Bank Concentration and Liquidity Crunch: Evidence from Emerging Markets

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Abstract

There is ample evidence on economic relevance of the market structure of banking sector to economic growth. Little is known, however, about the role played by the market structure when the banking sector itself is in turmoil and therefore when credit supply is impaired. Focusing on emerging countries, we investigate the relationship between banking system structure and firm performance using data from 20 emerging countries surrounding the 2007-2009 financial crisis as a natural experiment. We find that during the 2007- 2009 global financial crisis, firms in need for external liquidity financing in countries with higher level of bank concentration, bank development, and foreign bank presence tend to suffer a disproportionately smaller decline in stock prices during the crisis.

Key Words: Banking Concentration; External Financing; Financial Crisis; Bank Development

JEL Classification: G1, G2

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1. Introduction

The studies in the bank lending literature have shown that the credit made available by banks to firms can be affected by several factors. These factors include variations in bank liquidity (Khwaja and Mian, 2008; Paravisini, 2008; Loutskina and Strahan, 2009), exogenous shocks to bank capital (Ashcraft, 2005; Lemmon and Roberts, 2009; Leary, 2009), and changes in the wholesale funding markets (Ivashina and Scharfstein, 2010a, 2010b; Strahan, 2009). In addition, studies have also documented that, from cross-country perspectives, declines in international bank loans may also cause liquidity constraints to local banks that rely on foreign banks' lending as sources for funding, and lead to reductions in domestic credit supply. For instance, Peek and Rosengren (1997) report that the lending made by Japanese banks to U.S. firms was severely affected by the financial shocks in Japan in the 1990s, suggesting that financial shocks may be transmitted internationally from lending countries (to be referred to as home countries) to borrowing countries (to be referred to as host countries). Using the 2007-2009 global financial crisis data, Tong and Wei (2011) also show that the sudden decline in foreign bank loans during the crisis transmitted the liquidity crunch in the U.S. banking sector to emerging countries and affected local firms' stock performance.

While the 2007- 2009 crisis affected nearly all the emerging countries, there is significant variation in the severity of liquidity crunch across countries. In this paper, we show that the reason some countries and firms performed better during the crisis can be related to the structure of the banking system in these countries. We focus on emerging countries because of the unique feature of banking systems in these economies. Banks in emerging countries, on one hand, are the major source of external funding for financially constrained firms, and they are

providers of much needed credit to firms for operation and growth. On the other hand, banks in emerging countries tend to rely heavily on foreign banks to fund their need for liquidity and they tend to cut lending to firms when liquidity constraints occur. As a result, a sudden decline in international bank lending caused by financial crisis in foreign countries could adversely affect credit supply provided by local banks and thus the local economy may be undesirably disrupted.

The banking literature has suggested two competing theories in explaining the effect of banking structure on economic growth. The "market power" theory argues that bank concentration has a negative impact on economic growth, because large banks in a concentrated banking system may take advantage of their market power and charge a higher price for credit and thus reduce credit availability to firms (Elsas, 2005; Boot and Thakor, 2000; Ongena and Smith, 2000). The "information asymmetry" theory, on the other hand, contends a positive relationship between bank market concentration and economic growth. Based on this theory, a concentrated banking system provides incentives for banks to establish a close relationship with borrowers in order to reduce costs associated with asymmetric information. Bank concentration, therefore, increases availability of credit to firms through relationship lending and thus reduces firms' financial constraints. As a result, bank concentration enhances economic growth (Boot, 2000; Dell'Ariccia and Marquez, 2004; Petersen and Rajan, 1994 and 1995).

The empirical evidence regarding the effect of bank concentration on credit availability and economic growth is, however, mixed. On one hand, Petersen and Rajan (1994, 1995), Berlin and Mester (1998), and Ratti et al. (2008) show firms in highly concentrated banking markets are subject to less financial constraints; On the other hand, the study of Cetorelli and Gambera

(2001) reports a negative effect of bank concentration on economic growth and the negative effect is widespread across all sectors for all firms indiscriminately.

Studies of emerging countries suggest that bank concentration and long-term lender-borrower relationship tend to be more important in solving the adverse selection and moral hazard problems between firms and banks in emerging countries, because information production costs on borrowers' credit quality in these countries tend to be higher due to weaker legal systems and poorer institutional infrastructure (La Porta et al., 1997, 1998). González and González (2008) analyze firms in 39 countries and conclude that bank concentration is beneficial to firms in expanding firms' access to long-term debt, especially in countries that provide weak protections of creditors' right.

Little empirical work has been done to examine the role played by banking market structure during financial crises when credit availability is severely impaired and obtaining external funding becomes extremely difficult. If bank concentration favors lending relationships, then during a financial turmoil, bank concentration should be beneficial to firms by providing continuing external funding to firms and thus alleviating the adverse impact of crisis. However, examining the potential effect of bank concentration on firms during financial crises is complicated by the potential endogeneity between concentration and financial crisis. Beck, Demirgüc-Kunt, and Levine (2006) study the effect of bank concentration on financial stability and find that there is a significantly negative correlation between banking crises and bank concentration. This correlation between bank concentration and financial crisis complicates the study of the effect of bank concentration on firms' financing in the event of a financial crisis. For emerging countries, however, the 2007- 2009 global financial crisis is not a home-grown banking crisis; instead, it was caused by an exogenous shock spread from the U.S. to these

economies. Therefore, the 2007- 2009 financial crisis provides a unique opportunity to empirically examine the effect of bank concentration on economic growth when the local banking system experiences exogenous shocks.

In this study we posit that during financial crisis, while the domestic credit supply may have been impaired and firms' access to external financing may have been limited at large, a concentrated banking system may alleviate the adverse impact of the liquidity crunch by helping firms acquire the needed capital through the continuing lending relationship that has been built up over the years before the crisis. We use firm-level data from 20 emerging countries to investigate whether bank concentration is beneficial to firms in these countries during the recent crisis. Our objective is to examine the stock price performance of firms in need for liquidity to see if their stock prices change differently with different level of bank concentration in different countries. The reason of examining changes in stock price is because in many emerging countries banks are the major, if not the only, source of external funding for many firms. The exogenous liquidity shock to the banking sectors is likely to be transmitted to firms because liquidity-constrained banks tend to cut their lending to firms when banks themselves suffer liquidity shocks (Bernanke and Blinder, 1992; Kaminsky and Reinhart, 1999). The reduction in credit availability to firms would then lead to reductions in production when firms cannot obtain funding to finance operation and investment activities, which then would be reflected in stock prices. Moreover, firms that are more dependent on external financing are expected to be more adversely affected by the liquidity crunch.

We find that during the 2007- 2009 global financial crisis, the stock prices for the manufacturing firms in the 20 emerging markets we study declined dramatically, suggesting a liquidity crunch transmitted from the financial sector in the U.S. to the manufacturing sector in

emerging countries. In addition, we find that the magnitude of decline varies across countries and the magnitude is a function of the firms' dependence on external financing for liquidity. Moreover, we find that the adverse effect of liquidity crunch was weaker in countries with higher level of bank concentration, bank development, and foreign bank presence. Our results are robust after controlling for various risk factors and country-specific characteristics.

Although there is a large volume of studies examining the 2007- 2009 global financial crisis, our study, to the best of our knowledge, is the first documenting the relationships between bank structure, firms' access to financing, and stock price performance during the financial crisis. Our paper contributes to the literature by providing empirical evidence on the relevance of banking structure to real economy especially when credit availability is severely impaired. Our paper also extends the literature on emerging countries by documenting the positive role played by a concentrated banking structure and foreign banks' contribution in alleviating the adverse impact of external financial shocks.

The remainder of this paper is organized as follows. In Section 2 we present the methodology used in this paper. In Section 3 we describe the data and discuss the summary statistics. In Section 4 we summarize the empirical results of the paper and in Section 5 we conclude the paper.

2. Empirical model specification

We first examine whether firms with external financing needs in emerging countries suffer a liquidity crunch transmitted from the U.S. to these countries. Specifically, we examine the impact that *ex ante* pre-crisis liquidity constraint has on the *ex post* change in stock prices during the crisis, specified as follows:

$$Return_{i,j,k} = \beta External_Financing_Dependence_j + X'\gamma + Y' + \varepsilon_{i,j,k}, \quad (1)$$

where $Return_{i,j,k}$ is the percentage change in the price during the sample period in local currency of the ith stock, j^{th} industry, and k^{th} country. $External_Financing_Dependence_j$ (henceforth EFD) is a sector-level measure of dependence on external financing for working capital and it is used to measure a firm's liquidity constraint[1]. If during the crisis, the liquidity shocks were transmitted to emerging countries and adversely affected firms' access to external financing and hindered their growth, we expect the stock price to decline during the crisis and the regression coefficient β in Equation (1) to be significantly negative. X' is a vector of control variables intended to control for firm size, market-to-book ratio, beta (the covariance between individual stock returns and market returns), momentum, and financial leverage. Y' is a vector of country fixed effects. This approach, as argued by Whited and Wu (2006) and Tong and Wei (2011), allows us to incorporate the four asset pricing factors (firm size, market-to-book ratio, beta, and momentum) by entering the relevant firm characteristics directly into the regression analysis without going through a factor model. The advantage of this method is in its easier implementation of control variables and allows us to achieve an equivalent controlling effect using the four asset pricing factors, although the interpretation of regression coefficients is less straightforward.

We next examine how bank concentration affects liquidity crunch following a difference-in-differences methodology commonly used in the literature examining the relationship between asset growth and financial development (e.g. Rajan and Zingales, 1998; Tong and Wei, 2011; Ilyina and Samaniego, 2011). Specifically, we regress firms' return on an interaction of

[1] We recognize that a firm-level measure of external finance need would be ideal for the analysis. However, due to the extensive variations in accounting standards across countries which leads to limitation in data coverage in Compustat Global, we are not able to construct a consistent measure of external finance need at firm level for the emerging countries in our sample.

between country level measure of bank concentration and firms' external financing dependency, i.e. EFD_j, in the baseline regression Equation (1). In other words, we augment Equation (1) by

$$\beta = \beta_1 + \beta_2 Concentration_k + \beta_3 Development_k \quad , \qquad (2)$$

where $Concentration_k$ measures the pre-crisis level of bank concentration in country k. To reduce the possibility of model misspecification due to omission of important variables, we include $Development_k$ which measures the level of bank development in country *k*. We also include other country-specific control variables in our robustness tests. We describe the entire vector of country control variables in more detail in the section of data description.

In this specification, our key interest is in the regression coefficient β_2 which measures the effect of bank concentration on liquidity crunch during the crisis. If a country's *ex ante* bank concentration alleviates firms' liquidity crunch during the crisis, we expect β_2 to be positive. The coefficient β_3 for the interaction between the degree of external financial dependence and the level of bank development is expected to be positive based on the study of Rajan and Zingales (1998).

3. Data descriptions

Our sample contains data on bank concentration and non-financial firms from 20 emerging countries: Argentina, Brazil, Chile, China, Colombia, Czech Republic, Egypt, Hungary, India, Indonesia, South Korea, Mexico, Malaysia, Pakistan, Peru, Philippines, Poland, Russia, Thailand, and Turkey.

3.1. Firm-level data

We collect the accounting data and stock prices for non-financial firms in the study from the Compustat Global database. We select manufacturing sectors based on the U.S. SIC 2-digit codes ranging from 20 to 39. To calculate the stock return (the difference in the log of stock prices), we use the stock prices on July 31, 2007 (the beginning of the crisis when the spread between the Merrill Lynch High Yield Index and the intermediate-term U.S. Treasury securities was relatively low) and December 31, 2008 (three months after the Lehman bankruptcy when the spread between the Merrill Lynch High Yield Index and the intermediate-term U.S. Treasury securities reached an unprecedented level).

[Insert Table 1 about here]

In Table 1 we present the 20 emerging countries in our sample and the statistics of the changes in stock price (measured by the difference of the log of stock prices) for the manufacturing firms in these countries over the sample period[2]. As shown in the table, among the 20 countries Poland and Russia suffered the largest decline in stock prices, while Mexico and Argentina experienced the smallest drop in stock prices. The cross country average decline in stock price was 46%, with a standard deviation of 31.1% (reported in Table 3).

We use firm size, market-to-book ratio, and beta to proxy for the risk factors that may also have an impact on stock prices. We use the logarithm of book value of total assets in U.S. dollars to measure firm size. Beta is computed using weekly returns over the past five years. For individual stock returns we use domestic prices to avoid foreign exchange fluctuations and for market returns we use MSCI market indices for the 20 emerging countries. To capture the momentum effect, we include the stock return during the six-month period prior to the starting date of our sample period (from January 31, 2007 to June 30, 2007). In addition to the above

[2] We repeat the tests by excluding countries with only a few stocks such as Czech Republic and Columbia, and the results in the study remain unchanged.

factors that may have an impact on stock prices, we also include firms' leverage as another control variable. During a financial crisis, more highly levered firms tend to have greater difficulties to roll over existing debt, which could adversely affect firms' stock price performance.

3.2. Sector-level external finance dependence

Studies in the literature often use sector-level measures of dependence on external financing in cross-country studies. For example, Rajan and Zingales (1998) construct a sector-level measure of financial dependence to examine the impact of financial development on economic growth. They first estimate the measures based on the data of U.S. firms, which are less likely to suffer from financing constraints in comparison to firms in other countries, then they apply the U.S. sector-level measures to the firms in the same sector in emerging countries.

Following the common approach in the literature, we also construct the measure of firms' dependency on short-term external financing at sector-level using the U.S. data. The measure the liquidity of firms uses the length of a firm's cash conversion cycle (e.g. Raddatz, 2006; Kroszner, Laeven, and Klingebiel, 2007; Tong and Wei, 2011). Specifically, the length of cash conversion cycle starts from the time when a firm pays for its inputs to the time the firm receives payments from selling the products and it is calculated as follows:

$$Cash\ conversion\ cycle = \left(\frac{Inventories - Account\ \ payables}{Cost\ of\ \ goods\ sold} + \frac{Account\ \ Receivables}{Total\ \ sales} \right) \times 365, \quad (3)$$

The accounting information for U.S. firms is obtained from the annual Compustat database and we: (1) calculate the cash conversion cycles for each firm in the U.S. during 1990- 2006; and (2) for each sector (based on the 2-digit SIC code), we compute the median cash conversion

cycle and apply the U.S. sector-level measure to the firms in the same sector in emerging countries.

3.3. Country-level banking and institutional characteristics

In our study, the key variable of interest is the degree of concentration of domestic banking system. Following the methodology used by Cetorelli and Gambera (2001), we compute the pre-crisis measure of bank concentration for each country based on the total assets of the largest three (five) banks as a percentage of the total assets of the entire banking sector in the country, using the data from BankScope[3]. Since BankScope does not cover the entire banking sector in each country, we compute the concentration measure for each country in each year over the period 2000 – 2006 and take the average to smoothen the changes in the coverage of BankScope. The measures of bank concentration based on the largest three and five banks for each country in our sample are listed in Table 2.

[Insert Table 2 about here]

In Table 2, it is clear that large banks play an important role in emerging country's banking systems. On average, the total assets of top three (five) banks account 37% (50%) of total assets of the entire banking sector. In countries like Czech Republic, Egypt, and Russia, the top three banks account for more than 50% of the total assets of entire banking system.

Previous studies have shown that international bank loan is a major channel through which the economic shocks in lending countries are transmitted to borrowing countries (Peek and Rosengren, 1997) and the severity of liquidity crunch during the 2007- 2009 crisis is related to

[3] Alternatively, the degree of concentration of a banking system can be measured by the Herfindahl index, which assigns more weights to larger banks in the market. However, this approach has no stronger advantage over the asset ratio used in our study as the number of banks in emerging countries tends to be small in contrast to developed countries that tend to have much more medium- and small-size banks. The concentration measure based on asset ratio is consistent with other measures of banking system structure such as foreign bank presence and ownership. For robustness, however, we repeated the tests using the Herfindahl index and find the results similar.

the country's pre-crisis exposure to foreign bank loans (Tong and Wei, 2011). We thus include a measure of a country's pre-crisis exposure to U.S. bank loans, which dominated the international loan market in emerging countries prior to the crisis, although declined during the crisis. The data we use are provided by the Bank for International Settlements (BIS) in the Consolidated Banking Statistics dataset (Table 9B: Consolidated foreign claims of reporting banks) and the measure we use is the average U.S. bank claims in the country as a percentage of that country's GDP from 2002 to 2006. The last column of Table 2 reports the measures of U.S. bank loans in each of the countries in our sample. On average, the lending from U.S. banks represents more than one percent of the GDP in these countries, suggesting the important role played by the U.S. loans in emerging countries.

To measure the degree of bank development in a country, we use the total domestic credit made to private sectors as a percentage of the country's GDP – a measure widely used in the literature. We also include the stock market capitalization as a percentage of GDP to control for alternative sources of external financing. The data for these two measures for 2006 are taken from Beck and Demirgüç-Kunt (2009).

Over the past decade, many emerging countries have lifted restrictions on foreign financial institutions' entry into local financial markets. As a result, the banking systems in emerging countries have experienced significant structural changes and foreign ownership of domestic institutions has been growing rapidly (Claessens et al., 2008). The financial literature in general recognizes the benefits of foreign banks' entry into emerging markets such as the introduction of new technologies, innovative financial products, and modern management techniques into the host countries. Foreign banks' entry, however, may have also increased bank's competition and dampen the benefits of bank concentration on the host country's economy. In addition, foreign

banks' entry may also have increased emerging country's exposure to foreign country's economic recession and caused transmission of financial crises. It is therefore interesting to examine whether bank concentration is still beneficial to a local economy when local banks are facing increased competition from foreign banks. To capture the effect of market competition, we also include two measures of foreign bank presence used by Claessens et al (2008): (1) the number of foreign banks as a percentage of total number of banks in the country; and (2) the percentage of total domestic assets owned by foreign banks. In this study we empirically examine whether foreign banks' presence affect the role of bank concentration in providing external financing and in alleviating liquidity crunch.

Another potential concern of using the concentration ratios is that in many emerging countries, a large proportion of banks are owned by government or by large block-holders. When banks are owned by government or large block-holders, they may act as a cartel and the concentration measure could underestimate the actual market power. It is also likely that these banks may not have an incentive to establish lending relationships with potential borrowers. La Porta et al. (2002) construct measures of government ownership and Taboada (2011) follows the approach and updates the measures. We use two measures to control for the impact of such banks: the large domestic block-holder ownership of banks and government block-holder ownership. We obtained the data for the two measures from Taboada (2011) for 2005 and use them as our pre-crisis measures of ownership structure of banking systems.

It is possible that the quality of the regulatory environment, banking freedom, and institutional environment may have an impact on credit supply as well. Therefore, we also use additional variables to capture the impact of these factors. The bank regulatory environment

measure we use in the study is taken from Barth et al. (2001)[4]. The economic freedom data are compiled by the Heritage Foundation and the measure is a composite of ten indicators which include policies in international trade, government finance, government intervention, monetary policy, capital flows and foreign investment, banking and finance, wages and prices, property rights, regulation, and black market activities. A higher score indicates a higher degree of economic freedom and more favorable policies toward competition. The measure for institutional environment is a country governance index constructed by Kaufman *et al*. (2006). The index includes six indicators measuring the "voice and accountability, government effectiveness, political stability, regulatory quality, rule of law, and control of corruption." We obtain the country governance data from the World Bank and use the average value of the six indicators as the measure of the quality of institutional environment. A country with greater degree of economic freedom and a better institutional environment tends to have a more competitive banking system. Table 3 reports the summary statistics for the main variables in our analyses and Table 4 lists the correlation matrix of these variables.

[Insert Tables 3 and 4 about here]

4. Empirical results

In this section, we present the results for the regression analyses on how the percentage changes in stocks price (from July 31, 2007 to December 31, 2008) for the manufacturing firms in the 20 emerging countries are related to bank concentration, bank development and foreign bank presence. In all the regression analyses, we standardize the *EFD* measure so that the

[4] The updated data in 2008 are available at http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTRESEARCH/0,,contentMDK:20345037~pagePK:64214825~piPK:64214943~theSitePK:469382,00.html

regression coefficients associated with the variable *EFD* measure the percentage changes in stock prices for an increase of one standard deviation in the *EFD* measure.

4.1. Main findings

In Column (1) of Table 5, we report the results of the baseline regression as specified in Equation (1) which only includes the EFD measure and firm-level risk factors (the interaction term between beta and market return, market-to-book ratio, firm size, momentum, and financial leverage) as independent variables. The regression coefficient for EFD is significantly negative, suggesting a liquidity crunch experienced by firms during the crisis. The results, consistent with the findings in Tong and Wei (2011), show that a firm's reliance on external financing for liquidity is a contributing factor for the deteriorating stock price performance during the crisis. In Column (2) we include an interaction term between EFD and the U.S. bank lending as a percentage of GDP. The regression coefficient for the interaction is significantly negative, also consistent with the finding in Tong and Wei (2011) that a sudden reduction in foreign loans contributes to the severity of financial shocks in emerging countries.

[Insert Table 5 about here]

In Columns (3) and (4), we include an interaction term between EFD and the measure of bank concentration as specified in Equation (2). In these two columns we use the total assets of the largest *three* and the largest *five* banks as a percentage of total assets of the entire banking sector as the measure for bank concentration. The significantly positive coefficients for the interaction terms in both columns indicate that in a country with a higher degree of bank concentration firms tend to suffer a smaller decline in stock prices. The result is consistent with our hypothesis that bank concentration, which allows firms to obtain funding through

established long-term lending relationship, can alleviate the liquidity constraints for firms during financial crises. The economic relevance of the bank concentration variable is significant too. In Column (3), for one standard-deviation increase in the level of bank concentration, the decline in stock price is 5.3% less (5.3=10.77 x 0.20 x 2.46, where 10.77 is the standard deviation of bank concentration ratio, 0.20 is the coefficient for the interaction term, and 2.46 is the average value of the standardized EFD). Similarly, an increase in the top five bank concentration ratio by one standard deviation reduces the decline in stock price by 6.7%. This effect is consistent with the theory that bank concentration enhances the lending relationship and firms' access to external financing when they need funding for liquidity.

To ensure that the positive effect on stock price performance that we observe is not driven by other factors, we add in Columns (5) and (6) another control variable, the level of bank development, to the regression equation. We find that the effect of bank concentration is stable and remains significantly positive after controlling for the level of bank development. The regression coefficients for the interaction term between EFD and the level of bank development in the two columns are both positive and significant at 1% level, consistent with our expectation that the development of the banking sector also increases firms' access to credit.

Because our two measures of bank concentration, the top three and top five banks' assets as a percentage of total assets in the entire banking sector, are highly correlated (with a correlation coefficient of 0.92), we will only report the results based on the top three bank concentration ratio in the rest of the paper. The results using top five bank concentration data are similar and they are available upon request.

[Insert Table 6 about here]

In Columns (1) and (2) of Table 6, we report the results of the regression analyses by adding an interaction between EFD and the measures of banking ownership structure (i.e. government and large block-holder ownership) as a control variable. After adding this variable, the effect of bank concentration and bank development remains significant, although the bank ownership does not appear to have a significant impact on liquidity crunch.

We also examine the impact of foreign bank presence on liquidity crunch and the results of the analyses are reported in Columns (3) and (4) of Table 6. While the coefficients associated with bank concentration and bank development remain significant after controlling for increased competition of foreign banks, the magnitude of the positive effect of bank concentration becomes smaller after adding the foreign bank presence variables. The results suggest that competition from foreign banks has reduced the benefits of the long-term lending relationship of local banks cultivated by the concentrated banking system. The positive effect of the bank development on stock price performance, on the other hand, is rather stable as the magnitude of the regression coefficient remains unchanged.

Interestingly, the results show that the presence of foreign banks also contributes to the reduction in liquidity crunch, as reflected in the significant and positive coefficient associated with the interaction between EFD and foreign bank presence. This is because foreign banks tend to have easier access to funding resources from abroad so they can maintain relatively stable credit supply. In other words, while foreign banks could be a source of contagion transmitting financial crisis to the local economy, the presence of foreign banks can also provide stability to a local economy because the foreign banks originated from countries not infected by financial crises may still have easier access to funding sources and these banks can still provide capital to local firms and reduce the financial shocks originated from contagious countries.

4.2. Robustness tests

We next check whether the bank concentration is still significant in alleviating liquidity crunch after control for alternative sources of external finance. We add an interaction variable between EFD and the size of stock market capitalization (as a percentage of GDP). During normal times, the coefficient is expected to be positive. However, during financial crises, equity capital may become costly to firms as well because of the increased risk premium during the turmoil; hence the sign of coefficient may be ambiguous. The results in Column (1) in Table 7 show a negative sign for the coefficient associated with the interaction between EFD and stock market capitalization, although it is statistically insignificant at a 10% level. In Column (2), we include a measure of the quality of bank regulation taken from Barth et al (2001). The results show that adding the bank regulation variable does not affect the effect of bank concentration on stock price performance for firms with liquidity financing need.

[Insert Table 7 about here]

In Columns (3) and (4) of Table 7, we report the results of regression analyses after adding an interaction between EFD and the quality of a country's institutional environment: economic freedom and country governance, respectively. None of these control variables shows significant impact on the degree of liquidity crunch. The results for bank concentration and bank development remain statistically significant in all specifications.

[Insert Table 8 about here]

We next conduct a series of regression analyses to further examine the robustness of our results. Instead of using the pre-crisis beta which is calculated using the past five years of stock returns prior to the crisis, we use a contemporaneous measure of beta which is calculated using

the stock returns during the same period of financial crisis. The results are reported in Table 8. The coefficients associated with bank concentration, bank development, and foreign bank presence are still all significant using contemporaneous beta.

5. Conclusions

In this paper we examine whether bank concentration plays a positive role in alleviating the impact of liquidity crunch transmitted to emerging countries from developed countries during the 2007- 2008 financial crises. We examine the effect of bank concentration on liquidity crunch through the stock price performance of manufacturing firms in 20 emerging countries, conditioned on firms' reliance on external financing for liquidity needs.

The results in our study show that during the 2007- 2008 global financial crisis, the stock prices of manufacturing firms in emerging countries suffered severe declines, showing the liquidity crunch was transmitted from the financial sector in the U.S. to the manufacturing firms in emerging markets. We also find that the severity of liquidity crunch was related to the degree of a firm's reliance on external financing. Firms that are more dependent on external financing suffer greater stock price declines. Moreover, we find that the adverse effect of liquidity crunch was alleviated in countries with higher level of bank concentration, bank development, and foreign bank presence. The positive role of a concentrated banking structure, as well as the presence of foreign banks, implies that a stable lending relationship enhances firms' access to external finance during financial crises when credit supply is impaired. The findings in the study are consistent with the "information asymmetry theory" that banks have incentives to produce information about potential borrowers and they value relationship lending. Bank concentration, therefore, enhances credit availability, reduces financial constraints, and alleviates liquidity crunch during financial crises.

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Table 1. Stock Prices

The table describes the percentage change in stock price (measured by the difference in the logarithm of stock prices) for manufacturing firms in 20 emerging countries from July 31, 2007 to December 31, 2008. The stock price data are obtained from the Compustat Global database and are measured in local currencies.

Country	Observation	Mean	Median	Std. Dev.	25th Pct	75th Pct
Argentina	28	-22.46	-30.37	36.04	-53.24	0.66
Brazil	102	-45.59	-50.70	38.77	-71.67	-32.09
Chile	34	-28.39	-30.91	36.53	-47.22	-21.22
China	793	-52.05	-57.33	22.34	-66.67	-43.82
Colombia	6	-45.58	-43.99	32.96	-63.59	-26.39
Czech Republic	3	-25.06	-31.63	24.27	-45.37	1.81
Egypt	8	-32.35	-36.17	22.56	-48.57	-14.12
Hungary	9	-52.45	-57.15	15.35	-64.26	-45.14
Indian	69	-37.17	-43.82	41.63	-65.12	-23.20
Indonesia	594	-46.27	-53.50	30.11	-67.92	-32.34
Korea, South	433	-51.18	-57.21	28.55	-70.46	-39.49
Mexico	28	-22.19	-19.26	37.30	-60.25	4.13
Malaysia	432	-39.87	-42.77	30.34	-62.84	-20.07
Pakistan	67	-49.40	-56.86	29.04	-75.32	-29.39
Peru	13	-56.67	-61.14	17.34	-69.09	-52.37
Philippines	23	-46.17	-46.82	28.69	-70.00	-20.42
Poland	86	-66.52	-73.28	26.58	-86.06	-54.98
Russia	8	-66.67	-71.22	23.42	-84.03	-53.40
Thailand	195	-27.40	-30.00	34.34	-55.87	-8.15
Turkey	67	-45.36	-55.40	40.42	-65.26	-40.45

Table 2. Bank concentration and U.S. bank claims in emerging countries

This table describes the bank concentration and international bank lending from U.S. in 20 emerging countries. The bank assets data are obtained from BankScope. U.S. bank loan data are obtained from Bank for International Settlements (BIS). For each country, the asset shares of the largest three (five) banks are the total assets of the largest three (five) banks as a percentage of the total assets of all domestic banks in the country, and the ratios are calculated as the average over the period from year 2000 to 2006.

Country	Assets share of largest three banks (%)	Asset share of largest five banks (%)	US bank loans /GDP(%)
Argentina	38.01	47.99	2.22
Brazil	27.12	37.79	1.47
Chile	31.82	46.75	2.97
China	34.54	51.53	0.36
Colombia	38.90	50.00	1.41
Czech Republic	50.19	68.78	0.37
Egypt	61.78	71.75	1.17
Hungary	42.08	55.39	0.79
Indian	49.99	63.06	0.78
Indonesia	31.06	39.05	0.94
Korea, South	24.30	37.89	1.43
Mexico	33.92	50.13	2.09
Malaysia	22.96	31.33	1.36
Pakistan	38.33	54.43	0.15
Peru	47.89	62.07	1.26
Philippines	32.22	44.60	2.01
Poland	35.72	48.89	0.57
Russia	52.34	59.30	0.70
Thailand	25.66	39.36	1.03
Turkey	23.80	34.71	1.19
Average	37.13	49.74	1.21
Standard deviation	10.77	11.32	0.70

Table 3. Summary statistics

This table presents the summary statistics for main variables used in analysis.

	Mean	Median	Std. Dev.	25th Pct	75th Pct
Percentage change in stock price	-46.04	-53.06	31.09	-67.10	-31.79
External finance dependence	88.40	97.69	35.92	66.20	116.10
Asset share of largest three banks	30.31	31.06	6.22	24.30	34.54
Asset share of largest five banks	42.79	39.05	8.30	37.89	51.53
Beta	0.61	0.56	0.57	0.28	0.93
Market-to-book ratio	1.61	1.33	0.80	1.00	2.10
Total assets (in millions US$)	825.68	166.40	4,434.37	65.28	434.75
Momentum	32.23	21.35	47.69	0.17	51.76
Leverage	0.30	0.25	1.55	0.11	0.38
Bank credit/GDP (%)	76.53	99.03	33.68	40.50	108.00
Stock market capitalization/GDP (%)	75.48	75.56	29.10	60.00	88.38
Foreign banks/total banks (%)	21.37	10.00	15.57	10.00	30.00
Foreign bank assets/total banks assets (%)	11.76	5.00	18.19	0.00	16.00
Large domestic block holder ownership (%)	15.39	8.61	16.22	1.53	27.87
Government ownership (%)	45.03	44.52	30.34	20.34	84.93
Financial freedom	59.83	61.63	6.18	52.22	63.26
Governance indicator	-0.04	-0.10	0.49	-0.57	0.40

Table 4. Correlation matrix of key variables

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Percentage change in stock price (1)	1							
External finance dependence for liquidity (2)	-0.14	1						
Asset share of largest three banks(3)	-0.06	-0.11	1					
Asset share of largest five banks (4)	-0.08	-0.09	0.92	1				
Beta (5)	-0.06	0.08	-0.23	-0.39	1			
Market-to-book ratio (6)	-0.02	0.01	0.03	0.02	-0.01	1		
Total assets (7)	-0.11	-0.11	0.10	0.17	-0.06	-0.14	1	
Momentum (8)	-0.13	0.00	0.14	0.28	-0.27	0.00	0.14	1

Table 5. Effect of banking structure on liquidity crunch

The table presents the results of regressions that examine the effect of liquidity crunch on stock price performance and the role of bank concentration and bank development in affecting liquidity crunch for manufacturing firms in 20 emerging countries. The dependent variable is the difference in the log of stock price between July 31, 2007 and December 31, 2008. All regressions include country fixed effects. Standard errors, clustered at the sector level, are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
External finance dependence (EFD)	-0.28***	-0.21***	-0.39***	-0.54***	-0.67***	-0.67***
	(0.05)	(0.06)	(0.11)	(0.13)	(0.14)	(0.14)
EFD x Assets share of largest three banks			0.20*		0.34***	
			(0.11)		(0.11)	
EFD x Assets share of largest five banks				0.24***		0.26***
				(0.09)		(0.08)
EFD x Bank credit/GDP					0.05***	0.03**
					(0.02)	(0.01)
Beta x Market return	0.16***	0.16***	0.16***	0.15***	0.15***	0.15***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Market-to-book ratio	-2.15**	-2.15**	-2.14**	-2.08**	-1.89**	-1.92**
	(0.85)	(0.85)	(0.85)	(0.85)	(0.85)	(0.85)
Firm size	-1.49***	-1.55***	-1.58***	-1.56***	-1.48***	-1.49***
	(0.45)	(0.45)	(0.45)	(0.45)	(0.45)	(0.45)
Momentum	-0.04***	-0.03**	-0.03**	-0.03***	-0.04***	-0.04***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Leverage	-1.3***	-1.27***	-1.27***	-1.26***	-1.22***	-1.23***
	(0.32)	(0.31)	(0.3)	(0.3)	(0.29)	(0.29)
EFD x US bank lending/GDP		-2.81**	-2.03*	-0.88	-0.28	0.10
		(1.12)	(1.18)	(1.37)	(1.37)	(1.47)
Country fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2982	2982	2982	2982	2982	2982
Adjusted R^2	0.1546	0.1566	0.1579	0.1594	0.1604	0.1606

Table 6. Effect of bank concentration: ownership and foreign bank presence

The table presents the results of regressions that examine the effect of liquidity crunch on stock price performance and the role of bank concentration and bank development in affecting liquidity crunch for manufacturing firms in 20 emerging countries, after controlling for banking ownership structure and foreign bank presence. The dependent variable is the difference in the log of stock price between July 31, 2007 and December 31, 2008. All regressions include country fixed effects. Standard errors, clustered at the sector level, are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
External finance dependence (EFD)	-0.78***	-0.79***	-0.72***	-0.63***
	(0.14)	(0.15)	(0.15)	(0.14)
EFD x Assets share of three largest banks	0.4***	0.35***	0.32***	0.27**
	(0.14)	(0.13)	(0.11)	(0.12)
EFD x Bank credit/GDP	0.06***	0.07***	0.06***	0.06***
	(0.02)	(0.02)	(0.02)	(0.02)
EFD x Government ownership	-0.02			
	(0.03)			
EFD x Large domestic block holder ownership		-0.01		
		(0.06)		
EFD x Foreign banks/total banks			0.11***	
			(0.04)	
EFD x Foreign bank assets/total banks assets				0.08**
				(0.04)
Beta x Market return	0.15***	0.15***	0.16***	0.16***
	(0.04)	(0.04)	(0.04)	(0.04)
Market-to-book ratio	-2.12**	-2.15**	-1.85**	-1.83**
	(0.87)	(0.87)	(0.86)	(0.86)
Firm size	-1.41***	-1.42***	-2.17***	-2.12***
	(0.46)	(0.46)	(0.49)	(0.49)
Momentum	-0.04***	-0.04**	-0.05***	-0.05***
	(0.01)	(0.01)	(0.02)	(0.02)
Leverage	-1.18***	-1.18***	-1.27***	-1.25***
	(0.29)	(0.29)	(0.29)	(0.29)
EFD x US bank lending/GDP	0.79	1.39	-0.67	-0.70
	(1.65)	(1.69)	(1.58)	(1.58)
Country fixed effect	Yes	Yes	Yes	Yes
Observations	2865	2865	2522	2522
Adjusted R^2	0.1528	0.1527	0.1784	0.1776

Table 7. Robustness check: Effect of alternative external capital and country institutions

The table presents the results of regressions that examine the effect of liquidity crunch on stock price performance and the role of bank concentration and bank development in affecting liquidity crunch for manufacturing firms in 20 emerging countries, after controlling for alternative external capital and country institutional environment. The dependent variable is the difference in the log of stock price between July 31, 2007 and December 31, 2008. All regressions include country fixed effects. Standard errors, clustered at the sector level, are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
External finance dependence (EFD)	-0.59***	-0.56***	-0.92***	-0.66***
	(0.16)	(0.18)	(0.31)	(0.15)
EFD x Assets share of three largest banks	0.28**	0.27**	0.41***	0.31**
	(0.13)	(0.13)	(0.14)	(0.14)
EFD x Bank credit/GDP	0.06***	0.03*	0.05*	0.05***
	(0.02)	(0.02)	(0.03)	(0.02)
EFD x Stock market capitalization/GDP	-0.04			
	(0.03)			
EFD x Bank regulation		-0.01		
		(0.025)		
EFD x Financial freedom			0.10	
			(0.18)	
EFD x Country governance				-0.66
				(2.00)
Beta x Market return	0.15***	0.15***	0.15***	0.15***
	(0.04)	(0.04)	(0.04)	(0.04)
Market-to-book ratio	-1.92**	-1.69**	-2.13	-1.89**
	(0.85)	(0.85)	(1.49)	(0.85)
Firm size	-1.49***	-1.27***	-1.33**	-1.49***
	(0.45)	(0.45)	(0.53)	(0.45)
Momentum	-0.04***	-0.04***	-0.01	-0.04***
	(0.01)	(0.01)	(0.02)	(0.01)
Leverage	-1.23***	-1.19***	-1.22***	-1.22***
	(0.29)	(0.29)	(0.31)	(0.29)
EFD x US bank lending/GDP	0.46	0.93	-1.29	0.03
	(1.57)	(1.50)	(1.54)	(1.66)
Country fixed effect	Yes	Yes	Yes	Yes
Observations	2982	2951	2169	2982
Adjusted R^2	0.1665	0.1661	0.1619	0.1528

Table 8. Robustness check: contemporaneous measure of market risk

The table presents the results of regressions that examine the effect of liquidity crunch on stock price performance and the role of bank concentration and bank development in affecting liquidity crunch for manufacturing firms in 20 emerging countries, using contemporaneous measure of market beta. The dependent variable is the difference in the log of stock price between July 31, 2007 and December 31, 2008. All regressions include country fixed effects. Standard errors , clustered at the sector level, are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)
External finance dependence (EFD)	-0.64***	-0.68***	-0.6***
	(0.14)	(0.15)	(0.14)
EFD x Assets share of three largest banks	0.33***	0.31**	0.26**
	(0.11)	(0.11)	(0.12)
EFD x Bank credit/GDP	0.05***	0.06***	0.06***
	(0.02)	(0.02)	(0.02)
EFD x Foreign banks/total banks		0.09**	
		(0.04)	
EFD x Foreign bank assets/total banks assets			0.07**
			(0.04)
Beta x Market return	0.2***	0.21**	0.21**
	(0.07)	(0.08)	(0.08)
Market-to-book ratio	-1.97**	-1.94**	-1.93**
	(0.84)	(0.85)	(0.85)
Firm size	-1.17**	-1.87***	-1.83***
	(0.47)	(0.51)	(0.51)
Momentum	-0.02*	-0.04**	-0.04**
	(0.01)	(0.02)	(0.02)
Leverage	-0.55***	-0.55***	-0.54***
	(0.19)	(0.18)	(0.18)
EFD x US bank lending/GDP	-0.96	-1.34	-1.39
	(1.44)	(1.67)	(1.68)
Country fixed effect	Yes	Yes	Yes
Observations	2982	2522	2522
Adjusted R^2	0.1694	0.1868	0.1863