm leverage is defined as financial liabilities divided by total assets. Quartiles are defined by the mean of sales for the sample period. Robust t-statistics from claustered standard errors at the firm level are in parentheses. *** p¡0.01, ** p¡0.05, * p¡0.1

Dependent variable: dln(cash)	(1)	(2)	(3)	(4)	(5)
	All firms	Quartile 1	Quartile 2	Quartile 3	Quartile 4
dln(fin liab)	0.135***	0.127**	0.182***	0.278***	0.112**
	(5.274)	(2.383)	(3.706)	(5.550)	(2.324)
dln(sales)	0.665***	0.566***	0.691***	0.625***	0.727***
	(35.06)	(19.19)	(19.01)	(14.46)	(16.61)
d(firm leverage)	-0.129	-0.331*	-0.0852	-1.830***	-0.0250
	(-1.435)	(-1.689)	(-1.040)	(-5.821)	(-0.355)
manufacturing dummy ×	0.0311	0.0197	-0.0295	0.0756*	0.0602
dln(fin liab)	(1.164)	(0.356)	(-0.557)	(1.694)	(1.151)
year fixed effects	yes	yes	yes	yes	yes
firm fixed effects	yes	yes	yes	yes	yes
constant	0.780***	0.0810***	-0.162	-0.142	1.048***
	(11.54)	(12.42)	(-1.363)	(-1.032)	(7.275)
Observations	23,519	6,199	6,147	5,955	5,218
R-squared	0.353	0.316	0.352	0.426	0.363
Number of firms	1,963	490	491	491	491

Table 15: **Indian non-financial firms: panel regression in log differences (1988- 2012).** Cash includes short-term investments; financial liabilities are defined as the sum of short–term debt and long-term debt; firm leverage is defined as financial liabilities divided by total assets. Quartiles are defined by the mean of sales for the sample period. Robust t-statistics from claustered standard errors at the firm level are in parentheses. *** p¡0.01, ** p¡0.05, * p¡0.1

Dependent variable: dln(cash)	(1)	(2)	(3)	(4)
	1988-2012	1988-2001	2002-2007	2008-2012
dln(fin liab)	0.121***	0.409***	0.352***	0.238***
	(3.565)	(4.001)	(6.971)	(2.752)
dln(sales)	0.737***	0.511***	0.521***	0.503***
	(23.94)	(6.272)	(10.50)	(6.495)
d(firm leverage)	-0.104	-2.527***	-2.381***	-0.920***
	(-0.716)	(-3.645)	(-7.735)	(-3.033)
manufacturing dummy×	0.0488	0.0166	0.176***	0.00545
dln(fin liab)	(1.429)	(0.236)	(3.633)	(0.0541)
year fixed effects	yes	yes	yes	yes
firm fixed effects	yes	yes	yes	yes
constant	1.072***	-0.518	-0.0287	-0.0117
	(11.03)	(-0.822)	(-0.764)	(-0.351)
Observations	11,173	1,716	4,887	4,570
R-squared	0.386	0.580	0.333	0.110
Number of firms	982	624	954	960

Table 16: **Indonesian non-financial firms: panel regressions in log ratios (1990 2012).** Cash includes short-term investments; financial liabilities are defined as the sum of short–term debt and long-term debt; firm leverage is defined as financial liabilities divided by total assets. Quartiles are defined by the mean of sales for the sample period.

Dependent variable: ln(cash to sales)	(1)	(2)	(3)	(4)	(5)
	Full sample	Quartile 1	Quartile 2	Quartile 3	Quartile 4
ln(fin liab to sales)	0.0771	-0.0376	0.0540	0.111	0.151**
	(1.342)	(-0.367)	(0.441)	(0.661)	(2.354)
ln(sales)	0.0408**	0.0243	0.0178	0.0843**	-0.0244
	(2.015)	(0.597)	(0.400)	(2.558)	(-1.056)
firm leverage	-0.550***	-0.348	-0.645**	-0.534	-0.970***
	(-3.230)	(-1.123)	(-2.178)	(-1.551)	(-2.707)
manufacturing dummy×	0.0565	0.0208	0.134	0.250	-0.0932
ln(fin liab to sales)	(0.846)	(0.180)	(0.986)	(1.476)	(-0.939)
year fixed effects	yes	yes	yes	yes	yes
firm fixed effect	yes	yes	yes	yes	yes
constant	-0.365	-0.0877	-1.947**	-0.918*	-1.165*
	(-1.049)	(-0.162)	(-2.212)	(-1.891)	(-1.888)
Observations	3,070	663	780	765	862
R-squared	0.178	0.156	0.261	0.194	0.238
Number of firms	265	66	66	66	67

7 Evidence from Other Asian Economies

The surrogate financial intermediation behavior can also be found in other economies. We look into firms incorporated in Indonesia and Korea in this section. Again, we took Indonesian and Korean data from the Compustat Global data sets and define the non-financial firms as the ones with GICS sector code not equal to 40. We drop the outliers in the similar way as we did for China, US, and India. After the sample selection, there are 265 firms and 3,070 observations in the Indonesia sample, and 1,377 firms and 8,851 observations in the Korea sample[3].

We run similar regressions for Indonesian firms as we did for Chinese firms. Table 16 reports the results when the log of cash to sales ratio is the dependent variable and the log of financial liabilities to sales ratio is key the key explanatory variable.

The correlation between financial liabilities to sales ratio and cash holdings to sales ratio is positively significant for the largest firms. When we look at the regressions for log differences,

---

[3]Data summary of the two countries is avaible upon requrest.

Table 17: **Indonesia non-financial firms: panel regression in log differences (1990- 2012).** Cash includes short-term investments; financial liabilities are defined as the sum of short–term debt and long-term debt; firm leverage is defined as financial liabilities divided by total assets. Quartiles are defined by the mean of sales for the sample period. Robust t-statistics from claustered standard errors at the firm level are in parentheses. *** p¡0.01, ** p¡0.05, * p¡0.1

Dependent variable: dln(cash)	(1)	(2)	(3)	(4)	(5)
	Full sample	Quartile 1	Quartile 2	Quartile 3	Quartile 4
dln(fin liab)	0.176***	0.0231	0.287***	0.275**	0.265***
	(3.279)	(0.238)	(3.338)	(2.644)	(2.990)
dln(sales)	0.831***	0.991***	0.699***	0.737***	0.733***
	(15.24)	(9.982)	(8.036)	(7.739)	(8.023)
d(firm leverage)	-0.646***	-0.247	-0.855**	-0.881**	-0.934***
	(-3.518)	(-1.245)	(-2.366)	(-2.433)	(-3.515)
manufacturing dummy $\times$	-0.0162	-0.0893	0.0362	0.00442	-0.0192
dln(fin liab)	(-0.475)	(-0.924)	(0.778)	(0.0600)	(-0.361)
year fixed effects	yes	yes	yes	yes	yes
firm fixed effects	yes	yes	yes	yes	yes
constant	2.025***	2.343***	-0.118	1.539***	1.147*
	(6.372)	(14.05)	(-0.614)	(12.06)	(1.833)
Observations	3,069	663	780	764	862
R-squared	0.708	0.620	0.730	0.706	0.807
Number of firms	265	66	66	66	67

as shown Table 17, the coefficient on financial liabilities is positively significant for all but Quartile 1 firms. For the largest firms, the results are consistent under both specifications and the magnitudes are also sizable, at 0.151 and 0.265 respectively.

We further check the regressions in different periods for the large firms (Quartile 3 and 4 firms). Table 18 and Table 19 show the results under both specifications. It can be seen that the coefficient of financial liabilities is significant for the $2002 - 2007$ and $2008 - 2012$ periods, with the magnitudes above 0.2 level.

Taken together with the results for different sales quartiles, our regressions show that the large non-financial firms in Indonesia behave in a similar way as Chinese and Indian firms. Their financial assets and liabilities move in the same direction which is different from the textbook predictions.

Furthermore, we perform the similar exercise for Korean non-financial firms and run regressions in both log ratios and growth rates. Table 20 and Table 21 show the results for different sales quartiles. The coefficient for financial liabilities to sales ratio is positively

Table 18: **Indonesian non-financial firms: panel regression in log levels (1985- 2012).** Cash includes short-term investments; financial liabilities are defined as the sum of short–term debt and long-term debt; firm leverage is defined as financial liabilities divided by total assets. Quartiles are defined by the mean of sales for each subperiod. We drop firms with zero financial liabilities at any date. Robust t-statistics from claustered standard errors at the firm level are in parentheses. *** p¡0.01, ** p¡0.05, * p¡0.1

Dependent variable: ln(cash to sales)	(1)	(2)	(3)	(4)
	1990-2012	1990-2001	2002-2007	2008-2012
ln(fin liab to sales)	0.140*	0.158	0.416***	0.273*
	(1.847)	(1.494)	(3.136)	(1.965)
ln(sales)	0.0362*	-0.404**	-0.109	0.0267
	(1.757)	(-2.192)	(-0.461)	(1.636)
firm leverage	-0.643**	-0.722	-1.181**	-1.002**
	(-2.592)	(-1.526)	(-2.175)	(-2.124)
manufacturing dummy×	0.0673	-0.125	-0.0932	-0.287*
ln(fin liab to sales)	(0.675)	(-0.726)	(-0.709)	(-1.671)
year fixed effects	yes	yes	yes	yes
firm fixed effects	yes	yes	yes	yes
constant	-0.386	3.790*	-0.169	-2.382***
	(-1.200)	(1.771)	(-0.0497)	(-6.811)
Observations	1,627	478	536	613
R-squared	0.178	0.140	0.121	0.048
Number of firms	133	76	111	128

Table 19: **Indonesia non-financial firms: panel regression in log differences (1990- 2012).** Cash includes short-term investments; financial liabilities are defined as the sum of short–term debt and long-term debt; firm leverage is defined as financial liabilities divided by total assets. Quartiles are defined by the mean of sales for each subperiod. We drop firms with zero financial liabilities at any date. Robust t-statistics from claustered standard errors at the firm level are in parentheses. *** p¡0.01, ** p¡0.05, * p¡0.1

Dependent variable: dln(cash)	(1)	(2)	(3)	(4)
	1990-2012	1990-2001	2002-2007	2008-2012
dln(fin liab)	0.278***	0.232*	0.218**	0.265**
	(4.113)	(1.937)	(2.261)	(2.086)
dln(sales)	0.730***	0.821***	0.804***	0.711***
	(10.89)	(6.397)	(8.063)	(5.492)
d(firm leverage)	-0.974***	-0.681**	-1.077**	-1.194***
	(-4.237)	(-2.099)	(-2.203)	(-2.836)
manufacturing dummy×	-0.0121	0.00222	0.0270	-0.0220
dln(fin liab)	(-0.262)	(0.0208)	(0.317)	(-0.458)
year fixed effects	yes	yes	yes	yes
firm fixed effects	yes	yes	yes	yes
constant	1.562***	1.780***	-0.178**	-0.00759
	(21.82)	(11.03)	(-2.070)	(-0.134)
Observations	1,626	477	536	613
R-squared	0.753	0.622	0.601	0.862
Number of firms	133	76	111	128

Table 20: **Korean non-financial firms: panel regressions in log ratios (1993- 2012).** Cash includes short-term investments; financial liabilities are defined as the sum of short–term debt and long-term debt; firm leverage is defined as financial liabilities divided by total assets. Quartiles are defined by the mean of sales for the sample period.

Dependent variable: ln(cash to sales)	(1)	(2)	(3)	(4)	(5)
	Full sample	Quartile 1	Quartile 2	Quartile 3	Quartile 4
ln(fin liab to sales)	0.316***	0.295***	0.266***	0.204	0.337***
	(6.507)	(3.679)	(3.367)	(1.438)	(4.678)
ln(sales)	-0.157***	-0.382***	-0.304***	-0.194***	-0.130**
	(-4.605)	(-4.349)	(-3.471)	(-3.475)	(-2.431)
firm leverage	-1.545***	-1.556***	-1.644***	-1.258***	-1.488***
	(-8.538)	(-3.575)	(-4.256)	(-4.335)	(-4.907)
manufacturing dummy×	-0.0247	0.0170	0.0443	0.0181	-0.0629
ln(fin liab to sales)	(-0.455)	(0.172)	(0.466)	(0.125)	(-0.768)
year fixed effects	yes	yes	yes	yes	yes
firm fixed effect	yes	yes	yes	yes	yes
constant	0.583	3.705***	2.357***	0.814	0.203
	(1.568)	(4.310)	(2.873)	(1.318)	(0.307)
Observations	8,851	1,022	1,614	2,601	3,614
R-squared	0.102	0.225	0.185	0.103	0.090
Number of firms	1,377	344	344	344	345

significant for all but Quartile 3 firms in both specifications and the coefficient for the Quartile 3 firms is significantly positive in the regression in growth rates.

Table 22 and Table 23 show the results for the Quartile 3 and 4 firms over different time periods. The coefficient of financial liabilities is positively significant at 1% level for all the period under both specification. Moreover, the coefficient in for the $1993 - 2001$ period reaches as high as 0.671 in the ratio regression. Such results indicate that similar to Chinese non-financial firms, Korean non-financial corporates also behaves as surrogate financial intermediaries.

Results from both Indonesian and Korean firms suggest that the surrogate financial intermediaries behavior of the non-financial firms is not a phenomenon confined within China or India, but is shared by other emerging markets.

Table 21: **Korean non-financial firms: panel regressions in log differences (1993- 2012).** Cash includes short-term investments; financial liabilities are defined as the sum of short–term debt and long-term debt; firm leverage is defined as financial liabilities divided by total assets. Quartiles are defined by the mean of sales for the sample period. Robust t-statistics from claustered standard errors at the firm level are in parentheses. *** p¡0.01, ** p¡0.05, * p¡0.1

Dependent variable: dln(cash)	(1)	(2)	(3)	(4)	(5)
	All firms	Quartile 1	Quartile 2	Quartile 3	Quartile 4
dln(fin liab)	0.272***	0.279***	0.147*	0.339***	0.277***
	(7.575)	(3.606)	(1.729)	(3.809)	(4.864)
dln(sales)	0.458***	0.363***	0.411***	0.466***	0.551***
	(17.76)	(6.000)	(7.696)	(9.171)	(11.92)
d(firm leverage)	-1.537***	-1.642***	-1.718***	-1.441***	-1.408***
	(-10.56)	(-4.662)	(-5.228)	(-7.370)	(-4.737)
manufacturing dummy ×	0.00718	-0.0150	0.132	-0.0397	-0.0461
dln(fin liab)	(0.209)	(-0.190)	(1.510)	(-0.465)	(-0.914)
year fixed effects	yes	yes	yes	yes	yes
firm fixed effects	yes	yes	yes	yes	yes
constant	-0.150	0.523	-0.133	-0.0939	-0.179
	(-1.366)	(1.377)	(-0.339)	(-0.450)	(-1.320)
Observations	8,850	1,022	1,614	2,601	3,613
R-squared	0.320	0.313	0.277	0.304	0.389
Number of firms	1,377	344	344	344	345

Table 22: **Korean non-financial firms: panel regression in log levels (1993- 2012).** Cash includes short-term investments; financial liabilities are defined as the sum of short–term debt and long-term debt; firm leverage is defined as financial liabilities divided by total assets. Quartiles are defined by the mean of sales for the sample period. Robust t-statistics from claustered standard errors at the firm level are in parentheses. *** p¡0.01, ** p¡0.05, * p¡0.1

Dependent variable: ln(cash to sales)	(1)	(2)	(3)	(4)
	1993-2012	1993-2001	2002-2007	2008-2012
ln(fin liab to sales)	0.312***	0.671***	0.255***	0.246***
	(4.490)	(3.865)	(2.975)	(3.103)
ln(sales)	-0.131***	-0.0877	-0.297***	-0.154***
	(-3.295)	(-1.132)	(-3.932)	(-2.698)
firm leverage	-1.402***	-1.567***	-1.648***	-1.774***
	(-6.473)	(-5.344)	(-4.197)	(-4.874)
manufacturing dummy×	-0.0543	-0.163	-0.0795	0.0544
ln(fin liab to sales)	(-0.731)	(-0.956)	(-0.844)	(0.671)
year fixed effects	yes	yes	yes	yes
firm fixed effects	yes	yes	yes	yes
constant	0.139	-0.0687	2.262**	0.708
	(0.295)	(-0.0735)	(2.379)	(1.002)
Observations	6,215	1,598	2,076	2,541
R-squared	0.084	0.160	0.073	0.100
Number of firms	689	309	459	650

Table 23: **Korea non-financial firms: panel regression in log differences (1993- 2012).** Cash includes short-term investments; financial liabilities are defined as the sum of short–term debt and long-term debt; firm leverage is defined as financial liabilities divided by total assets. Quartiles are defined by the mean of sales for the sample period. Robust t-statistics from claustered standard errors at the firm level are in parentheses. *** p¡0.01, ** p¡0.05, * p¡0.1

Dependent variable: dln(cash)	(1)	(2)	(3)	(4)
	1993-2012	1993-2001	2002-2007	2008-2012
dln(fin liab)	0.306***	0.462***	0.306***	0.282***
	(6.600)	(3.677)	(4.234)	(3.542)
dln(sales)	0.511***	0.569***	0.446***	0.491***
	(15.11)	(7.838)	(6.403)	(8.444)
d(firm leverage)	-1.420***	-1.266***	-1.873***	-1.383***
	(-7.640)	(-4.317)	(-4.796)	(-3.922)
manufacturing dummy×	-0.0400	-0.161	-0.0275	-0.0131
dln(fin liab)	(-0.932)	(-1.402)	(-0.357)	(-0.185)
year fixed effects	yes	yes	yes	yes
firm fixed effects	yes	yes	yes	yes
constant	-0.158	-0.107	-0.0214	0.167***
	(-1.393)	(-0.958)	(-0.476)	(4.492)
Observations	6,214	1,597	2,076	2,541
R-squared	0.349	0.491	0.217	0.301
Number of firms	689	309	459	650

8 Implications and Conclusions

Our findings hold important lessons for the way we interpret aggregate financial time series in emerging economies and their exposure to global financial conditions. Our investigation raises a number of important questions, both on the cross-country differences in the surrogate intermediation activity by firms, as well as on the policy implications and lessons for policy makers.

One important lesson is that when firms operate across borders, the traditional indicators of vulnerability based on net external debt positions may not be very informative. Much more informative concerning the exposures and actions of the firms themselves will be the consolidated balance sheets that straddle the border. The guiding principle when we look to available data for insights should be that they shed light on behavior. In the case of firms that straddle borders, it would be more illuminating to look at the consolidated balance sheet that motivates corporate treasurers, rather than the balance of payments statistics that are

organized according to residence. Since firms' activities are influenced by the regulatory regime itself, it would be reasonable to conjecture that firms with headquarters in tightly regulated jurisdictions are more likely to engage in the type of surrogate intermediation activities that we have described in this paper.

When global credit conditions are easy, the firm may be tempted to take on US dollar debt and engineer a net short position in US dollars on the consolidated balance sheet in order to benefit from the appreciation of the domestic currency. Such currency exposures may be achieved even if no flows actually take place across borders. When such currency mismatches are then exposed to tighter US dollar funding conditions, then the concerted attempt by firms to reduce their dollar liabilities will exert even greater pressure on the exchange rate, as currency weakness and selling pressure combine to amplify the initial shock.

Another implication is that the sub-component of the money stock that corresponds to corporate deposits may convey useful information on the extent of surrogate intermediation by non-financial firms. Since corporate deposits in the formal banking sector reflects the size of financial assets held by firms performing surrogate intermediation, the money stock can play a role as an indicator of the stage of the financial cycle.

Further research may uncover additional details that can inform the policy debates on the impact of monetary policy tightening in advanced economies on the fortunes of emerging economies.

Table 24: **Chinese non-financial firms: panel regressions in log levels (1990- 2012).** Cash includes short-term investments; financial liabilities are defined as the sum of short–term debt and long-term debt; firm leverage is defined as financial liabilities divided by total assets. Quartiles are defined by the mean of sales for the sample period.

Dependent variable: ln(cash)	(1)	(2)	(3)	(4)	(5)
	Full sample	Quartile 1	Quartile 2	Quartile 3	Quartile 4
ln(fin liab to sales)	0.183***	0.222***	0.0812	0.353***	0.376***
	(2.897)	(2.798)	(1.111)	(3.914)	(8.170)
ln(sales)	0.617***	0.667***	0.731***	0.441***	0.436***
	(13.91)	(11.22)	(10.91)	(6.732)	(9.080)
firm leverage	-1.352***	-1.373***	-0.732	-2.367***	-3.290***
	(-2.665)	(-2.636)	(-1.447)	(-3.769)	(-12.19)
manufacturing dummy×	0.0593***	-0.0295	0.0544	0.0643	0.0972***
ln(fin liab)	(2.703)	(-0.542)	(1.112)	(1.313)	(2.718)
year fixed effects	yes	yes	yes	yes	yes
firm fixed effect	yes	yes	yes	yse	yes
constant	-2.095***	-0.203	-2.710***	-2.087***	-0.879***
	(-6.985)	(-0.517)	(-10.73)	(-6.874)	(-3.096)
Observations	17,993	3,974	4,373	4,752	4,894
R-squared	0.607	0.477	0.529	0.662	0.759
Number of firms	1,532	383	383	383	383

Appendix

A   Panel Regressions in Log Levels

We list the tables for the regression on log levels for China, US, India, Indonesia and Korea.

Table 25: **US non-financial firms: panel regressions in log levels (1987- 2012).** Cash includes short-term investments; financial liabilities are defined as the sum of short–term debt and long-term debt; firm leverage is defined as financial liabilities divided by total assets. Quartiles are defined by the mean of sales for the sample period.

Dependent variable: ln(cash)	(1)	(2)	(3)	(4)	(5)
	Full sample	Quartile 1	Quartile 2	Quartile 3	Quartile 4
ln(fin liab to sales)	-0.0695***	-0.0656***	-0.0650***	-0.0555*	0.0164
	(-6.883)	(-3.110)	(-3.061)	(-1.793)	(0.680)
ln(sales)	0.657***	0.483***	0.635***	0.708***	0.640***
	(45.06)	(20.94)	(21.36)	(18.27)	(18.97)
firm leverage	-0.00231**	-0.00194***	-0.0989**	-0.313*	-0.735***
	(-2.455)	(-2.733)	(-2.258)	(-1.883)	(-6.141)
manufacturing dummy×	-0.00721	-0.0599*	-0.0669**	-0.00884	0.0549**
ln(fin liab)	(-0.476)	(-1.691)	(-2.173)	(-0.289)	(2.247)
year fixed effects	yes	yes	yes	yes	yes
firm fixed effect	yes	yes	yes	yes	yes
constant	-1.154***	-1.263***	-1.285***	-1.393***	-1.028***
	(-18.68)	(-16.70)	(-13.90)	(-8.806)	(-5.792)
Observations	91,536	13,256	19,228	22,970	36,082
R-squared	0.231	0.101	0.179	0.222	0.365
Number of firms	10,644	2,661	2,661	2,661	2,661

Table 26: **India non-financial firms: panel regressions in log levels (1988- 2012).** Cash includes short-term investments; financial liabilities are defined as the sum of short–term debt and long-term debt; firm leverage is defined as financial liabilities divided by total assets. Quartiles are defined by the mean of sales for the sample period.

Dependent variable: ln(cash)	(1)	(2)	(3)	(4)	(5)
	Full sample	Quartile 1	Quartile 2	Quartile 3	Quartile 4
ln(fin liab to sales)	0.135***	0.153***	0.116**	0.287***	0.243***
	(5.002)	(3.463)	(2.140)	(5.409)	(3.968)
ln(sales)	0.673***	0.542***	0.700***	0.596***	0.599***
	(28.89)	(17.29)	(16.67)	(13.08)	(8.703)
firm leverage	-0.203	-0.328**	-0.0618	-1.782***	-1.679***
	(-1.361)	(-2.176)	(-1.060)	(-5.373)	(-5.978)
manufacturing dummy×	-0.0241	-0.115**	-0.0777	0.0476	0.0381
ln(fin liab)	(-0.999)	(-2.418)	(-1.326)	(1.121)	(0.843)
year fixed effects	yes	yes	yes	yes	yes
firm fixed effect	yes	yes	yes	yes	yes
constant	-1.509***	-0.0641	-2.032***	-1.868***	-0.192
	(-12.63)	(-0.348)	(-8.059)	(-7.179)	(-0.499)
Observations	23,520	6,199	6,147	5,955	5,219
R-squared	0.485	0.321	0.434	0.582	0.616
Number of firms	1,963	490	491	491	491

Table 27: **Indonesia non-financial firms: panel regressions in log levels (1990- 2012).** Cash includes short-term investments; financial liabilities are defined as the sum of short–term debt and long-term debt; firm leverage is defined as financial liabilities divided by total assets. Quartiles are defined by the mean of sales for the sample period.

Dependent variable: ln(cash)	(1)	(2)	(3)	(4)	(5)
	Full sample	Quartile 1	Quartile 2	Quartile 3	Quartile 4
ln(fin liab to sales)	0.0889*	-0.0552	0.0289	0.256*	0.169**
	(1.721)	(-0.539)	(0.312)	(1.882)	(2.236)
ln(sales)	0.930***	1.043***	0.897***	0.809***	0.865***
	(17.42)	(10.82)	(9.037)	(5.983)	(10.66)
firm leverage	-0.548***	-0.345	-0.678**	-0.439	-1.000***
	(-3.242)	(-1.104)	(-2.381)	(-1.168)	(-2.870)
manufacturing dummy×	0.0354	0.0436	0.159**	0.0182	-0.125***
ln(fin liab)	(0.977)	(0.543)	(2.444)	(0.285)	(-2.687)
year fixed effects	yes	yes	yes	yes	yes
firm fixed effect	yes	yes	yes	yes	yes
constant	-0.369	0.0485	-2.306***	-0.919*	-1.071*
	(-1.078)	(0.0907)	(-3.027)	(-1.769)	(-1.798)
Observations	3,070	663	780	765	862
R-squared	0.739	0.650	0.815	0.717	0.775
Number of firms	265	66	66	66	67

Table 28: **Korea non-financial firms: panel regressions in log levels (1993- 2012).** Cash includes short-term investments; financial liabilities are defined as the sum of short–term debt and long-term debt; firm leverage is defined as financial liabilities divided by total assets. Quartiles are defined by the mean of sales for the sample period.

Dependent variable: ln(cash)	(1)	(2)	(3)	(4)	(5)
	Full sample	Quartile 1	Quartile 2	Quartile 3	Quartile 4
ln(fin liab to sales)	0.309***	0.341***	0.263***	0.177	0.309***
	(7.159)	(4.138)	(3.114)	(1.555)	(4.670)
ln(sales)	0.545***	0.317***	0.393***	0.588***	0.576***
	(13.51)	(4.114)	(5.415)	(7.564)	(8.733)
firm leverage	-1.550***	-1.567***	-1.638***	-1.267***	-1.505***
	(-8.610)	(-3.557)	(-4.303)	(-4.362)	(-4.987)
manufacturing dummy×	-0.0146	-0.0726	0.0458	0.0496	-0.0223
ln(fin liab)	(-0.339)	(-0.781)	(0.473)	(0.454)	(-0.368)
year fixed effects	yes	yes	yes	yes	yes
firm fixed effect	yes	yes	yes	yes	yes
constant	0.589	3.755***	2.365***	0.776	0.231
	(1.573)	(4.552)	(2.877)	(1.210)	(0.348)
Observations	8,851	1,022	1,614	2,601	3,614
R-squared	0.364	0.188	0.244	0.283	0.490
Number of firms	1,377	344	344	344	345

References

Bates, T. W., K. M. Kahle, and R. M. Stulz (2009). Why do us firms hold so much more cash than they used to? *The Journal of Finance 64*(5), 1985–2021.

Denis, D. J. and V. Sibilkov (2010). Financial constraints, investment, and the value of cash holdings. *Review of Financial Studies 23*(1), 247–269.

Dittmar, A., J. Mahrt-Smith, and H. Servaes (2003). International corporate governance and corporate cash holdings. *Journal of Financial and Quantitative analysis 38*(1), 111–134.

Duchin, R. (2010). Cash holdings and corporate diversification. *The Journal of Finance 65*(3), 955–992.

Fama, E. F. and K. R. French (2005). Financing decisions: who issues stock? *Journal of Financial Economics 76*(3), 549–582.

Ferreira, M. A. and A. S. Vilela (2004). Why do firms hold cash? evidence from emu countries. *European Financial Management 10*(2), 295–319.

Foley, C. F., J. C. Hartzell, S. Titman, and G. Twite (2007). Why do firms hold so much cash? a tax-based explanation. *Journal of Financial Economics 86*(3), 579–607.

Frank, M. Z. and V. K. Goyal (2003). Testing the pecking order theory of capital structure. *Journal of Financial Economics 67*(2), 217–248.

Harford, J. (1999). Corporate cash reserves and acquisitions. *The Journal of Finance 54*(6), 1969–1997.

Hattori, M., H. S. Shin, and W. Takahashi (2009). A financial system perspective on japan's experience in the late 1980s. Technical report, Institute for Monetary and Economic Studies, Bank of Japan.

Haushalter, D., S. Klasa, and W. F. Maxwell (2007). The influence of product market dynamics on a firm's cash holdings and hedging behavior. *Journal of Financial Economics 84*(3), 797–825.

Leary, M. T. and M. R. Roberts (2010). The pecking order, debt capacity, and information asymmetry. *Journal of Financial Economics 95*(3), 332–355.

Lie, E. (2000). Excess funds and agency problems: an empirical study of incremental cash disbursements. *Review of Financial Studies 13*(1), 219–248.

Lins, K. V., H. Servaes, and P. Tufano (2010). What drives corporate liquidity? an international survey of cash holdings and lines of credit. *Journal of Financial Economics 98*(1), 160–176.

Myers, S. C. (1984). The capital structure puzzle. *The Journal of Finance 39*(3), 574–592.

Opler, T., L. Pinkowitz, R. Stulz, and R. Williamson (1999). The determinants and implications of corporate cash holdings. *Journal of Financial Economics 52*(1), 3–46.

Shyam-Sunder, L. and S. C. Myers (1999). Testing static tradeoff against pecking order models of capital structure. *Journal of Financial Economics 51*(2), 219–244.