FDI, Trade Credit, and Transmission of Global Liquidity Shocks: Evidence from Chinese Manufacturing Firms

Shu Lin
Fudan University

Haichun Ye*
Fudan University

Abstract

We empirically explore a trade credit channel through which FDI firms can propagate global liquidity shocks to the host country despite its tight controls on portfolio flows. Using detailed data on Chinese manufacturing firms, we find robust evidence that FDI firms provide more trade credit than local firms during tight domestic credit periods and that a favorable global liquidity shock amplifies FDI firms' advantage in trade credit provision. We also use the global financial crisis as a natural experiment and find a significant adverse impact of crisis on FDI firms' advantage in trade credit provision.

Keywords: FDI; international transmission of financial shocks; trade credit; global financial crisis

JEL classification: F3, F42, F23, E52, G15, G30

*Corresponding author. School of Economics, Fudan University, 600 Guoquan Road, Shanghai, China. Email: haichunye@gmail.com.

1. Introduction

Capital account openness and the international transmission of financial shocks is a central issue in international finance. Conventional wisdom holds that the international transmission of financial shocks depends on exchange rate regime and the degree of capital account openness (e.g., Mundell, 1963). Under free capital mobility, fixed exchange rate regimes export financial shocks from a base country to its peggers. This trilemma idea is not only a theoretical curiosity but supported by recent empirical studies (e.g., Obstfeld and Taylor, 1997, 2003, 2004; Frankel et al., 2004; Obstfeld et al., 2004, 2005; Aizenman, et al., 2015).[1]

A common feature of the existing studies is that they focus mainly on openness to portfolio flows, such as debt and equity flows. Little attention has been paid to the role of openness to foreign direct investment (FDI) flows in the international transmission of financial shocks.[2] Moreover, in practice, while many developing countries impose strict restrictions on portfolio flows, they are quite open to (or even embrace) inward FDI flows. Figure 1 illustrates this point. Panel A graphs the commonly used (standardized) Chinn and Ito (2006)'s capital account openness index values for the U.S., Japan, China, and a group of 38 developing countries with strict controls on portfolio flows over the period of 1998-2007.[3] Not surprisingly, the index

[1] Rey (2015) argues that even floaters do not have monetary autonomy in a financially integrated world. Cetorelli and Goldberg (2012) show that global banks play an important role in the international transmission of financial shocks.

[2] While there is a strand of literature that compares the effects of different types of capital flows (e.g., Tong and Wei, 2010), studies on the role of openness to FDI flows in the transmission of global financial shocks are rare.

[3] The 38 countries are those whose average openness index values fall into the first quartile of the Chinn and Ito index, including Albania, Angola, Azerbaijan, Belize, Brazil, Bulgaria, Cote d'Ivoire, Cambodia, Cameroon, Cape Verde, Central Africa, Chad, China, Colombia, Congo, Rep., Dominica, Equatorial Guinea, Ethiopia, Fiji, Ghana, Grenada, Kazakhstan, Lao PDR, Lesotho, Malawi, Moldova, Morocco, Mozambique, Myanmar, Namibia, Papua New Guinea, Sierra Leone, South Africa, Swaziland, Tanzania, Tunisia, Turkmenistan, Ukraine, and Vietnam.

values of the U.S. and Japan are at the highest possible value, unity, for most of the years, but the index value for China and the average index value for the 38 developing countries never exceed 0.17. When comparing the inward FDI stocks (% of GDP) of these four country groups over the same period, however, we observe a completely different picture. As shown in Panel B of Figure 1, the 38 developing countries and China on average are found to be more open to FDI inflows than the U.S. and Japan in the *de facto* sense (e.g. Lane and Milesi-Ferretti, 2007; Kose et al., 2009).[4]

Then, how would global financial shocks be transmitted to countries that have tight controls on portfolio flows but are open to inward FDI flows? Would the presence of FDI firms create any new channel for the propagation of global financial shocks to these countries? This study makes an attempt to examine these important yet unexplored issues. In particular, we focus on the role of trade credit in FDI firms' propagation of global liquidity shocks to local downstream firms. Our study is motivated by two stylized facts documented in the existing literature. First, it is well-documented in the FDI literature that foreign-owned firms are financially less constrained than local firms in developing countries, and that an important source of their financing advantage comes from their superior access to global financial markets (e.g., Froot and Stein, 1991; Aguiar and Gopinath, 2005; Desai et al., 2006, Desai et al., 2008; Alquist et al., 2014; Wang and Wang, 2015). Second, firms are financially interconnected through trade credit, and existing work finds that trade credit represents a significant part of firms' external financing, especially in financially less

[4] It is important to note that the results in Panel B of Figure 1 are not driven by extreme values. Most of the developing countries in the group have higher inward FDI stock/GDP ratios than those of U.S. and Japan.

developed countries or during tight domestic credit periods (e.g., Petersen and Rajan, 1997; Nilsen, 2002; Fisman and Love, 2003; Fisman and Raturi, 2004; Mateut et al., 2006; Love et al., 2007).

Motivated by the above observations, we conjecture that (1) financially less constrained FDI firms are able to extend more trade credit than their local counterparts during tight money periods in the host country; and, more importantly, that (2)with better access to global credit markets, FDI firms' advantage in trade credit provision over local firms depends crucially upon global liquidity conditions. A favorable global liquidity shock makes FDI firms easier and/or less costly to raise funds internationally and consequently strengthens their advantage in trade credit provision to local downstream firms. There thus exists a trade credit channel through which FDI firms can propagate global liquidity shocks to the host economy despite its tight controls on non-FDI financial flows.

We then test the above two hypotheses using firm level data from China, a country that has strict controls on portfolio flows but is fairly open to FDI inflows. Our hypotheses are borne out by the micro-level data. We first provide evidence that foreign-owned firms offer more trade credit than domestically-owned firms during tight money periods in China. We then take one step forward to verify our main hypothesis that foreign firms' advantage in trade credit extension is contingent upon global credit conditions. We show that a favorable global liquidity shock indeed strengthens FDI firms' advantage in providing trade credit to local downstream firms. Moreover, as additional supportive evidence, we also find similar impacts of global

liquidity conditions on the difference in short-term debt financing between FDI and domestic firms. The above findings are robust to alternative measures of foreign ownership, samples, model specifications, and even to controlling for potential selection bias. Finally, we also provide additional evidence using the recent global financial crisis as a natural experiment. Our results suggest that, the global credit crunch occurred during the financial crisis period significantly weakened FDI firms' advantage in trade credit provision. Taken the above evidence together, our analyses indicate that, even in countries like China that impose strict controls on cross-border portfolio flows, the presence of FDI firms creates a trade credit channel through which global liquidity conditions can influence domestic economic activities.

Our work contributes to the relevant literature in the following aspects. First, we identify a trade credit channel through which FDI firms can propagate global liquidity shocks to the local economy. To the best of our knowledge, this channel is new to the literature on international transmission of financial shocks. While previous studies focus overwhelmingly on portfolio flows, we add to the literature by looking at openness to FDI flows. In addition, the use of disaggregate firm level data allows us to shed light on the specific transmission channel of global financial shocks to the local economy.

Second, our study provides a nice complement to the literature on liquidity-driven FDI, which identifies financing advantage as an important driver of cross-border mergers and acquisitions (M&A) (e.g., Aguiar and Gopinath, 2005; Alquist et al., 2015; Desai et al., 2008). In particular, our paper is closely related to the

recent work by Wang and Wang (2015) which finds a significant improvement in target firms' financial conditions after foreign acquisitions in China. While existing studies focus on either cross-border M&A decisions or the post-M&A performance of acquired firms, here we move one step further by examining FDI firms' provision of trade credit to local downstream firms and its responses to domestic and global liquidity conditions. Our results suggest that openness to FDI can not only affect financial conditions of the acquired firms but local downstream firms as well, indicating more profound financial effects of FDI on the host economy than what we have learned from the existing work.

Third, our study adds to the trade credit literature by exploring the heterogeneity in trade credit extension between FDI and local firms and examining the impact of global liquidity shocks on firm's trade credit provision. Finally, our work is also related to the recently-emerged literature on the propagation of financial shocks through production networks (e.g., Luo, 2015; Ozdagli and Weber, 2016). While the existing work focuses on the propagation of domestic financial shocks, we study the propagation of international financial shocks.

The remainder of this paper is organized as follows. Section 2 describes the data, and Section 3 introduces our empirical strategies. Section 4 reports our main empirical results. Section 5 provides additional evidence from the recent global financial crisis. Section 6 offers our concluding remarks.

2. The Data

2.1. Background Information

We put our hypotheses into test using detailed data on Chinese manufacturing firms. China offers an ideal setting for examining our hypotheses for two reasons. First, as illustrated in Figure 1, China is precisely the type of country that has strict controls on portfolio flows but is fairly open to FDI inflows. On the one hand, the literature typically considers China as one of the financially least open economies. On the other hand, FDI attraction has in fact been a major characteristic of China's state policy of economic openness and liberalization over the last three decades. Starting from the early 1990s, China has become the largest FDI recipient among developing countries, absorbing around 30% of total FDI inflows to developing countries. During the period of 1998-2007, FDI inflows account for 87.5% of total capital inflows to China on average and are much larger than the shares of equity (12.2%) and debt inflows (0.3%).

Second, despite its fast growth in recent decades, China's financial markets still remain underdeveloped. Compared to FDI firms, domestic private firms are financially more constrained and often have difficulty in obtaining external finance. Moreover, FDI firms in China do have an overwhelming advantage in accessing international financial markets compared to domestically-owned firms, which have very limited access to international credit markets due to strict capital control policies. For example, according to the Chinese external debt data published by the State Administration of Foreign Exchange (SAFE), the external debt held by foreign-funded enterprises is about 16 times as large as that held by Chinese-funded

enterprises in 2007.

2.2. Sample Coverage and Data Sources

Our main firm-level dataset is extracted from the annual surveys of Chinese industrial firms administered by the National Bureau of Statistics (NBS) of China between 1998 and 2007.[5] The data contains detailed information on firm's production, ownership structure, trade credit provision, and other balance sheet variables. Concerning on potential errors arising from misreporting or mismeasurement of accounting data, we follow the conventional procedures in the literature (e.g., Wang and Wang, 2015) to clean the data and remove outliers. Detailed data cleaning procedures are available in Appendix A.

In addition, we also construct a second firm-level dataset from the Oriana database. While the Oriana dataset contains a smaller number of Chinese manufacturing firms, it has an appealing advantage of covering the period 2005-2013, which allows us to use the recent global financial crisis as a natural experiment to provide useful additional evidence.

Macro-level data used in our analyses are obtained from various sources, including the CEIC database, the St. Louis Fed's FREDII database, Romer and Romer (2004) and its subsequent update by Wieland and Yang (2015). Table 1 summarizes the descriptive statistics of all variables used in our empirical analyses.

2.3. Trade Credit Provision and Firm Ownership

To measure the extent of firm's trade credit provision, we follow the standard

[5] In order to compute the Gross Domestic Product, the NBS requires all above-scale industrial firms in China to file annual accounting reports. Here "above-scale" firms include all industrial state-owned enterprises (SOEs) and all other firms with annual sales above RMB 5 million.

practice in the trade credit literature (e.g., Petersen and Rajan, 1997) and calculate the accounts receivable to sales ratio (*arec*) for each firm. To test our conjecture on the role of foreign-owned firms in transmitting global liquidity shocks to the host country, we focus on firms that exclusively serve the domestic market to ensure that trade credit is extended to domestic entities only.[6] To mitigate the effect of outliers, we winsorize the accounts receivable to sales ratio at the top and bottom 1% of its distribution.[7] As shown in Table 1, the median and mean of the accounts receivable to sales ratio are 8.94% and 17.31% with a standard deviation of 24.62%.

Another key variable in our empirical analysis is firm ownership. The NBS data contains information on firm's total amount of paid-in capital and its distribution across six different ownership types: state, collective, legal-person, domestic private, Hong Kong-Macau-Taiwan (HMT), and foreign. We first compute the share of paid-in capital for each ownership type and then classify firms based on their largest owner. Specifically, a firm is classified as foreign-owned if foreign interests (including HMT) hold the largest share of paid-in capital and domestically-owned if domestic interests (including collective, legal-person and domestic private) hold the largest share. State-owned enterprises (SOEs) are excluded from our baseline sample for they are known to have soft budget constraints, inefficient management and operational objectives other than profit-maximization (Dollar and Wei, 2007; Manova et al., 2015). To avoid potential complications associated with switching of ownership status, we

[6] In the cleaned NBS data, about 73% of firm-year observations have zero export sales, less than 19% of observations have both domestic and export sales, and the remaining 8% of observations have export sales only. To ensure the robustness of our results, we also augmented the baseline sample by including exporting firms (i.e. firms with positive foreign sales) and found very similar results. The estimation results are reported in the Appendix Table B1.

[7] Simply excluding those observations yields similar results.

also exclude from our baseline sample a small fraction of firms (less than 5%) that have switched their ownership types during the sample period.[8]

2.4. Measures of Domestic and Global Liquidity Conditions

It has been widely documented that interest rates are heavily regulated in China and the People's Bank of China (PBoC) relies predominantly on quantity-based instruments to conduct monetary policy with M2 growth as its intermediate target. So we use the growth rate of M2 as our primary measure of China's monetary policy stance. To facilitate interpretation, we multiply M2 growth rate by minus one so that the tight money indicator (*tight_cn*) increases in times of monetary tightening and decreases in monetary easing in China. Besides, we also use the minus growth rate of total bank loans outstanding as an alternative measure of China's monetary tightening. We center both measures around their respective means and then normalize them by their respective standard deviations.

Another key variable needed in our estimation is the proxy for global liquidity conditions. For the sake of robustness, we use three different indicators throughout, including the change in US real effective federal funds rate (*Δrffr*), the US monetary policy shock series (*RR*) initially constructed by Romer and Romer (2004) and subsequently updated by Wieland and Yang (2015), and the change in average of G7 countries' central bank policy rates weighted by their respective GDP shares in the world (*Δg7rate_wa*). To facilitate interpretation, again we multiply all three indicators by minus one so that they rise in times of credit easing in international financial

[8] Including these switchers does not alter our main results.

markets and fall in times of global credit tightening. For sensitivity checks, we also employ three alternative proxies of global credit conditions. The first one is the change in US nominal federal funds rate (*Δffr*). The second one is the change in the first principal component of G7 countries' central bank policy rates (*Δg7rate_pc1*). The third one is the change in the 3-month US dollar LIBOR interest rate (*Δlibor3m*). Again, all three alternative proxies are multiplied by minus one so that a rise in the value represents a more permissive global credit condition. When used in estimation, all above measures of global liquidity indicators are normalized by their respective standard deviations.

2.5. Other Control Variables

There are several firm-specific characteristics that may affect the provision of trade credit, and hence should be included as controls in all regressions. First, we include firm's age and size. The former is computed as the number of years since its establishment (in log form), and the latter is measured by the logarithm of total assets. Second, we also include profit to sales ratio and the logarithm of sales per worker to capture firms' differences in profitability and growth potential. Third, we include financial leverage and liquidity to control for the state of firm's financial health. Specifically we measure a firm's financial leverage as the percentage of total assets that is financed by debt and firm's liquidity as the share of liquid assets in total assets. Fourth, to control for the effect of product market structure on trade credit extension, we also include the ten-firm concentration ratio, which is computed as the total market share of top ten firms at the four-digit industry-year level.

Finally, since the FDI literature finds that exchange rate plays an important role in FDI activities (e.g., Desai et al., 2008), we also include the interaction term between the foreign ownership dummy and the growth rate of real effective exchange rate of the Chinese RMB (*foreign*×*reerg*) to control for the heterogeneous responses between foreign and domestic firms to movements in real exchange rate. To reduce the influence of outliers, all firm-specific controls are winsorized at the top and bottom 1% of their respective distributions.

3. Empirical Strategy

Our empirical analysis follows a two-step approach. We first examine whether financially less constrained FDI firms extend more trade credit than local firms in times of domestic monetary tightening. We then show that FDI firms' advantage in trade credit provision over their local counterparts depends crucially upon global credit conditions.

3.1. The Effect of Domestic Monetary Tightening

Existing studies in the trade credit literature show that firms with deep pockets or better access to credit markets offer more trade credit, especially during tight credit periods (e.g., Petersen and Rajan, 1997; Fisman and Love, 2003; Fisman and Raturi, 2004; Mateut et al., 2006; Nilsen, 2002). In this study, we take a different perspective by examining the role of firm ownership in trade credit provision. We conjecture that, since foreign-owned firms are financially less constrained in general, they are able to extend more trade credit than domestically-owned firms during monetary contraction

in China.

To test this hypothesis, we estimate the following specification:

$$(1) \qquad arec_{ijt} = \alpha_i + \beta \times (foreign_{ijt} \times tight\_cn_t) + \delta \times X_{ijt} + \mu_j + \nu_t + \varepsilon_{ijt},$$

where $arec_{ijt}$ is the amount of trade credit extended by firm i of industry j at year t scaled by its sales, *foreign* is an ownership dummy that takes the value of 1 for foreign-owned firms and 0 for Chinese domestically-owned private firms, and $tight\_cn_t$ is a measure of monetary tightness in China at year t, and X_{ijt} is a set of firm-specific control variables.

We include in the regressions industry fixed effects (μ_j) to control for time-invariant systematic difference in trade credit provision across industries. We also use year fixed effects (ν_t) to control for the aggregate time trend common to all firms, such as aggregate trends in Chinese macro economy during the sample period. The year fixed effects also absorb the level effect of China's monetary tightening (*tight_cn*).

Our model specification further includes firm fixed effects (α_i) to capture time-invariant unobservable firm characteristics that can potentially have an influence on a firm's extension of trade credit. For instance, FDI firms may have better management practices and corporate governance structures relative to local firms, which may lead to more efficient management of trade credit in FDI firms than in local firms. Since the firms included in our baseline samples have constant ownership types throughout the sample period, the firm fixed effects subsume the ownership dummies and thus pick up the gap in trade credit provision between firms of different

ownership types at the average level of credit tightness in China.

We are particularly interested in the coefficient (β) on the interaction term between the foreign ownership dummy and the monetary tightness indicator. As shown in the trade credit literature, a contractionary monetary policy leads to an expansion of trade credit extended. Here we expect further that this expansionary effect of monetary tightening on trade credit provision to be even stronger for foreign-owned firms as they are financially less constrained. Thus a positive coefficient (β) would be consistent with our hypothesis.

3.2. The Transmission of Global Liquidity Shocks

Next, we use changes in global credit condition to further identify the source of foreign firms' financing advantage over domestically-owned firms and to illustrate the role of FDI firms in the propagation of global liquidity shocks. If having access to international credit markets is indeed an important source of foreign firms' financing advantage over local firms, we anticipate foreign firms to be more responsive to shocks to international credit markets than their local counterparts. Specifically, a favorable global liquidity shock is expected to strengthen foreign-owned firms' ability in trade credit provision relative to local firms. Thus, FDI firms can potentially propagate global liquidity shocks, via the trade credit channel, to local downstream firms despite China's strict controls on debt and equity flows.

To test this conjecture, we add a triple interaction term of the foreign ownership dummy, with the Chinese monetary tightness indicator and the global liquidity shock measure, and estimate the following model specification:

$$(2) \qquad arec_{ijt} = \alpha_i + \gamma \times (foreign_{ijt} \times tight\_cn_t) + \lambda \times (foreign_{ijt} \times tight\_cn_t \times gloliq_t) + \varphi \times (foreign_{ijt} \times gloliq_t) + \delta \times X_{ijt} + \mu_j + \nu_t + \varepsilon_{ijt}.$$

Again, firm, industry and year fixed effects are included in the regression, and the level effect of global liquidity shock (*gloliq*) and its interaction with domestic monetary tightness are both subsumed by year fixed effects.

The key variable of interest here is the triple interaction term. Its coefficient (λ) reflects the degree to which the difference in trade credit provision between FDI and local firms in times of Chinese monetary tightening depends on international credit conditions. We expect $\lambda > 0$ to be supportive for our hypothesis that a favorable shock to global credit condition strengthens the financing advantage of foreign firms over local ones and thus enables foreign firms to supply even more trade credit to local downstream firms during tight money periods in China.

4. Empirical Results

This section reports the estimation results from our empirical specifications outlined in Section 2. We begin by exploring the difference in trade credit provision between domestic and foreign-owned firms. We show that foreign-owned firms extend more trade credit than domestic firms during tight domestic credit periods. We then examine the effect of international liquidity shocks on the financing advantage of foreign-owned firms and present evidence that a global credit easing strengthens foreign firms' advantage in trade credit provision while a global credit crunch significantly diminishes foreign firms' advantage.

4.1. Basic Results

Table 2 presents the estimation results from Equation (1). As shown in Column (1), the interaction term of foreign ownership dummy with the minus M2 growth rate is positive and statistically significant at the 1% level. That is to say, foreign-owned firms offer more trade credit than domestically-owned private firms in times of China's monetary tightening. In the next column of Table 1, we use the minus growth rate of total bank loans outstanding as an alternative measure of China's monetary tightness and obtain similar results. Compared with local private firms, FDI firms provide significantly more trade credit to their local customers when China implements a contractionary monetary policy. As for other control variables, most of them are statistically significant and have signs consistent with previous findings in the trade credit literature. We find that more trade credit is offered by larger and older firms with lower profitability, lower labor productivity, higher leverage, more liquid assets, and stronger market power.

The finance literature has well documented that firm size plays an important role in shaping firm's financing advantage and that bigger firms tend to be less financially constrained than smaller firms. Since FDI firms may be larger in size than local firms for reasons unrelated to external financing, the coefficient on the interaction term ($foreign_{ijt} \times tight\_cn_t$) might thus capture the effect of firm size rather than that of foreign ownership *per se*. To ensure that we isolate the response of foreign-owned firms to changes in domestic credit condition instead of the response of larger firms, we further control for the size interaction in specification (1). For similar reasons, we

also include separately the interaction of tight money indicator with profitability, leverage ratio and liquidity ratio to the regression. As shown in Table 3, including these additional interaction terms does not alter our main results. We continue to find evidence for more trade credit offered by foreign-owned firms relative to their local counterparts in times of Chinese monetary tightening.

Having established the fact that FDI firms offer more trade credit than local ones during tight domestic monetary periods, we now use specification (2) to test our hypothesis on the importance of foreign firms' access to international credit market and the role of FDI in the transmission of global liquidity shocks.

Results summarized in Table 4 provide supportive evidence for our hypothesis. To save space, we only report the estimated coefficients on three interaction terms. As shown in Panel A, the coefficient on the interaction between foreign ownership and China's monetary tightness indicator remains statistically significant and positive, which confirms the amplification effect of China's monetary tightening on foreign firms' trade credit provision relative to domestic firms in the absence of global liquidity shocks. More importantly, the coefficient on the triple interaction term is found to be positive and statistically significant at least at the 5% level, suggesting that, while foreign-owned firms extend more trade credit relative to domestic ones during tight money periods in China, this advantage is further amplified by a positive global liquidity shock.

To gauge the size of the impact, let's consider two firms with median level of accounts receivable to sales ratio (8.94 percent). Take the estimated coefficients in the

second column for example. Given no change in global liquidity conditions (i.e., *rrshock* = 0), a one standard deviation decline in the M2 growth rate relative to its mean would lead to an increase in the trade credit provision gap between FDI and local firms by 0.56 percentage point, which is equivalent to an over 6% increase relative to the median level of trade credit extension. When global liquidity condition eases (as proxied by a one standard deviation reduction in *rrshock*) in such times of Chinese monetary tightening, however, the trade credit provision advantage of FDI firms over local ones would grow even wider by an extra 0.59 percentage point, leading to a total increase in the gap by 1.15 percentage points, that is, close to a 13% increase relative to the median accounts receivable to sales ratio.

Panel B uses three alternative proxies of global credit condition and yields similar results. FDI firms are found to have a strong advantage in trade credit provision over their local counterparts in times of China's monetary tightening. In particular, their trade credit provision advantage is further strengthened by a favorable shock to global credit condition.

To sum up, our benchmark results provide strong evidence that access to international credit markets is indeed an important driver behind FDI firms' advantage in trade credit provision. Moreover, our results also reveal a new channel through which FDI firms transmit international liquidity shocks to the local economy despite China's strict controls on cross-border non-FDI capital flows.

4.2. Robustness Checks

In this subsection we conduct a variety of sensitivity analyses to check if our

results are robust to alternative ownership definitions, different model specifications and samples used.

4.2.1. Alternative Ownership Definitions

Since foreign ownership is a key explanatory variable in our analysis and different types of firm ownership classifications have been used in previous studies, our first set of robustness check is to verify that the results are not driven by the *de facto* ownership classification (i.e., defined based on the owner that holds the largest share of capital paid-in) we used in the main analysis.

In Table 5 we consider two alternative ways to classify firm ownership. Panel A defines a foreign-owned firm if its foreign share of capital paid-in exceeds 25%, which is the official threshold set by the Chinese government. Panel B uses a *de jure* classification of firm ownership that is based on firm's registration type. Results shown in both panels confirm that our main findings are not driven by the specific foreign ownership definition employed in our regressions. No matter which ownership classification is used, we always find that foreign-owned firms provide more trade credit during tight credit periods in China, and that their financing advantage over domestically-owned firms is amplified by a favorable global liquidity shock.

4.2.2. Different Model Specifications

The second set of robustness checks is to examine the sensitivity of our results to different types of model specifications. First, we include a more stringent set of fixed effects to control for potential confounding factors at the industry and province levels. In particular, we add the province×year fixed effects in the regression to control for

time-varying provincial-specific characteristics, such as the preferential policies to attract FDI and the development of local financial market at the province level. Furthermore, we also include the industry×year fixed effects to control for the time-varying industry-specific factors, such as industry-specific demand and supply shocks.

As we report in Panel A of Table 6, including this more stringent set of fixed effects does not change our results at all. We again obtain a similar pattern in the estimated coefficients as before - the coefficients on the interaction of the foreign dummy with the tightness indicator and the triple interaction terms are positive and statistically significant.

Next, given the fact that the accounts receivable to sales ratio has a lower bound of zero, we also employ a random effect Tobit model specification to address potential concerns arising from this left-censoring issue. Results presented in Panel B of Table 6 confirm that our main findings hold strongly in the Tobit regressions. Foreign-owned firms offer more trade credit than domestically-owned firms in times of China's monetary tightening. Particularly, their trade credit financing advantage over local firms is significantly strengthened by a favorable shock to global credit condition.

4.2.3. Alternative Samples Used

To ensure that our results are not driven by the specific sample we use in the estimation, our last set of robustness checks is to see whether the main results still hold when different samples are used.

First, we expand the baseline sample to include non-exporting SOEs. To account for the systematic differences in trade credit provision and the differential responses to domestic and foreign liquidity shocks between SOEs and all other non-SOEs, we also add to our regression the interactions of the SOE dummy with Chinese monetary tightness measure and the global liquidity indicator, respectively, and also the triple interaction involving the SOE dummy. As shown in Panel A of Table 7, adding SOEs leaves our main results intact. We still find expected positive coefficients on the two interaction terms involving the foreign ownership dummy. Interestingly, we also notice some weak evidence that SOEs seem to behave somewhat similarly to FDI firms in terms of trade credit provision and their responses to credit changes at home and abroad.[9]

Second, we exclude collectively-owned firms as well as legal-person-owned firms from the baseline sample. As a unique ownership type in China, some collectively-owned firms are owned collectively by employees while others are owned by township-village governments. With respect to legal-person-owned firms, they can be owned either by state legal persons or private legal persons or both. In Panel B of Table 7, we exclude these two types of firms from the baseline sample so that domestically-owned firms now consist of domestic private firms only. Our main results remain unchanged in this exercise.

In addition, since there may be some difference in accessing international credit markets between HMTs and non-HMT foreign firms and a part of HMTs are believed

[9] This is consistent with the fact that, although China imposes strict capital controls in general, state-owned firms have the priority over private firms in terms of accessing global capital markets.

to be round-tripping FDI flows to China, we also check the robustness of our results to the exclusion of HMTs. As reported in the Appendix Table B2, dropping HMTs does not alter our main results.

All in all, the results from our robustness checks deliver a consistent message. That is, FDI firms extend more trade credit during tight domestic credit periods, and this advantage depends crucially on international liquidity conditions.

4.3. Evidence from Short-Term Debt

If differences in accessing international credit markets between FDI and local firms contribute to their differential ability in trade credit provision, then we should also expect differential impacts of domestic and global liquidity shocks on foreign and local firm s' short-term debt, a primary source of fund to extend trade credit. Specifically, relative to local firms, we should expect FDI firms to have stronger position in short-term debt during China's monetary contraction and that this advantage would be further augmented by a credit easing in global credit markets.

In Panel A of Table 8 we use firm's short-term debt to sales ratio as the dependent variable and re-estimate specification (2). No matter which global liquidity indicator is used, we always find that FDI firms have significantly higher level of short-term debt than local ones in times of China's monetary tightening and the gap in short-term debt between FDI and local firms becomes significantly wider when there is a favorable shock to global credit condition. In Panel B we add firm's long-term debt as an additional covariate to control for the possibility that firms may substitute long-term debt for short-term debt in funding the supply of trade credit. The results

remain unchanged. These findings thus further corroborate our conjecture that the financing advantage of FDI firms over local firms in China depends on global credit conditions and that FDI firms are able to propagate global liquidity shocks to a capital control country like China via trade credit channel.

4.4. Dealing with Potential Selection Bias

A potential econometric issue in our previous analysis is that firm's selection into foreign ownership can be non-random. While we have tried to alleviate this issue by focusing on firms that did not change their ownership status throughout the whole sample period (i.e., non-switchers) and control for a comprehensive set of covariates along with fixed effects, it can still be a concern. To formally address this issue, here we apply a propensity score matching method. We first obtain comparable FDI-local firm pairs with similar characteristics based on the estimated propensity scores and then examine the differential responses of trade credit provision between FDI and local firms using the matched sample.

To match foreign and domestic firms, we estimate the following logit model,

$$(3) \qquad P_{it} = \Pr\{ foreign_{it} = 1 \mid X_{it}\} = e^{(X_{it}'\beta)} / [1 + e^{(X_{it}'\beta)}],$$

where *foreign* is the foreign ownership dummy and X is the vector of variables used to match firms, including firm size, age, labor productivity, leverage ratio, wage rate and product market structure. Year, industry and region fixed effects are also included.[10] Next we employ the nearest neighbor matching procedure to search for matched firm

[10] Since firms have constant ownership status, it is not feasible to include firm fixed effects in the logit regressions here. A logit regression with firm fixed effects would automatically drop firms whose dependent variables exhibit no time variations because these observations are not informative in deriving the conditional maximum likelihood function used to estimate the fixed effect logit regression.

pairs. That is, we calculate each firm's predicted propensity score, and then, for each FDI firm *f*, we choose the domestically-owned firm *d* that minimized the distance between their propensity scores. To ensure that the matched firm pairs are indeed comparable, we perform the balance tests of matching covariates and present the test results in the Appendix Table B3. Overall, the results show that foreign firms and the matched domestic firms share similar characteristics. The differences in the means of all covariates are less than 1% and not statistically different from zero at the conventional significance levels.

Panel A of Table 9 reports the estimated differences in trade credit provision between FDI and local firms using the sample of matched firm pairs. In all three columns, the estimated coefficients on the triple interaction terms are positive and statistically significant at least at the 5% level, and their magnitudes are fairly similar to the baseline estimates from Panel A of Table 4. This suggests that even when controlling for potential selection bias, there continues to be strong evidence for the role of FDI firms in transmitting global liquidity shocks - the gap in trade credit supply between FDI and local firms in times of domestic monetary contraction would be further widened by a favorable global liquidity shock.

In Panel B, we examine the differential responses of short-term debt between foreign and domestic firms using the matched firm pairs. It turns out that controlling for the selection bias does not alter our results on short-term debt either. The estimated coefficients remain positive and statistically significant, indicating that FDI firms have stronger positions in short-term debt than local firms in times of domestic

monetary tightening and their financing advantage would be further strengthened by a credit easing in international financial market.

Overall, the estimation results from the sample of matched firm pairs further confirm that global liquidity condition is an important determinant of FDI firms' advantage in the trade credit provision over their local counterparts and that FDI firms can import global liquidity shocks via the trade credit channel to local economy despite its restrictive controls on portfolio flows.

5. Additional Evidence from Recent Global Financial Crisis

In this section we provide additional evidence using the recent global financial crisis as a natural experiment. Given the severe credit crunch during the recent global financial crisis, we expect FDI firms' advantage in trade credit provision over their local counterparts to decline sharply.

Since the NBS survey data is only available through 2007, we collect supplementary data on Chinese manufacturing firms from the Oriana database, which covers the period of 2005-2013. Maintained by Bureau van Dijk, the Oriana data contains firm's balance sheet and ownership information but covers a smaller sample of firms.[11] After removing SOEs, we retain a sample of over 5500 Chinese manufacturing firms, of which around 38% are foreign-owned firms and the remaining 62% are domestically-owned private firms.[12]

As a first pass at gauging the effect of recent global financial crisis on foreign

[11] Since no information on firms' exports sales is available in the Oriana data, we are unable to distinguish between exporters and non-exporters.

[12] We also exclude firms whose global ultimate owners are located in offshore financial centers, such as Bermuda, Cayman Islands and Virgin Islands. Including these firms and SOEs yields similar results.

firms' trade credit provision advantage over domestic firms, in Figure 2, we compare the medians of the accounts receivable to sales ratio between foreign and domestic firms over time. As the graph illustrates, foreign-owned firms provide more trade credit over the whole sample period. However, there is a sharp drop in trade credit provision by foreign-owned firms during the global financial crisis period. Moreover, the gap in trade credit provision between foreign-owned and domestically-owned firms also shrinks dramatically during the global financial crisis period. These patterns suggest that the recent global financial crisis has an adverse impact on the financing advantage of FDI firms over their local counterparts.

To formally examine the effect of the global financial crisis on FDI firms' trade credit provision advantage over domestically-owned firms, we re-estimate specification (2). Given the fact that the world major economies, including the U.S., reduced their policy rates to almost zero and adopted unconventional monetary policies (i.e., quantitative easing) to accommodate the global financial crisis, the conventional measures of U.S. monetary shocks and the average G7 policy rates used in our previous analyses are no longer suitable indicators of global liquidity conditions during recent financial crisis. Here we create a crisis dummy for the period between 2007 and 2009 to capture the sharp decline in global credit during the recent global financial crisis.

Given that recent global financial crisis caused a severe credit crunch in international financial markets, we expect that FDI firms would be more adversely affected by this negative global liquidity shock and, consequently, their advantage on

trade credit provision would be eroded. Thus, a negative coefficient on the triple interaction term between the foreign ownership dummy, the domestic tightness measure and the crisis dummy is considered as supportive evidence for our hypothesis on the role of FDI in the transmission of global liquidity shocks. Column (1) of Table 10 reports the estimates of specification (2). The coefficient on the triple interaction term is negative and statistically significant at least at the 1% level, suggesting a dramatic decline in FDI firms' advantage in trade credit extension relative to local firms in times of domestic monetary tightening.

Another advantage of the Oriana data is that it also contains firms' accounts payable information, which allows us to construct a measure of net trade credit provision, defined as the difference between accounts receivable and accounts payable scaled by sales, for each firm. In the second column of Table 10, we use net trade credit provision as the dependent variable and obtain quite similar results as those reported in the first column.

In the last column of Table 10, we also check the impact of the global financial crisis on the difference in short-term debt position between foreign and local firms. Here we continue to find that the recent global financial crisis significantly recuded FDI firm's advantage in short-term debt position over local firms in times of domestic monetary tightening.

Overall, the results presented in Table 10 provide further supportive evidence for our hypothesis: (1) the credit crunch in international financial markets caused by the recent global financial crisis significantly reduces FDI firms' advantage in trade credit

provision over local firms in China; (2) FDI firms transmit this adverse global liquidity shock to the Chinese economy through the trade credit channel despite tight controls on non-FDI capital flows imposed by the Chinese monetary authority.

6. Conclusions

In this study we empirically investigate the role of openness to inward FDI in channeling global liquidity shocks to the host country. In particular, motivated by existing studies in the FDI and trade credit literature, we propose a trade credit channel through which global liquidity shock can affect FDI firms' provision of trade credit to downstream firms in the host country. Since foreign-owned firms have access to global financial markets and firms are financially linked through trade credit, global liquidity shocks can affect the local economy through its impact on foreign-owned firms' provision of trade credit to downstream firms in the host country.

Employing a large sample of Chinese manufacturing firms for the years 1998-2007, we find strong empirical evidence in favor of our hypotheses. First, since foreign-owned firms are less constrained in general, we find that they provide more trade credit than domestic firms during tight domestic credit periods. Second, and more interestingly, we show that foreign-owned firms' advantage in providing trade credit depends crucially upon international liquidity conditions. Specifically foreign-owned firms' advantage in trade credit provision is amplified when international liquidity conditions are favorable. Those findings are robust to alternative measures of firm ownership, samples, model specifications and even to

controlling for potential selection bias. Last, we also obtain additional supportive evidence from the recent global financial crisis. Using supplementary firm-level data from the Oriana database over the period 2005-2013, we show that FDI firms' advantage in trade credit provision over domestically-owned firms (in times of China's tight money periods) are dramatically diminished by the recent global financial crisis.

Our results complement the existing work in the literature on FDI, trade credit, and also the international transmission of financial shocks. They should, however, also be interpreted properly. First, while we find supportive evidence for the existence of a trade credit channel, we are not arguing that this is the only channel through which openness to FDI firms can propagate global liquidity shocks to the host economy. Other channels can potentially exist and deserve further exploration in future studies. Second, our results indicate that, at least at the firm level, global liquidity shocks can have economically meaningful impacts on FDI firms' trade credit provision (and short-term debt) and, in turn, the financial conditions of the local downstream firms in China. Thus a potential policy implication is that, even for countries closed to cross-border portfolio flows, FDI firms' ability to access international financial markets may mitigate the impact of domestic monetary policy, especially when domestic and foreign policies diverge. Nonetheless, the economic significance of such an effect at the aggregate level and whether the China case also applies to other developing economies still remain open questions and could be fruitful areas for future research.

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Appendix

A. Data Cleaning Procedure

This section describes our data cleaning procedures applied to the NBS survey data. Specifically, we keep manufacturing firms (i.e., 2-digit industry code of 13-15, 17-37 and 39-43) only.* We also require each firm to satisfy the following criteria:

(1) Legal identification number must be non-missing and unique, and registration type must be non-missing;

(2) Total assets, total liabilities, gross value of industrial output , liquid assets, net value of fixed assets and sales must be non-missing and positive;

(3) The number of employees must be non-missing and not less than eight;

(4) Liquid assets, total fixed assets and net value of fixed assets must not exceed total assets;

(5) Accounts receivable must be non-missing and non-negative;

(6) Total paid-in capital must be non-missing and positive, and its five subcomponents (i.e., state capital, collective capital, legal-person capital, domestic private capital, Hong Kong, Macau and Taiwan capital and foreign capital) must be non-missing and non-negative.

* Since China's tobacco industry (2-digit industry code of 16) has been under the strictest state control and governed by the State Tobacco Monopoly Administration (STMA) bureau system, no foreign firm is allowed to enter. We thus exclude this industry from our analysis. Including it in the sample does not affect our results.

Table B1. Including Exporters

	-Δrffr	-rrshock	-ΔG7rate_wa
foreign ×tight_cn	0.632***	1.035***	0.775***
	(0.061)	(0.072)	(0.066)
foreign ×gloliq	0.493***	0.626***	0.305***
	(0.074)	(0.062)	(0.059)
foreign ×tight_cn ×gloliq	0.346***	0.987***	0.519***
	(0.045)	(0.081)	(0.085)
R-squared	0.709	0.709	0.709
No. of obs.	1,420,622	1,420,622	1,420,622

Notes: The dependent variable is accounts receivable as percentage of sales. The sample used include both exporting and non-exporting firms. Tight_cn is measured by the minus growth rate of M2. Gloliq is measured by the negative change in US real effective federal funds rate(*-Δrffr*), the negative of US monetary policy shock series (*-rrshock*) constructed by Romer and Romer (2004) and Wieland and Yang (2015), and the negative change in average of G7 countries' central bank policy rates weighted by their respective GDP shares (*-ΔG7rate_wa*) in the three columns. All regressions include a constant term, all control variables, firm fixed effects, industry fixed effects and year fixed effects. Clustered standard errors at the firm level are in parentheses. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively.

Table B2. Excluding HMTs

	-Δrffr	-rrshock	-ΔG7rate_wa
foreign ×tight_cn	0.525***	0.603***	0.590***
	(0.176)	(0.211)	(0.196)
foreign ×gloliq	-0.031	0.037	-0.138
	(0.212)	(0.181)	(0.167)
foreign ×tight_cn ×gloliq	0.262**	0.544**	0.601**
	(0.129)	(0.238)	(0.245)
R-squared	0.731	0.731	0.731
No. of obs.	968,102	968,102	968,102

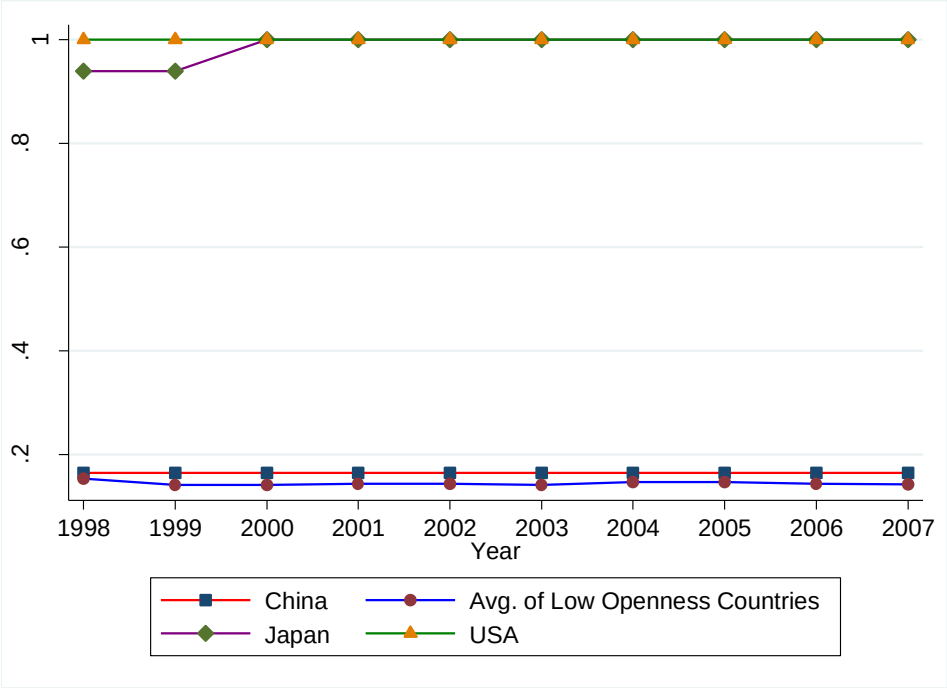
Notes: The dependent variable is accounts receivable as percentage of sales. The sample used include domestic private and non-HMT FDI firms. Tight_cn is measured by the minus growth rate of M2. Gloliq is measured by the negative change in US real effective federal funds rate(*-Δrffr*), the negative of US monetary policy shock series (*-rrshock*) constructed by Romer and Romer (2004) and Wieland and Yang (2015), and the negative change in average of G7 countries' central bank policy rates weighted by their respective GDP shares (*-ΔG7rate_wa*) in the three columns. All regressions include a constant term, all control variables, firm fixed effects, industry fixed effects and year fixed effects. Clustered standard errors at the firm level are in parentheses. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively.

Table B3. Results from Covariates Imbalance Testing

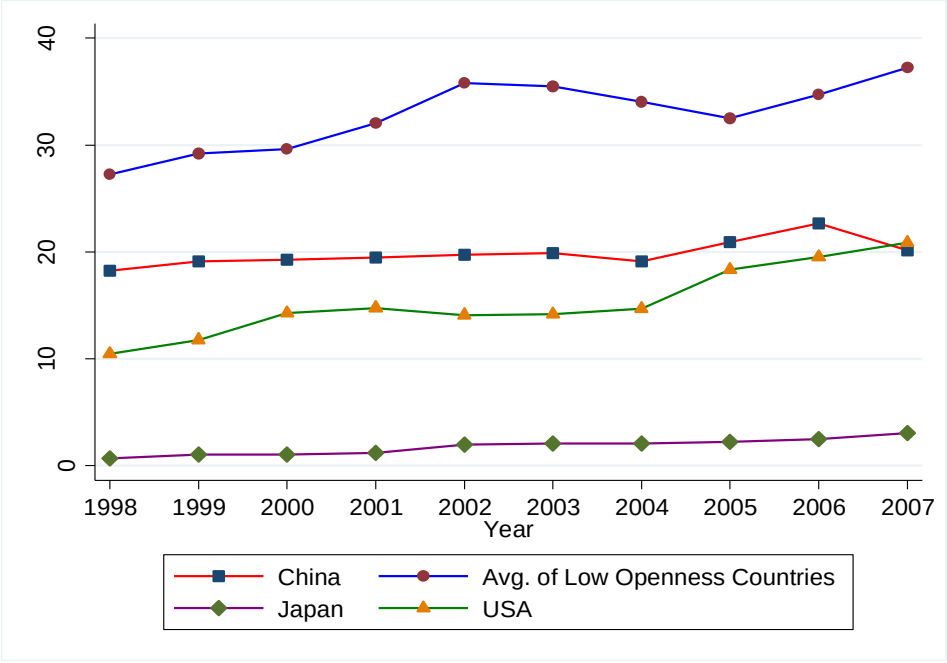
	Mean		% bias	t test	
Variable	Treated	Control		t statistic	p > |t|
ln(assets)	10.237	10.228	0.7	1.21	0.227
ln(age)	1.681	1.675	0.8	1.46	0.145
ln(sales per worker)	5.572	5.567	0.5	0.82	0.414
leverage	47.271	47.181	0.4	0.65	0.517
ln(wage)	0.103	0.102	0.7	1.23	0.218
ln(concentration ratio)	3.036	3.034	0.3	0.58	0.565

Figure 1.Cross-Country Comparison

Panel A. Capital Account Openness (Standardized Chinn and Ito index)

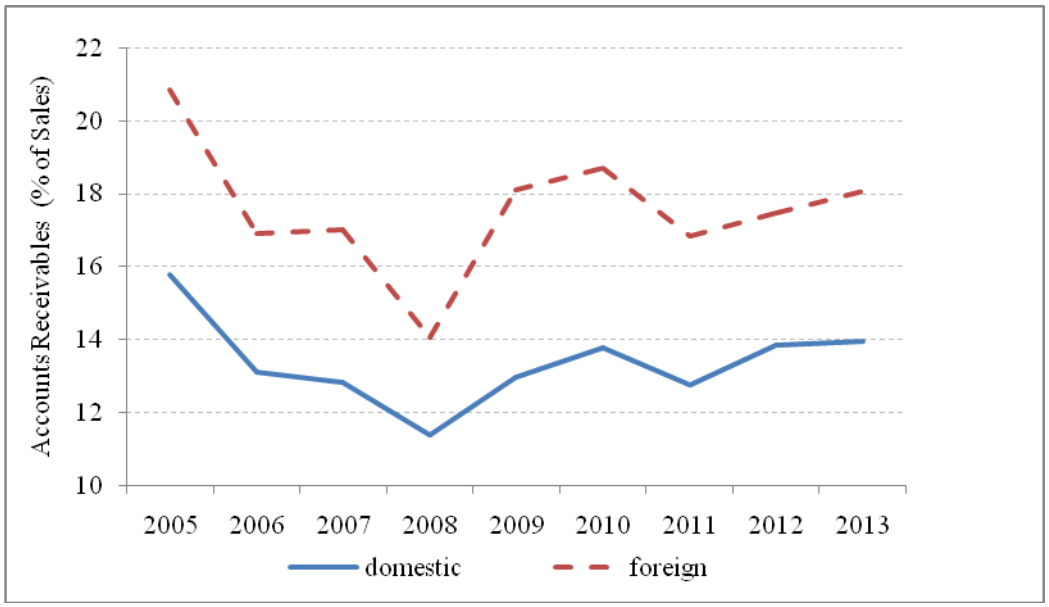


Panel B. Inward FDI Stock (% of GDP)



Notes: Capital account openness is obtained from the updated dataset constructed by Chinn and Ito (2006). Here low openness country refers to the one whose average capital account openness index value falls into the first quartile of the openness index. Inward FDI stocks and GDP are obtained fromthe updated and extended "External Wealth of Nations" dataset constructed by Lane and Milesi-Ferretti (2007).

Figure 2. Trade Credit Provision by Firm Ownership (2005-2013)



Notes: The solid line and the dashed line represent the medians of the accounts receivable to sales ratios for domestically-owned private firms and foreign-owned firms in the Oriana sample, respectively.

Table 1. Summary Statistics

Variable	Median	Mean	Std. Dev	Min.	Max.
accounts receivable/sales	8.94	17.31	24.62	0	191.95
foreign	0	0.06	0.24	0	1
ln(total assets)	9.29	9.43	1.24	6.69	13.89
ln(age)	1.79	1.86	0.85	0	4.08
profit/sales	2.56	3.43	9.45	-83.15	35.65
ln(sales per worker)	5.29	5.32	1.04	1.81	7.91
leverage	57.82	55.24	25.83	0.74	98.65
liquidity	58.89	57.73	23.33	5.68	98.35
ln(concentration ratio)	3.01	3.00	0.62	1.60	4.61
Short-term debt/sales	31.06	55.41	98.71	0	1156.86

Notes: The baseline sample contains 1,122, 528 firm-year observations over the decade of 1998 to 2007.

Table 2. Differential Responses of Trade Credit Provision

	Minus M2 growth	Minus Loan growth
foreign×tight_cn	0.259***	0.245**
	(0.090)	(0.106)
ln(assets)	6.460***	6.461***
	(0.066)	(0.066)
ln(age)	0.142**	0.140**
	(0.063)	(0.063)
profit	-0.137***	-0.137***
	(0.007)	(0.007)
ln(sales per worker)	-10.155***	-10.154***
	(0.072)	(0.072)
leverage	0.019***	0.019***
	(0.001)	(0.001)
liquidity	0.184***	0.183***
	(0.002)	(0.002)
ln(concentration ratio)	0.211**	0.210**
	(0.098)	(0.098)
foreign×Δln(reer)	-0.033	-0.049*
	(0.026)	(0.027)
R-squared	0.730	0.730
No. of obs.	998,462	998,462

Notes: The dependent variable is accounts receivable as percentage of sales. Tight_cn is measured by the minus growth rate of M2 in the first column and the minus growth rate of bank loans in second column, respectively. Both regressions include a constant term, firm fixed effects, industry fixed effects and year fixed effects. Clustered standard errors at the firm level are in parentheses. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively.

Table 3. Adding Interactions with Firm-Specific Characteristics

	size	profit	leverage	liquidity
foreign ×tight_cn	0.285***	0.258***	0.258***	0.312***
	(0.091)	(0.090)	(0.090)	(0.089)
ln(assets) ×tight_cn	0.402			
	(0.353)			
ln(profit) ×tight_cn		-0.006		
		(0.018)		
leverage ×tight_cn			0.015*	
			(0.009)	
liquidity ×tight_cn				0.040***
				(0.010)
R-squared	0.730	0.730	0.730	0.730
No. of obs.	998,462	998,462	998,462	998,462

Notes: The dependent variable is accounts receivable as percentage of sales. Tight_cn is measured by the minus growth rate of M2. All regressions include a constant term, all control variables, firm fixed effects, industry fixed effects and year fixed effects. Clustered standard errors at the firm level are in parentheses. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively.

Table 4. Differential Responses to Global Liquidity Shocks

Panel A. Primary Proxies of Global Liquidity Shocks

	-Δrffr	-rrshock	-ΔG7rate_wa
foreign ×tight_cn	0.349***	0.558***	0.450***
	(0.120)	(0.140)	(0.132)
foreign ×gloliq	0.241	0.299**	0.119
	(0.148)	(0.124)	(0.117)
foreign ×tight_cn ×gloliq	0.229***	0.588***	0.426**
	(0.089)	(0.162)	(0.169)
R-squared	0.730	0.730	0.730
No. of obs.	998,462	998,462	998,462

Panel B. Alternative Proxies of Global Liquidity Shocks

	-Δffr	-ΔG7rate_pc	-Δlibor3m
foreign ×tight_cn	0.354***	0.416***	0.352***
	(0.123)	(0.140)	(0.120)
foreign ×gloliq	0.072	0.202*	0.110
	(0.116)	(0.115)	(0.116)
foreign ×tight_cn ×gloliq	0.177*	0.250**	0.203**
	(0.093)	(0.119)	(0.103)
R-squared	0.730	0.730	0.730
No. of obs.	998,462	998,462	998,462

Notes: The dependent variable is accounts receivable as percentage of sales. Tight_cn is measured by the minus growth rate of M2. In Panel A, Gloliq is measured by the negative change in US real effective federal funds rate(-*Δrffr*), the negative of US monetary policy shock series (-*rrshock*) constructed by Romer and Romer (2004) and Wieland and Yang (2015), and the negative change in average of G7 countries' central bank policy rates weighted by their respective GDP shares (-*ΔG7rate_wa*). In Panel B, Gloliq is measured by the negative change in US nominal federal funds rate (*Δffr*), the negative change in the first principal component of G7 countries' central bank policy rates (-*Δg7rate_pc1*), and the negative change in the 3-month US dollar LIBOR interest rate (-*Δlibor3m*). All regressions include a constant term, all control variables, firm fixed effects, industry fixed effects and year fixed effects. Clustered standard errors at the firm level are in parentheses. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively.

Table 5. Different Definitions of Firm Ownership

Panel A. Official Classifications

	-Δrffr	-rrshock	-ΔG7rate_wa
foreign×tight_cn	0.243**	0.392***	0.312***
	(0.102)	(0.119)	(0.112)
foreign×gloliq	0.141	0.205*	0.066
	(0.125)	(0.105)	(0.100)
foreign×tight_cn×gloliq	0.161**	0.438***	0.315**
	(0.074)	(0.135)	(0.142)
R-squared	0.730	0.731	0.730
No. of obs.	987,275	987,275	987,275

Panel B. Firm Registration Types

	-Δrffr	-rrshock	-ΔG7rate_wa
foreign×tight_cn	0.238***	0.386***	0.316***
	(0.086)	(0.100)	(0.095)
foreign×gloliq	0.160	0.207**	0.064
	(0.106)	(0.089)	(0.084)
foreign×tight_cn×gloliq	0.182***	0.455***	0.352***
	(0.062)	(0.113)	(0.121)
R-squared	0.727	0.727	0.727
No. of obs.	1,034,247	1,034,247	1,034,247

Notes: The dependent variable is accounts receivable as percentage of sales. Tight_cn is measured by the minus growth rate of M2. Panel A defines firm ownership by official classifications, and Panel B classifies firm ownership by their registration types. Gloliq is measured by the negative change in US real effective federal funds rate(*-Δrffr*), the negative of US monetary policy shock series (*-rrshock*) constructed by Romer and Romer (2004) and Wieland and Yang (2015), and the negative change in average of G7 countries' central bank policy rates weighted by their respective GDP shares (*-ΔG7rate_wa*) in the three columns. All regressions include a constant term, all control variables, firm fixed effects, industry fixed effects and year fixed effects. Clustered standard errors at the firm level are in parentheses. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively.

Table 6. Alternative Model Specifications

Panel A. Time-Varying Industry and Province Fixed Effects

	-Δrffr	-rrshock	-ΔG7rate_wa
foreign ×tight_cn	0.335***	0.504***	0.428***
	(0.123)	(0.144)	(0.135)
foreign ×gloliq	0.197	0.232*	0.082
	(0.152)	(0.127)	(0.120)
foreign ×tight_cn ×gloliq	0.212**	0.512***	0.413**
	(0.091)	(0.166)	(0.173)
R-squared	0.731	0.731	0.731
No. of obs.	998,462	998,462	998,462

Notes: The dependent variable is accounts receivable as percentage of sales. Tight_cn is measured by the minus growth rate of M2. Gloliq is measured by the negative change in US real effective federal funds rate(*-Δrffr*), the negative of US monetary policy shock series (*-rrshock*) constructed by Romer and Romer (2004) and Wieland and Yang (2015), and the negative change in average of G7 countries' central bank policy rates weighted by their respective GDP shares (*-ΔG7rate_wa*) in the three columns. All regressions include a constant term, all control variables, firm fixed effects, industry ×year fixed effects and province ×year fixed effects. Clustered standard errors at the firm level are in parentheses. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively.

Panel B. Random Effect Tobit Model

	-Δrffr	-rrshock	-ΔG7rate_wa
foreign ×tight_cn	0.733***	0.991***	0.852***
	(0.098)	(0.096)	(0.104)
foreign ×gloliq	0.477***	0.560***	0.259***
	(0.109)	(0.090)	(0.094)
foreign ×tight_cn ×gloliq	0.510***	1.008***	0.797***
	(0.074)	(0.124)	(0.151)
No. of obs.	1,122,528	1,122,528	1,122,528

Notes: The dependent variable is accounts receivable as percentage of sales. Tight_cn is measured by the minus growth rate of M2. Gloliq is measured by the negative change in US real effective federal funds rate(*-Δrffr*), the negative of US monetary policy shock series (*-rrshock*) constructed by Romer and Romer (2004) and Wieland and Yang (2015), and the negative change in average of G7 countries' central bank policy rates weighted by their respective GDP shares (*-ΔG7rate_wa*) in the three columns. All regressions include a constant term, all control variables, firm random effects, industry dummies and year dummies. Standard errors derived from the observed information matrix (OIM) are in parentheses. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively.

Table 7. Alternative Samples

Panel A. Including SOEs

	-Δrffr	-rrshock	-ΔG7rate_wa
foreign ×tight_cn	0.381***	0.612***	0.487***
	(0.120)	(0.140)	(0.132)
foreign ×gloliq	0.291**	0.327***	0.149
	(0.148)	(0.124)	(0.117)
foreign ×tight_cn ×gloliq	0.252***	0.630***	0.441***
	(0.089)	(0.162)	(0.169)
soe ×tight_cn	-0.074	0.124	0.044
	(0.151)	(0.173)	(0.173)
soe ×gloliq	0.947***	0.236	0.566***
	(0.159)	(0.156)	(0.155)
soe ×tight_cn ×gloliq	0.460***	0.312*	-0.129
	(0.118)	(0.180)	(0.229)
R-squared	0.743	0.743	0.743
No. of obs.	1,020,961	1,020,961	1,020,961

Panel B. Excluding Collectively-Owned & Legal-Person Firms

	-Δrffr	-rrshock	-ΔG7rate_wa
foreign ×tight_cn	0.342***	0.548***	0.420***
	(0.120)	(0.141)	(0.133)
foreign ×gloliq	0.303**	0.312**	0.123
	(0.151)	(0.127)	(0.120)
foreign ×tight_cn ×gloliq	0.277***	0.609***	0.413**
	(0.090)	(0.165)	(0.172)
R-squared	0.748	0.748	0.748
No. of obs.	532,125	532,125	532,125

Notes: The dependent variable is accounts receivable as percentage of sales. The sample used in Panel A include FDI, domestic private and domestic SOE firms. The sample in Panel B include FDI and domestic private firms while excluding collectively-owned and legal person firms. Tight_cn is measured by the minus growth rate of M2. Gloliq is measured by the negative change in US real effective federal funds rate(*-Δrffr*), the negative of US monetary policy shock series (*-rrshock*) constructed by Romer and Romer (2004) and Wieland and Yang (2015), and the negative change in average of G7 countries' central bank policy rates weighted by their respective GDP shares (*-ΔG7rate_wa*) in the three columns. All regressions include a constant term, all control variables, firm fixed effects, industry fixed effects and year fixed effects. Clustered standard errors at the firm level are in parentheses. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively.

Table 8. The Differential Responses of Short-Term Debt

Panel A. Benchmark Results

	-Δrffr	-rrshock	-ΔG7rate_wa
foreign ×tight_cn	3.323***	5.076***	4.353***
	(0.448)	(0.486)	(0.469)
foreign ×gloliq	2.645***	2.163***	1.717***
	(0.533)	(0.442)	(0.430)
foreign ×tight_cn ×gloliq	1.745***	4.107***	3.246***
	(0.327)	(0.580)	(0.628)
R-squared	0.736	0.736	0.736
No. of obs.	998,306	998,306	998,306

Panel B. Controlling for Long-Term Debt

	-Δffr	-ΔG7rate_pc	-Δlibor3m
foreign ×tight_cn	3.210***	4.939***	4.193***
	(0.446)	(0.483)	(0.468)
foreign ×gloliq	2.660***	2.181***	1.716***
	(0.530)	(0.441)	(0.429)
foreign ×tight_cn ×gloliq	1.714***	4.016***	3.081***
	(0.326)	(0.577)	(0.626)
R-squared	0.738	0.739	0.739
No. of obs.	997,273	997,273	997,273

Notes: The dependent variable is short-term debt as percentage of sales. Tight_cn is measured by the minus growth rate of M2. Gloliq is measured by the negative change in US real effective federal funds rate(*-Δrffr*), the negative of US monetary policy shock series (*-rrshock*) constructed by Romer and Romer (2004) and Wieland and Yang (2015), and the negative change in average of G7 countries' central bank policy rates weighted by their respective GDP shares (*-ΔG7rate_wa*) in the three columns. All regressions include a constant term, all control variables, firm fixed effects, industry fixed effects and year fixed effects. Long-term debt as a percentage of sales is included in regressions in Panel B as an additional control variable. Clustered standard errors at the firm level are in parentheses. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively.

Table 9. Results from Matched Sample

Panel A. Trade Credit Provision

	-Δrffr	-rrshock	-ΔG7rate_wa
foreign ×tight_cn	0.272	0.484**	0.371*
	(0.198)	(0.232)	(0.218)
foreign ×gloliq	0.336	0.350*	0.069
	(0.247)	(0.205)	(0.195)
foreign ×tight_cn ×gloliq	0.369**	0.739***	0.574**
	(0.147)	(0.268)	(0.280)
R-squared	0.831	0.831	0.831
No. of obs.	126,474	126,474	126,474

Panel B. Short-Term Debt

	-Δrffr	-rrshock	-ΔG7rate_wa
foreign ×tight_cn	1.822**	3.192***	2.630***
	(0.777)	(0.847)	(0.815)
foreign ×gloliq	2.432***	1.841**	1.422*
	(0.938)	(0.774)	(0.754)
foreign ×tight_cn ×gloliq	1.505***	3.178***	2.479**
	(0.569)	(1.013)	(1.089)
R-squared	0.844	0.844	0.844
No. of obs.	126,449	126,449	126,449

Notes: The dependent variables in Panels A and B are accounts receivable and short-term debt as percentages of sales, respectively. Tight_cn is measured by the minus growth rate of M2. Gloliq is measured by the negative change in US real effective federal funds rate(*-Δrffr*), the negative of US monetary policy shock series (*-rrshock*) constructed by Romer and Romer (2004) and Wieland and Yang (2015), and the negative change in average of G7 countries' central bank policy rates weighted by their respective GDP shares (*-ΔG7rate_wa*) in the three columns. All regressions include a constant term, all control variables, firm fixed effects, industry fixed effects and year fixed effects. Clustered standard errors at the firm level are in parentheses. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively.

Table 10. Additional Evidence from the Recent Global Financial Crisis

Dependent variable	accounts receivable/sales	net trade credit/sales	short-term debt/sales
foreign ×tight_cn	1.171***	3.193***	4.368***
	(0.431)	(0.501)	(0.675)
foreign ×crisis	-0.396	-1.931***	-3.262***
	(0.418)	(0.474)	(0.591)
foreign ×tight_cn ×crisis	-1.415***	-4.024***	-4.410***
	(0.470)	(0.541)	(0.708)
R-squared	0.756	0.680	0.731
No. of obs.	27,507	27,302	27,272

Notes: The sample consists of Chinese manufacturing firms contained in the Oriana dataset over the period of 2005-2013. The dependent variables in the three columns are accounts receivable, accounts receivable net of accounts payable, and short-term debt as percentages of sales, respectively. Tight_cn is measured by the minus growth rate of M2. Crisis is a dummy variable equal to one for the years 2007-2009. All regressions include a constant term, all control variables, firm fixed effects, and year fixed effects. Clustered standard errors at the firm level are in parentheses. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively.