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

by

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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. In a large sample of 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. Moreover, the differential responses of FDI and local firms are stronger in financially more dependent industries or in Chinese provinces with less financial depth.

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

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

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 equity flows and debt 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 non-FDI flows, they are quite open to (or even embrace) inward FDI flows. Figure 1 illustrates this point. In Panel A, we construct a *de facto* measure of openness to non-FDI flows following the literature (e.g., Lane and Milesi-Ferretti, 2007; Kose et al., 2009) and graph its time path for the U.S., Japan, China, and a group of low openness economies over the period of 1998-2011.[3] Not surprisingly, the U.S. and Japan are highly open to non-FDI flows while

[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 *de facto* measure of non-FDI openness is defined as the sum of portfolio equity and debt assets and liabilities to GDP ratio. Low openness economies here include countries whose degrees of non-FDI openness are below the first quartile.

China and the group of low openness economies are rather restrictive toward non-FDI flows. When comparing their openness to inward FDI (defined as FDI liabilities to GDP ratio) over the same period, however, we observe a completely different picture. As shown in Panel B, the group of low openness economies and China are found to be more open to FDI inflows than the U.S. and Japan in the *de facto* sense.[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 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).

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

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 FDI 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 FDI firms' advantage in trade credit extension is contingent on global credit conditions and a favorable global liquidity shock indeed strengthens their advantage in providing trade credit. To further establish the causal relationship, we follow the literature (e.g., Rajan and Zingales, 1998; Fisman and Love, 2003; Manova, Wei, and Zhang, 2015) to exploit cross-industry variations in external finance dependence and cross-province variations in the degrees of financial development. We find that the impact of global liquidity conditions on FDI firms' advantage in trade credit provision is more pronounced in financially more dependent industries or in provinces with a lower level of financial development.

In addition to the supply of trade credit, we also extend our analysis to firms' differential responses in short-term debt, use of trade credit, and net trade credit provision to offer more supportive evidence for the trade credit channel. Finally, we provide additional evidence through the lens of a large negative global liquidity shock. Using the recent global financial crisis as a natural experiment, we show that a sufficiently large negative shock to global liquidity can significantly weaken 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 host countries' 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 their 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 existing work focuses on the propagation of domestic 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 use detailed data on Chinese manufacturing firms to test our hypotheses. 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. FDI attraction has 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. Table 1 provides some evidence for the financing advantage of FDI firms using a sample of Chinese manufacturing firms over the period 1998-2007.[5] Specifically, we compare the investment-cash flow sensitivity between FDI and domestic private firms by regressing investment on cash flow and its interaction with the FDI firm dummy. Column (1) employs a static investment model commonly used in the literature (e.g., Fazzari, et al., 1988; Kaplan and Zingales, 1997), controlling for firm's sales growth as well as industry sales growth.[6] Column (2) makes use of the Euler equation approach developed by Bond and Meghir (1994) and estimates a dynamic investment model, controlling for lagged investment and its square, sales and debt squared.[7] In both columns we find a negative and statistically significant, at least at the 5%

[5] Details on the sample of Chinese manufacturing firms are available in Section 2.2 and Appendix A1.

[6] Since our sample consists mainly of non-listed firms, we are unable to compute Tobin's Q for each firm. Following Whited and Wu (2006), we include firm's sales growth and 3-digit industry sales growth as proxies for investment opportunity.

[7] The dynamic investment equation is estimated using a first-difference GMM approach of Arellano and Bond (1991). Since

level, coefficient on the interaction between cash flow and the FDI firm dummy. These results indicate that, compared with domestic private firms, FDI firms have significantly lower investment-cash flow sensitivity and thus are less financially constrained.

Moreover, FDI firms in China do have an overwhelming advantage in accessing international financial markets compared to domestically-owned firms due to the capital control policy. China adopts a differentiated foreign debt management policy, under which domestic firms face strict controls over their foreign borrowing while foreign-invested enterprises are allowed to incur foreign debt much more easily.[8] To get a quantitative sense about the difference in accessing international financial market between FDI and domestic firms, we compute their respective shares of total external debt stocks held by Chinese firms using the data published by the State Administration of Foreign Exchange (SAFE). As evident in Figure 2, over the period 1998-2013, foreign-owned firms hold substantially more external debt than domestic firms. On average, the external debt stock held by foreign-funded enterprises is about 13 times of that held by domestically-owned firms.

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. The data contains detailed information on firm's production, ownership structure, trade

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lagged values of the regressors are used as instruments, the sample size in the second column is smaller.

[8] In general, domestic firms' foreign borrowing requires approval from the National Development and Reform Commission on a case-by-case basis while FDI firms need only to register their foreign borrowing. For example, the minimum requirements for a domestic firm to issue short-term foreign debt include belonging to national priority industry, having positive profits in the last 3 years, and net assets exceeding 30% of total assets and 200% of the amount of borrowing.

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 the Appendix.

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 FRED II database, Romer and Romer (2004) and its subsequent update by Wieland and Yang (2015). Appendix Table A2 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 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 mitigate the effect of outliers, we winsorize the accounts receivable to sales ratio at the top and bottom 1% of its distribution.[9] To test our conjecture on the role of FDI 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.[10] As shown in Appendix Table A2, the median and mean

[9] Simply excluding those observations yields similar results.

[10] In the cleaned NBS data, 73% of firm-year observations have no foreign sales, 19% have both domestic and export sales, and the remaining 8% have exports only. In a robustness check, we also augment the baseline sample by including exporting

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 an FDI firm 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, Wei, and Zhang, 2015). To avoid potential complications associated with switching of ownership status, we also exclude from our baseline sample a small fraction of firms (less than 5%) that have switched their ownership types during the sample period.[11]

2.4. Measures of Domestic and Global Liquidity Conditions

Our estimation requires an appropriate measure of the degree of monetary tightness (*tightness*) in China. For the sake of robustness, we consider three different measures. First, given that interest rates are heavily regulated in China and the People's Bank of China relies mainly on quantity-based tools to conduct monetary policy with M2 growth as its

firms. The estimation results are reported in the Appendix Table A4 and are quite similar to baseline results.

[11] As shown in the Appendix Table A4, including these switchers does not alter our main results.

intermediate target, we use the (standardized) minus M2 growth rate (*-M2g*) as a measure of China's monetary condition. Second, following Christiano, Eichenbaum and Evans (1999), we estimate a structural VAR model of output growth, CPI inflation, and M2 growth and obtain the exogenous monetary shock (*t-var*) using their recursive identification. Third, we also consider a narrative-based monetary tightness index constructed by Shu and Ng (2010), which follows Romer and Romer (1989, 2004) and extracts information from China's official records including meeting notes of the Monetary Policy Committee and Monetary Policy Reports. Specifically, we follow Romer and Romer (2004) to regress the Shu-Ng index on future, current and lagged values of output growth and CPI inflation and to use the residuals from this regression as exogenous monetary tightening shocks (*t-narrative*).[12] To facilitate interpretation, the above three measures are constructed in such a way that their values increase in times of monetary tightening in China.

For indicators of global liquidity conditions (*gloliq*), we use the change in US real effective federal funds rate (*Δrffr*) as our primary indicator for US monetary policy is typically considered as a critical determinant of the liquidity condition in international markets. For sensitivity checks, we also employ two alternative proxies of global credit conditions. One is the US monetary policy shock series (*RRshock*) initially constructed by Romer and Romer (2004) and subsequently updated by Wieland and Yang (2015), and the other is the change in the average of G7 countries' central bank policy rates weighted by their respective GDP shares in the world (*ΔG7rate*). Here we multiple all three global liquidity

[12] Since the People's Bank of China started to publish Monthly Policy Reports in 2001, there is no data available on the series of narrative-based tightening shocks prior to 2001.

indicators by minus one so that the value of *gloliq* rises in times of credit easing in international financial markets and falls in times of global credit tightening.

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 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 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 FDI and domestic firms to movements in the real exchange rate. To reduce the influence of outliers, all firm-level controls are winsorized at the top and bottom 1% of their respective distributions.

3. Empirical Strategy

Our baseline analysis follows a two-step approach. We begin by examining whether FDI firms extend more trade credit than local firms during tighter domestic credit periods. We then show that FDI firms' advantage in trade credit provision over their local counterparts depends crucially upon global credit conditions. In addition to the baseline analyses, we also extend our study in several important ways. First, to further establish the causality, we follow the literature and exploit cross-industry variations in external finance dependence and cross-province variations in financial development. Second, we make efforts to control for downstream demand factors. Third, we provide additional supportive evidence by extending our analysis to firms' differential responses in short-term debt positions, accounts payable and net trade credit provision. Finally, we also use the recent global financial crisis as a natural experiment to examine the impact of a sufficiently large negative shock to global liquidity on FDI firms' advantage in trade credit provision.

3.1. The Effects of Domestic Monetary Tightness

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 tighter domestic 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 FDI firms are financially less constrained in general, they are able to extend more trade credit than domestically-owned firms when the credit condition in China becomes tighter.

To test this hypothesis, we estimate the following specification:

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

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 FDI firms and 0 for Chinese domestically-owned private firms, and $tightness_t$ 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 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. Given that firms switch their industries during the sample period, we also include industry fixed effects (μ_j) to control for time-invariant systematic difference in trade credit provision across industries. Further, 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 level effect of China's monetary tightness (*tightness*) is thus absorbed by the year fixed effects.

We are particularly interested in the coefficient (β) on the interaction term between the foreign dummy and the monetary tightness measure. As shown in the trade credit literature, a tighter domestic credit condition leads to an expansion of trade credit extended. Here we expect further that this expansionary effect of tighter credit condition on trade credit

provision to be even stronger for FDI 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 FDI firms' financing advantage over domestically-owned firms and to illustrate the role of FDI firms in the propagation of global liquidity shocks. If having better access to international credit markets is indeed an important source of FDI firms' financing advantage over local firms, we anticipate FDI 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 FDI 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:

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

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 domestic firms during tighter domestic money periods depends on global

credit conditions. We expect $\lambda > 0$ to be evidence in favor of our hypothesis.

3.3. Extensions

Besides the above baseline analyses, we also extend our study in several important ways. Our first set of extensions is to make efforts to further ensure the causality running from FDI firms' financing advantage to their trade credit provision. Specifically, we follow the literature (e.g., Rajan and Zingales, 1998; Manova, Wei, and Zhang, 2015) and employ cross-industry variations in the degrees of technologically-determined dependence on external finance. We expect FDI firms' financial advantage matters more for industries that rely more heavily on external finance. In a similar vein, we also exploit cross-province variations in local financial development and examine whether the differential responses are stronger in financially less developed provinces where domestic private firms face more difficulties raising funds.

Second, we also make efforts to explicitly control for downstream demand factors. A competing explanation for our results is that FDI firms offer more trade credit not because they are financially less constrained but because they face higher demand for trade credit from their downstream firms. To address this concern, we first construct a downstream trade credit dependence index at the industry level using Fisman and Love's (2003) trade credit dependence measure and China's input-output table.[13] We then include its interaction with the domestic monetary tightness measure in specification (2) to further control for downstream demand factors and see whether our results stay the same. It is also worth noting that a positive coefficient on this newly added interaction term would indicate that, during tighter domestic credit periods, firms tend to offer more trade credit if their downstream

[13] See Section 4.4 for more details on the construction of the downstream trade credit dependence index.

industries rely more on it.

Next, we shall provide additional supportive evidence by extending our analysis to FDI and domestic firms' differential responses in short-term debt positions, accounts payable and net trade credit provision. Finally, we also use the recent global financial crisis as a natural experiment to examine the impact of a sufficiently large negative shock to global liquidity on FDI firms' advantage in trade credit provision.

4. Empirical Results

4.1. Basic Results

We begin our empirical analysis by investigating whether FDI firms extend more trade credit than domestic firms during tighter domestic credit periods. Table 2 presents the estimation results for specification (1). In Columns (1)-(3), we use the minus M2 growth rate, the VAR-based monetary shock, and the narrative-based shock as the measure of domestic monetary tightness, respectively. We find that, in each column, the estimated coefficient on the interaction between the foreign ownership dummy and the tightness measure is positive and statistically significant at the 1% level. That is, FDI firms offer more trade credit than domestically-owned private firms when China's monetary condition becomes tighter. While the estimated coefficients on the control variables are not reported due to space limitation, we find most of them are statistically significant and have signs consistent with previous findings in the trade credit literature. In particular, 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. To isolate the effect of firm size, we interact it with minus M2 growth and include the interaction term as additional control in Column (4). For similar reasons, we also include separately the interaction of minus M2 growth with firm's age, profitability, leverage ratio and liquidity ratio to the regression in Columns (5)-(8).[14] Adding these additional interaction terms does not alter our main results as we continue to find more trade credit offered by FDI firms in times of tighter domestic credit.

Having established the fact that FDI firms offer more trade credit than local ones during tighter domestic monetary periods, we now use specification (2) to test the impact of global liquidity conditions on FDI firms' advantage in trade credit provision. Results summarized in Table 3 provide supportive evidence for our hypothesis. To save space, we only report the estimated coefficients on three interaction terms. No matter which domestic tightness measure is used, the coefficient on its interaction with foreign ownership remains statistically significant and positive, confirming more trade credit provision by FDI firms during tighter domestic money periods in the absence of global liquidity shocks. More importantly, the coefficient on the triple interaction term is also found to be significantly positive, suggesting that a favorable global liquidity shock can further amplify FDI firms' advantage in trade credit provision.

To gauge the size of this impact, here we consider two firms with the median level of

[14] We also estimated the regressions in Columns (4) through (8) using the VAR-based shock and the narrative-based shock as measures of domestic monetary tightness and obtained similar results.

accounts receivable to sales ratio (8.94 percent). Take the estimated coefficients in the second column for example. Given no change in the real federal funds rate (i.e., *gloliq*= 0), a one standard deviation contractionary shock (VAR-based) would lead to an increase in the trade credit provision gap between FDI and local firms by 0.42 percentage point, equivalent to a 5% increase relative to the median level of trade credit extension. When global liquidity condition eases (as proxied by a one standard deviation reduction in *Δrffr*), however, the trade credit provision advantage of FDI firms over domestic ones would increase to 0.66 percentage points, that is, an over 7% increase relative to the median accounts receivable to sales ratio.

To sum up, our benchmark results provide strong evidence that access to international credit markets is 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 global liquidity indicators, different foreign ownership definitions, different samples used in estimation as well as alternative model specifications.

4.2.1. Alternative Global Liquidity Indicators

To ensure that our results are not sensitive to different global liquidity indictors, our first robustness check is to replace our primary global liquidity indicator with two alternative measures: the narrative-based US monetary policy shock series multiplied by minus one

(-*RRshock*) and the negative change in G7 countries' average policy rates weighted by their GDP shares (-*ΔG7rate*). As shown in Table 4, our results are robust to using the two alternative measures. FDI firms are found to have a significant advantage in trade credit provision over their local counterparts in times of China's monetary tightening, and this advantage is further strengthened by a favorable shock to global credit condition. Besides, we also consider three additional global liquidity indicators, including the negative change in US nominal federal funds rate (-*Δffr*), the negative change in the first principal component of G7 countries' policy rates (-*ΔG7rate_pc*), and the negative change in the 3-month US dollar LIBOR interest rate (-*Δlibor3m*). The estimation results (shown in the Appendix Table A3) again are in favor of our hypotheses.

4.2.2. Different Ownership Definitions

Since foreign ownership is a key explanatory variable in our analysis, our second set of robustness check is to verify that the results are not driven by the *de facto* ownership classification we used in the baseline analysis. In Panel A of Table 5 we use a *de jure* classification of firm ownership that is based on firm's registration type and find our main results unaltered. They again strongly support our hypotheses that FDI firms provide more trade credit during tighter credit periods in China and that their financing advantage over domestically-owned firms is amplified by a favorable global liquidity shock. While not reported for the sake of brevity, we also repeat the above exercise using the official classification of foreign-owned firms set by the Chinese government (i.e., the foreign share of capital paid-in exceeds 25%) and obtain fairly similar results.

4.2.3. Alternative Samples Used

Our third set of robustness checks is to see whether the main results still hold when different samples are used. 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 5, we exclude these two types of firms from the baseline sample so that domestically-owned firms now consist of pure domestic private firms only. We also estimate (and report in the Appendix Table A4) our baseline model in three augmented samples. One is to include non-exporting state-owned enterprises (SOEs), the second is to include exporting private firms, and yet another is to include private firms that have ever changed their foreign ownership. In all cases, our main results remain unchanged. We consistently find positive and statistically significant coefficients on the interaction between the foreign ownership dummy and the tightness measure as well as the triple interaction term.

4.2.4. Alternative Specifications

The last set of robustness checks is to examine the sensitivity of our results to different types of model specifications. First, we consider a more stringent set of fixed effects. Specifically, we add province-year and industry-year fixed effects to the regression to control for potential time-varying confounding factors at the industry and province levels. Second, given the fact that the accounts receivable to sales ratio has a lower bound of zero, we also employ a random effect Tobit model to address potential concerns arising from this left-censoring issue. As shown in Appendix Table A5, using these alternative specifications does not alter our findings either.

All in all, the results from our robustness checks deliver a consistent message. That is, FDI firms extend more trade credit than domestic firms during tighter domestic credit periods, and a favorable global liquidity shock strengthens this advantage.

4.3. External Finance Dependence and Financial Development

To better identify the causal effect of FDI firms' financing advantage on their trade credit provision, we now go one step forward to exploit cross-industry variations in external finance dependence and cross-province variations in financial development. First, we check if the differential responses of FDI and domestic firms are more pronounced in industries depending more on external finance. We use the industry-level external finance dependence indicator from Manova, Wei, and Zhang (2015), which is constructed from the Compustat data on the US listed firms in the tradition of Rajan and Zingales (1998). Since this indicator represents the technological component of difference in demand for external finance at the industry level, it is exogenous to changes in real economic activities and credit conditions in China. We split our sample into two groups of industries - high external finance dependence (above median) and low external finance dependence (below median) industries, and estimate specification (2) in the two subsamples. As demonstrated in Table 6, domestic monetary tightening and global credit easing have significantly positive effects on the trade credit provision gap between FDI and domestic private firms in high external finance dependence industries, but no significant impact for firms in low external finance dependence industries.

Next, we examine whether the effects of domestic and global liquidity shocks on FDI firms' trade credit provision advantage are more noticeable in financially less developed Chinese provinces. We use private credit to GDP ratio averaged over the sample period as a

measure of financial development at the province level and classify provinces into high or low financial development groups according to the sample median.[15] The results reported in Table 7 confirm that a favorable shock to global liquidity significantly amplifies FDI firms' advantage in trade credit provision in financially less developed provinces but has no significant impact in financially more developed provinces.

4.4. Downstream Trade Credit Dependence

So far we have not paid specific attention to downstream firms' demand for trade credit. An alternative explanation for our results could be that FDI firms are equally financially constrained as domestic firms but face higher downstream demand for trade credit. To control for the demand factors from downstream firms, here we construct an industry-level measure of downstream trade credit dependence using China's 2002 input-output table. Specifically, for industry *i*, we identify its downstream industries for which its products are used as intermediate inputs and calculate their respective usage as a share of industry *i*'s total production. We then obtain each downstream industry's degree of trade credit dependence from Fisman and Love (2003), which is constructed from the US data and captures the technological aspect of dependence on trade credit innate to an industry. Finally, we compute industry *i*'s downstream trade credit dependence as the average of its downstream industries' trade credit dependence weighted by their intermediate input usage shares.

In our previous analyses, the effect of this industry-level downstream trade credit dependence *per se* is absorbed by the industry fixed effects. Here to further control for the

[15] Since private credit is not directly available at the province level, we use total bank lending to GDP ratio predicted by the share of private enterprises in industrial output following Aziz and Duenwald (2002).

possibility that downstream firms' demand for trade credit may depend on both their trade credit dependence and domestic credit conditions, we add the interaction of these two variables as an additional regressor in specification (2) and report the estimation results in Table 8. Controlling explicitly for downstream demand factors does not affect our main findings. Again, there is strong evidence that FDI firms provide more trade credit relative to domestic private firms during tighter domestic credit periods and that their trade credit provision advantage is amplified by a positive shock to global liquidity.[16] Moreover, we notice that the coefficients on the interaction term between *tightness* and downstream trade credit dependence are positive and statistically significant in all cases. That is, during tighter domestic credit periods, more trade credit are offered by firms whose downstream industries use trade credit more intensively.

4.5. Other Differential Responses

In this subsection, we extend our analysis on the differential responses between FDI and domestic firms to other firm-level financial variables, including short-term debt position, accounts payable and net trade credit.

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 FDI and local firms' short-term debt, a primary source of fund for extending trade credit. Specifically, relative to local firms, we should expect FDI firms to have stronger position in short-term debt during

[16] The results in Panel (a) of Appendix Table A5 confirm that our results hold even after controlling for time-varying industry fixed effects, which captures all time-varying industry level factors including time-varying downstream trade credit dependence.

China's monetary contraction and that this advantage would be further augmented by a favorable global credit condition. In Panel (a) of Table 9, we use firm's short-term debt to sales ratio as the dependent variable and re-estimate specification (2). No matter which domestic monetary tightness indicator is used, we always find that FDI firms have significantly more short-term debt than domestic private firms during tighter domestic credit periods. Moreover, the gap in short-term debt between FDI and domestic private firms becomes significantly wider when there is a favorable shock to global credit conditions.[17]

To further corroborate our conjecture that the financing advantage of FDI firms over domestic private firms in China depends on global credit conditions, we also examine the differential responses in accounts payable and net trade credit extended between FDI and domestic firms to liquidity shocks at home and abroad. We measure net trade credit extended as the difference between accounts receivable and accounts payable. We scale both variables by sales. Since the data on accounts payable and hence net trade credit extended is only available starting from 2004, the size of the sample used in the estimation shrinks dramatically. Nonetheless, as illustrated in Panels (b) and (c) of Table 9, the results from the accounts payable and the net trade credit regressions are also consistent with our hypotheses. Compared with domestic firms, FDI firms tend to use less accounts payable and offer more net trade credit during tighter money periods in China. Moreover, their differential responses are more pronounced in times of abundant global liquidity.

[17] While not reported for the sake of brevity, we also 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 and find that the results remain unchanged.

5. Additional Evidence from Recent Global Financial Crisis

In this section, we use the recent global financial crisis as a natural experiment to examine whether a sufficiently large *negative* shock to global liquidity is able to wipe out FDI firms' trade credit provision advantage. Given the severe global credit crunch occurred during this period, 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 detailed firm balance sheet and ownership information but covers a relatively smaller sample of firms.[18] After removing the 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.[19]

As a first pass at gauging the effect of recent global financial crisis on FDI firms' trade credit provision advantage over domestic firms, in Figure 3, we compare the medians of the accounts receivable to sales ratio between FDI and domestic firms over time. As the graph illustrates, FDI firms provide more trade credit over the whole sample period. However, there is a sharp drop in trade credit provision by FDI firms during the global financial crisis period. Moreover, the gap in trade credit provision between FDI and domestic firms also shrinks

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

[19] 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 or SOEs yields similar results.

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 advantages, we re-estimate specification (2) using the Oriana data.[20] Given the fact that the world's major economies, including the U.S., reduced their policy rates to almost zero and adopted unconventional monetary policies to accommodate the global financial crisis, conventional measures of U.S. monetary shocks are no longer suitable indicators of global liquidity conditions. Here we instead create a global financial crisis dummy for the period between 2007 and 2009 to capture the sharp decline in global credit during the crisis period.[21]

Given that recent global financial crisis caused a severe credit crunch in international financial markets, we expect that FDI firms to 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

[20] Since the Shu and Ng (2010) index ends in 2009, we use another narrative-based tightening indicator by Sun (2013) for the Oriana sample over the period 2005-2013.

[21] Here we essentially compare the differential response in trade credit provision to a domestic monetary tightening shock between FDI and domestic private firms and between the crisis and non-crisis periods. We perform a graphical diagnostic test for the parallel trend assumption. As shown in Figure 3, FDI and domestic private firms follow similar trends in trade credit provision during the non-crisis periods. Moreover, we also conduct falsification tests by randomly setting years (e.g. 2005-2006, 2010-2011 or 2012-2013) as a crisis period and find no differential responses in trade credit provision between FDI and domestic private firms.

supportive evidence for our hypothesis. Panel (a) of Table 10 reports the estimation results for accounts receivable. The coefficient on the triple interaction term is negative and statistically significant at least at the 1% level, suggesting a significant decline in FDI firms' advantage in trade credit extension relative to local firms in times of domestic monetary tightening.

In addition, we also look at the effect of the global financial crisis on FDI and domestic firms' differential responses in accounts payable, net trade credit extended and short-term debt. Conceptually, since the 2007-2009 global financial crisis significantly reduces the international funds available to FDI firms, they would increase their usage of trade credit, reduce their net trade credit extension and have less short-term debt positions. The results presented in Panels (b) through (d) of Table 10 are consistent with our conjecture.

To sum up, through the lens of negative global liquidity shocks experienced during the 2007-2009 global financial crisis, we provide further supportive evidence for FDI firms' role in transmitting global liquidity shocks via the trade credit channel.

6. Conclusions

This study empirically investigates 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 shocks can affect FDI firms' provision of trade credit to downstream firms in the host country. Since FDI firms have access to global financial markets and firms are financially linked through trade credit, global liquidity shocks can affect the local economy through their impacts on FDI firms' provision of trade credit to local downstream firms.

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 FDI firms are less constrained in general, we find that they provide more trade credit than domestic firms during tighter domestic credit periods. Second, more interestingly, we show that FDI firms' advantage in providing trade credit depends crucially upon international liquidity conditions. FDI firms' advantage in trade credit provision can be amplified when international liquidity conditions are favorable. These findings are robust to alternative measures of firm ownership, samples, and model specifications. Furthermore, we find that the differential responses in trade credit provision between FDI and domestic private firms are stronger in industries that rely more on external finance or in provinces with less financial depth. When the analysis is extended to firms' differential responses in short-term debt position, accounts payable and net trade credit provision, we continue to find firms' differential responses to domestic and global liquidity shocks to be consistent with our hypothesis.

Finally, 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 domestic private firms is significantly 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, 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, 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 credit conditions, especially when domestic and foreign credit conditions 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.1. 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 no 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.

A.2. Summary Statistics

Table A2. Summary Statistics

Variable	Median	Mean	Std. Dev	Min.	Max.
accounts receivable/sales (%)	8.94	17.31	24.62	0	191.95
accounts payable/sales (%)	5.25	12.18	19.39	0	135.03
net trade credit/sales (%)	1.44	4.15	18.62	-90.92	79.63
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

A.3. Robustness Checks

Table A3. Alternative Global Liquidity Indicators

(a) Negative Change in nominal Federal Funds Rate (*-Δffr*)			
	-M2g	*T-var*	*T-narrative*
foreign×tightness	0.354***	0.430***	0.136
	(0.123)	(0.160)	(0.145)
foreign×gloliq	0.072	0.136	0.140
	(0.116)	(0.114)	(0.153)
foreign×tightness×gloliq	0.177*	0.201	0.193**
	(0.093)	(0.135)	(0.082)
(b) Negative Change in the first principal component of G7 policy rates (*-ΔG7rate_pc*)			
	-M2g	*T-var*	*T-narrative*
foreign×tightness	0.416***	0.571***	0.415**
	(0.140)	(0.178)	(0.180)
foreign×gloliq	0.202*	0.328***	0.327**
	(0.115)	(0.125)	(0.165)
foreign×tightness×gloliq	0.250**	0.494**	0.607***
	(0.119)	(0.193)	(0.197)
(c) Negative Change in the 3-month US dollar LIBOR rate (*-Δlibor3m*)			
	-M2g	*T-var*	*T-narrative*
foreign×tightness	0.352***	0.450***	0.138
	(0.120)	(0.159)	(0.135)
foreign×gloliq	0.110	0.177	0.165
	(0.116)	(0.117)	(0.146)
foreign×tightness×gloliq	0.203**	0.259*	0.220**
	(0.103)	(0.149)	(0.092)
R-squared	0.730	0.730	0.748
No. of obs.	998,462	998,462	829,329

Notes: The dependent variable is accounts receivable as percentage of sales. *Tightness* is measured by the minus growth rate of M2 (*-m2g*), a VAR-based monetary shock (*t-var*), and a narrative-based monetary tightening shock (*t-narrative*) in three columns of each panel, respectively. *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_pc*), and the negative change in the 3-month US dollar LIBOR interest rate (*-Δlibor3m*), respectively. 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 A4. Different Samples Used in Estimation

(a) Include SOEs

	-M2g	*T-var*	*T-narrative*
foreign×tightness	0.381***	0.446***	0.308*
	(0.120)	(0.156)	(0.158)
foreign×gloliq	0.291**	0.322**	0.190
	(0.148)	(0.149)	(0.149)
foreign×tightness×gloliq	0.252***	0.260*	0.303***
	(0.089)	(0.133)	(0.108)
R-squared	0.743	0.743	0.756
No. of obs.	1,148,354	1,148,354	933,458

(b) Include Exporters

	-M2g	*T-var*	*T-narrative*
foreign×tightness	0.632***	0.773***	0.484***
	(0.061)	(0.079)	(0.081)
foreign×gloliq	0.493***	0.556***	0.629***
	(0.074)	(0.075)	(0.075)
foreign×tightness×gloliq	0.346***	0.322***	0.611***
	(0.045)	(0.066)	(0.054)
R-squared	0.709	0.709	0.730
No. of obs.	1,420,622	1,420,622	1,182,801

(c) Include Switchers

	-M2g	*T-var*	*T-narrative*
foreign×tightness	0.468***	0.573***	0.371***
	(0.099)	(0.130)	(0.132)
foreign×gloliq	0.086	0.165	0.061
	(0.119)	(0.120)	(0.123)
foreign×tightness×gloliq	0.215***	0.237**	0.234***
	(0.073)	(0.111)	(0.088)
R-squared	0.727	0.727	0.745
No. of obs.	1,051,828	1,051,828	872,284

Notes: The dependent variable is accounts receivable to sales ratio. *Tightness* is measured by the minus growth rate of M2 (*-m2g*), a VAR-based monetary tightening shock (*t-var*), and a narrative-based monetary tightening shock (*t-narrative*), respectively. *Gloliq* is measured by the negative change in real federal funds rate (-Δ*rffr*). Panel (a) includes SOEs. Panel (b) includes exporting private firms. Panel (c) includes firms that have ever changed their foreign ownership. All 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 A5. Alternative Model Specifications

(a) Controlling for Time-Varying Industry and Province Fixed Effects

	-M2g	*T-var*	*T-narrative*
foreign×*tightness*	0.335***	0.404**	0.281*
	(0.123)	(0.160)	(0.162)
foreign×*gloliq*	0.197	0.231	0.086
	(0.152)	(0.152)	(0.152)
foreign×*tightness*×*gloliq*	0.212**	0.231*	0.206*
	(0.091)	(0.136)	(0.111)
R-squared	0.731	0.731	0.749
No. of obs.	998,462	998,462	829,329

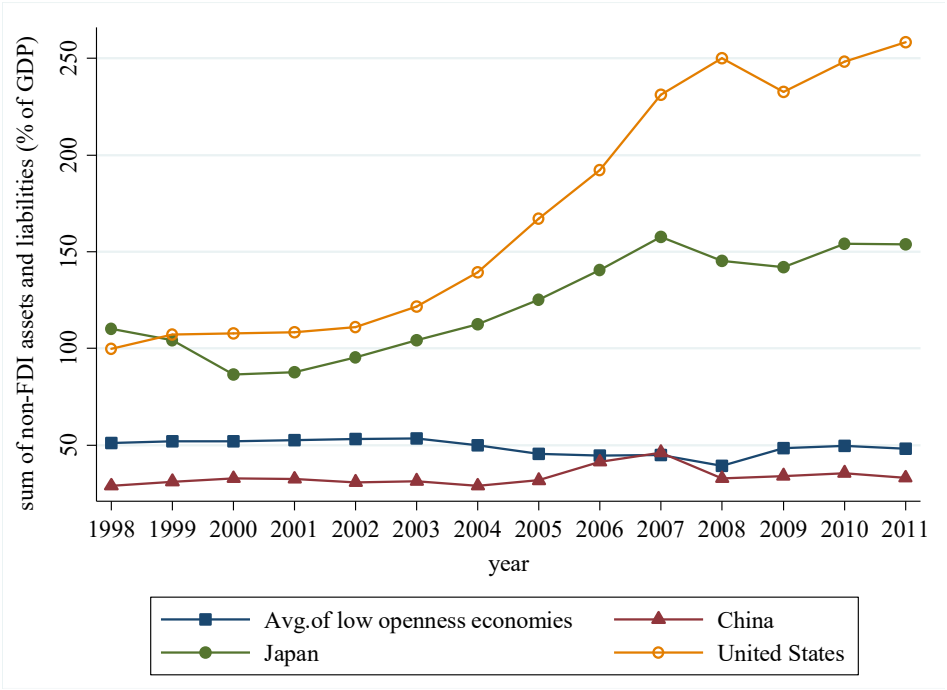
(b) Random Effect Tobit Model

	-M2g	*T-var*	*T-narrative*
foreign×*tightness*	0.733***	0.901***	0.710***
	(0.098)	(0.133)	(0.133)
foreign×*gloliq*	0.477***	0.480***	0.459***
	(0.109)	(0.104)	(0.111)
foreign×*tightness*×*gloliq*	0.510***	0.453***	0.719***
	(0.074)	(0.117)	(0.081)
R-squared	-	-	-
No. of obs.	998,462	998,462	829,329

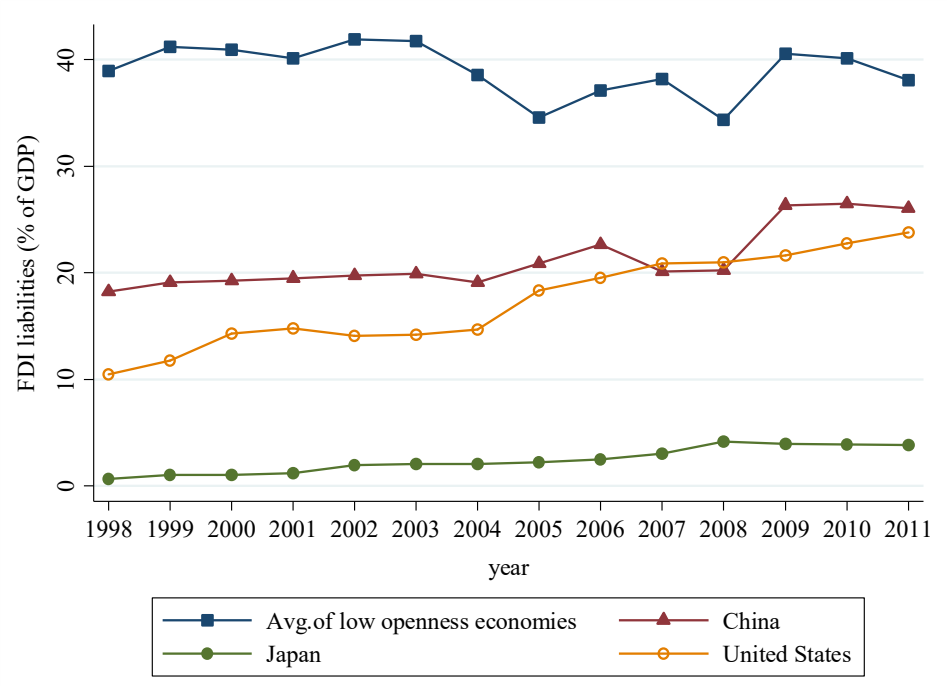
Notes: The dependent variable is accounts receivable to sales ratio. *Tightness* is measured by the minus growth rate of M2 (*-m2g*), a VAR-based monetary tightening shock (*t-var*), and a narrative-based monetary tightening shock (*t-narrative*), respectively. *Gloliq* is measured by the negative change in real federal funds rate (-Δ*rffr*). Panel (a) includes firm fixed effects, time-varying industry (industry×year) fixed effects, and time-varying province (province×year) fixed effects, and reports clustered standard errors at the firm level in parentheses. Panel (b) uses a random effect tobit model and includes industry dummies and year dummies as additional controls, and report standard errors from the observed information matrix (OIM) in parentheses. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Figure 1.Cross-Country Comparison

Panel A. *De facto* Openness to Non-FDI Flows

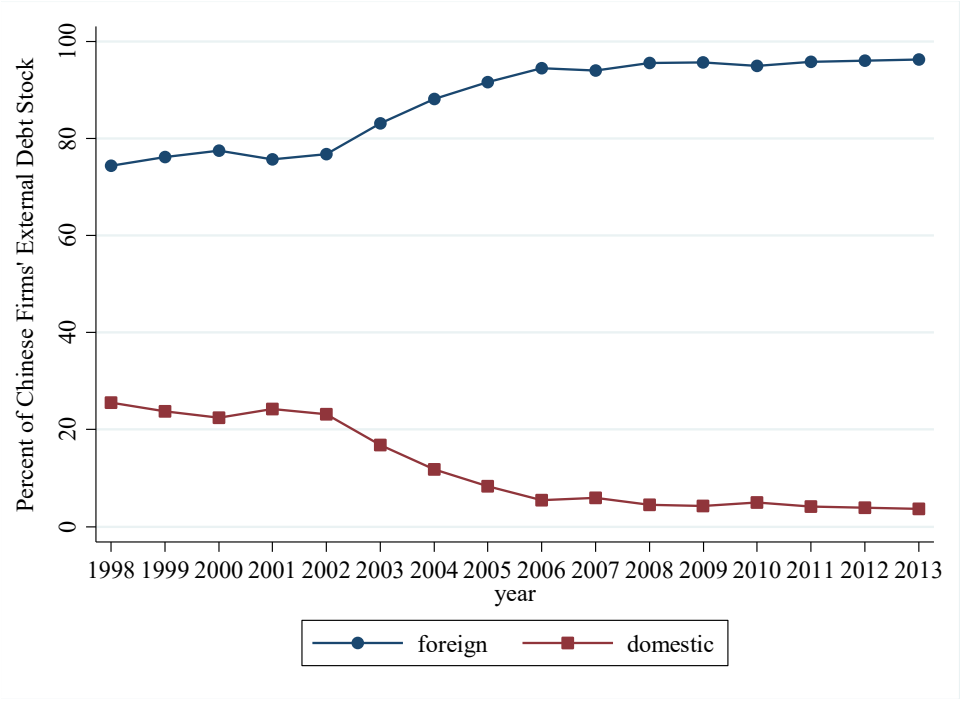


Panel B. *De facto* Openness to Inward FDI Flows



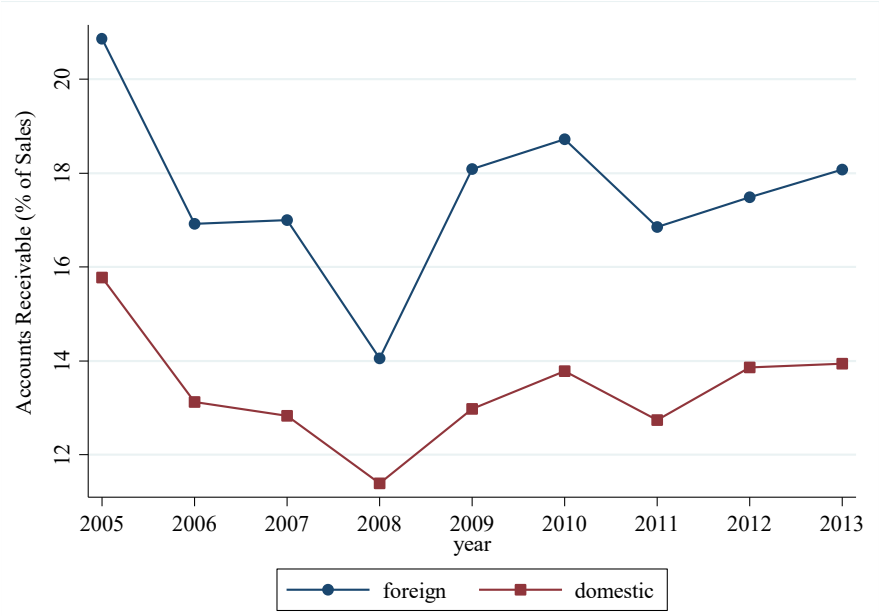
Notes: Non-FDI assets and liabilities include portfolio equity assets and liabilities and debt assets and liabilities. Data on non-FDI assets and liabilities, FDI liability and GDP are obtained from the updated and extended "External Wealth of Nations" dataset constructed by Lane and Milesi-Ferretti (2007). The group of low openness economies consists of economies whose average non-FDI assets and liabilities to GDP ratio is below the first quartile.

Figure 2. Share of Total External Debt Held by Chinese Firms: Foreign vs. Domestic



Notes: The data on Chinese firms' external debt stock is obtained from the State Administration of Foreign Exchange (SAFE). Here foreign firms refer to foreign-funded enterprises and domestic firms refer to Chinese-funded enterprises (including SOEs and non-SOEs).

Figure 3. Trade Credit Provision by Firm Ownership (2005-2013)



Notes: The data is from the Oriana over from period 2005-2013. The line with circles represents the median accounts receivable to sales ratios for FDI firms. The line with squares denotes the median accounts receivable to sales ratios for domestically-owned private firms.

Table 1. FDI Firms' Financing Advantage over Domestic Private Firms

	Static Model	*Dynamic Model*
	(1)	(2)
cash	0.106***	0.099***
	(0.001)	(0.017)
cash×*foreign*	-0.016***	-0.185**
	(0.003)	(0.093)
No. of obs.	716,161	354,058
R-squared	0.600	-
Wald chi-squared		575.027***
AR1 (*p*-value)		0.000
AR2 (*p*-value)		0.306
Sargan (*p*-value)		0.936

Notes: The dependent variable is firm's investment scaled by beginning of year total assets. *Cash* is cash flow, which equals net income plus depreciation, scaled by beginning of year total assets. Column (1) controls for firm-level sales growth and 3-digit industry sales growth. Column (2) controls for lagged investment and its square, sales and debt squared and is estimated using a GMM first-different specification. AR1 is a test for firs-order serial correlation in the first-differenced residual, and AR2 is a test for second-order serial correlation in the first-differenced residuals. Sargan is a test of the overidentifying restrictions. Both regressions include 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 2. Differential Responses in Trade Credit Provision to Domestic Credit Conditions

	-M2g	*T-var*	*T-narrative*	*Size*	*Age*	*Profitability*	*Leverage*	*Liquidity*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
foreign×tightness	0.259***	0.396***	0.222*	0.182**	0.252***	0.259***	0.247***	0.256***
	(0.090)	(0.138)	(0.119)	(0.091)	(0.090)	(0.090)	(0.090)	(0.090)
size×tightness				0.087***				
				(0.016)				
ln(age)×tightness					-0.053**			
					(0.022)			
profit×tightness						-0.006		
						(0.004)		
leverage×tightness							-0.001*	
							(0.001)	
liquidity×tightness								0.001
								(0.001)
R-squared	0.730	0.730	0.748	0.730	0.730	0.730	0.730	0.730
No. of obs.	998,462	998,462	829,329	998,462	998,462	998,462	998,462	998,462

Notes: The dependent variable is accounts receivable to sales ratio. In Columns (1) to (3), *tightness* is measured by the minus growth rate of M2 (*-m2g*) ,a VAR-based monetary shock (*t-var*), and a narrative-based monetary tightening shock (*t-narrative*), respectively. In Columns (4) to (8), *tightness* is measured by the minus growth rate of M2 (*-m2g*) and interacted with firm's characteristics, including size, age, profit, leverage and liquidity, respectively. All 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. Differential Responses to Global Liquidity shocks

	-M2g	*T-var*	*T-narrative*
foreign×*tightness*	0.349***	0.423***	0.301*
	(0.120)	(0.156)	(0.158)
foreign×*gloliq*	0.241	0.269*	0.167
	(0.148)	(0.149)	(0.149)
foreign×*tightness*×*gloliq*	0.229***	0.238*	0.294***
	(0.089)	(0.133)	(0.108)
R-squared	0.730	0.730	0.748
No. of obs.	998,462	998,462	829,329

Notes: The dependent variable is accounts receivable to sales ratio. *Tightness* is measured by the minus growth rate of M2 (*-m2g*), a VAR-based monetary tightening shock (*t-var*), and a narrative-based monetary tightening shock (*t-narrative*), respectively. *Gloliq* is measured by the negative change in real federal funds rate (-Δ*rffr*). All 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 4. Alternative Measures of Global Liquidity Shocks

	Panel A: -RRshock			Panel B: -ΔG7rate		
	-M2g	*T-var*	*T-narrative*	*-M2g*	*T-var*	*T-narrative*
foreign×*tightness*	0.558***	0.781***	0.474***	0.450***	0.661***	0.357**
	(0.140)	(0.190)	(0.168)	(0.132)	(0.180)	(0.153)
foreign×*gloliq*	0.299**	0.425***	0.032	0.119	0.334**	0.181
	(0.124)	(0.133)	(0.092)	(0.117)	(0.136)	(0.146)
foreign×*tightness*×*gloliq*	0.588***	0.975***	0.510***	0.426**	0.944***	0.693***
	(0.162)	(0.234)	(0.157)	(0.169)	(0.284)	(0.219)
R-squared	0.730	0.730	0.748	0.730	0.730	0.748
No. of obs.	998,462	998,462	829,329	998,462	998,462	829,329

Notes: The dependent variable is accounts receivable to sales ratio. In the three columns of each panel, *Tightness* is measured by the minus growth rate of M2 (*-m2g*), a VAR-based monetary tightening shock (*t-var*), and a narrative-based monetary tightening shock (*t-narrative*), respectively. Panel A measures *gloliq* by the negative of US monetary policy shock series (*-RRshock*) constructed by Romer and Romer (2004) and Wieland and Yang (2015). Panel B measures *gloliq* by the negative change in the average of G7 countries' central bank policy rates weighted by their respective GDP shares (*-ΔG7rate*). All 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 5. Robustness Checks

Panel A. Defining Firm's Ownership by Registration Types

	-M2g	*T-var*	*T-narrative*
foreign×*tightness*	0.238***	0.296***	0.211*
	(0.086)	(0.113)	(0.112)
foreign×*gloliq*	0.160	0.173	0.040
	(0.106)	(0.106)	(0.110)
foreign×*tightness*×*gloliq*	0.182***	0.193**	0.225***
	(0.062)	(0.094)	(0.078)
R-squared	0.727	0.727	0.745
No. of obs.	1,034,247	1,034,247	858,461

Panel B. Excluding Firms Owned by Collectives and Domestic Legal-Persons

	-M2g	*T-var*	*T-narrative*
foreign×*tightness*	0.342***	0.331**	0.281*
	(0.120)	(0.157)	(0.160)
foreign×*gloliq*	0.303**	0.344**	0.145
	(0.151)	(0.152)	(0.151)
foreign×*tightness*×*gloliq*	0.277***	0.309**	0.296***
	(0.090)	(0.135)	(0.110)
R-squared	0.748	0.748	0.763
No. of obs.	532,125	532,125	477,346

Notes: The dependent variable is accounts receivable to sales ratio. *Tightness* is measured by the minus growth rate of M2 (*-m2g*), a VAR-based monetary tightening shock (*t-var*), and a narrative-based monetary tightening shock (*t-narrative*), respectively. *Gloliq* is measured by the negative change in real federal funds rate (-Δ*rffr*). Panel A defines firm's ownership type according to its registration type. Panel B excludes firms owned by collectives and domestic legal-persons. All 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 6. Cross-Industry Variations in External Finance Dependence

	External Finance Dependence					
	High			*Low*		
	-M2g	*T-var*	*T-narrative*	*-M2g*	*T-var*	*T-narrative*
	(1)	(2)	(3)	(4)	(5)	(6)
foreign×*tightness*	0.417**	0.529**	0.416*	0.176	0.149	0.070
	(0.175)	(0.226)	(0.231)	(0.167)	(0.220)	(0.218)
foreign×*gloliq*	0.301	0.327	0.273	0.125	0.137	0.053
	(0.222)	(0.221)	(0.220)	(0.203)	(0.205)	(0.211)
foreign×*tightness*×*gloliq*	0.317**	0.366*	0.447***	0.090	0.044	0.081
	(0.131)	(0.196)	(0.158)	(0.121)	(0.182)	(0.150)
R-squared	0.740	0.740	0.756	0.727	0.727	0.745
No. of obs.	512,382	512,382	428,316	460,847	460,847	379,639

Notes: The dependent variable is accounts receivable to sales ratio. *Tightness* is measured by the minus growth rate of M2 (*-m2g*), a VAR-based monetary tightening shock (*t-var*) and a narrative-based monetary tightening shock (*t-narrative*), respectively. *Gloliq* is measured by the negative change in real federal funds rate (-Δ*rffr*). Columns (1) to (3) use the subsample of firms for which external finance dependence is above the median. Columns (4) to (6) use the subsample of firms for which external finance dependence is below the median. All 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 7. Cross-Province Variations in Financial Development

	Provincial Financial Development					
	High			*Low*		
	-M2g	*T-var*	*T-narrative*	*-M2g*	*T-var*	*T-narrative*
	(1)	(2)	(3)	(4)	(5)	(6)
foreign×*tightness*	0.451**	0.510**	-0.166	0.266*	0.345*	0.676***
	(0.182)	(0.238)	(0.215)	(0.160)	(0.209)	(0.227)
foreign×*gloliq*	-0.146	-0.067	-0.069	0.571***	0.546***	0.348*
	(0.219)	(0.224)	(0.230)	(0.201)	(0.199)	(0.195)
foreign×*tightness*×*gloliq*	0.111	0.054	-0.164	0.331***	0.389**	0.646***
	(0.133)	(0.200)	(0.164)	(0.119)	(0.179)	(0.146)
R-squared	0.721	0.721	0.738	0.743	0.743	0.761
No. of obs.	481,092	481,092	389,720	517,363	517,363	439,607

Notes: The dependent variable is accounts receivable to sales ratio. *Tightness* is measured by the minus growth rate of M2 (*-m2g*), a VAR-based monetary tightening shock (*t-var*), and a narrative-based monetary tightening shock (*t-narrative*), respectively. *Gloliq* is measured by the negative change in real federal funds rate (-Δ*rffr*). Columns (1) to (3) use the subsample of firms for which provincial financial development is above the median. Columns (4) to (6) use the subsample of firms for which provincial financial development is below the median. All 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 8. Controlling for Downstream Trade Credit Dependence

	-M2g	*T-var*	*T-narrative*
foreign×*tightness*	0.348***	0.422***	0.301*
	(0.120)	(0.156)	(0.158)
foreign×*gloliq*	0.242	0.268*	0.167
	(0.148)	(0.149)	(0.149)
foreign×*tightness*×*gloliq*	0.230***	0.239*	0.295***
	(0.089)	(0.133)	(0.108)
downtcdep×*tightness*	2.577***	4.503***	1.521
	(0.751)	(1.137)	(0.940)
R-squared	0.730	0.730	0.748
No. of obs.	998,462	998,462	829,329

Notes: The dependent variable is accounts receivable to sales ratio. *Tightness* is measured by the minus growth rate of M2 (*-m2g*), a VAR-based monetary tightening shock (*t-var*), and a narrative-based monetary tightening shock (*t-narrative*), respectively. *Gloliq* is measured by the negative change in real federal funds rate (-Δ*rffr*). *Downtcdep* is a measure of downstream trade credit dependence. All 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 9. Short-Term Debt, Accounts Payable and Net Trade Credit

(a) Short-Term Debt

	-M2g	*T-var*	*T-narrative*
foreign×tightness	3.323***	4.544***	1.836***
	(0.448)	(0.585)	(0.580)
foreign×gloliq	2.645***	2.959***	3.501***
	(0.533)	(0.531)	(0.506)
foreign×tightness×gloliq	1.745***	1.864***	2.199***
	(0.327)	(0.497)	(0.374)
R-squared	0.736	0.736	0.749
No. of obs.	998,306	998,306	829,196

(b) Accounts Payable

	-M2g	*T-var*	*T-narrative*
foreign×tightness	-2.403*	-2.377*	-2.044*
	(1.316)	(1.397)	(1.232)
foreign×gloliq	0.435	0.245	0.237
	(0.434)	(0.244)	(0.211)
foreign×tightness×gloliq	-1.774***	-2.157***	-1.811***
	(0.637)	(0.719)	(0.652)
R-squared	0.720	0.720	0.720
No. of obs.	600,454	600,454	600,454

(c) Net Trade Credit

	-M2g	*T-var*	*T-narrative*
foreign×tightness	1.283	1.111	0.904
	(1.545)	(1.640)	(1.446)
foreign×gloliq	-0.293	-0.365	-0.417*
	(0.513)	(0.289)	(0.250)
foreign×tightness×gloliq	1.514**	1.937**	1.542**
	(0.747)	(0.843)	(0.765)
R-squared	0.707	0.707	0.707
No. of obs.	600,454	600,454	600,454

Notes: The dependent variables are short-term debt to sales ratio in Panel (a), accounts payable to sales ratio in Panel (b), and net trade credit to sales ratio in Panel (c). *Tightness* is measured by the minus growth rate of M2 (*-m2g*), a VAR-based monetary tightening shock (*t-var*), and a narrative-based monetary tightening shock (*t-narrative*), respectively. *Gloliq* is measured by the negative change in real federal funds rate (-Δ*rffr*). All 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 10. Additional Evidence from the Recent Global Financial Crisis

	(a) Accounts Receivable			(b) Accounts Payable		
	-M2g	*T-var*	*T-narrative*	*-M2g*	*T-var*	*T-narrative*
foreign×tightness	1.171***	0.924**	0.718	-2.047***	-2.403***	-2.069***
	(0.431)	(0.406)	(0.493)	(0.443)	(0.439)	(0.506)
foreign×crisis	-0.396	-0.982*	-0.003	1.730***	3.090***	0.470
	(0.418)	(0.564)	(0.386)	(0.422)	(0.556)	(0.389)
foreign×tightness×crisis	-1.415***	-1.694***	-2.677***	2.776***	4.104***	3.319***
	(0.470)	(0.604)	(0.880)	(0.485)	(0.639)	(0.887)
R-squared	0.756	0.756	0.756	0.703	0.703	0.703
No. of obs.	27,507	27,507	27,507	27,463	27,463	27,463
	(c) Net Trade Credit			(d) Short-term Debt		
	-M2g	*T-var*	*T-narrative*	*-M2g*	*T-var*	*T-narrative*
foreign×tightness	3.193***	3.307***	2.654***	4.368***	4.742***	3.801***
	(0.501)	(0.486)	(0.520)	(0.675)	(0.646)	(0.760)
foreign×crisis	-1.931***	-3.776***	-0.447	-3.262***	-5.115***	-2.301***
	(0.474)	(0.638)	(0.431)	(0.591)	(0.858)	(0.510)
foreign×tightness×crisis	-4.024***	-5.457***	-5.804***	-4.410***	-5.135***	-7.144***
	(0.541)	(0.694)	(0.979)	(0.708)	(0.819)	(1.373)
R-squared	0.680	0.680	0.679	0.731	0.732	0.731
No. of obs.	27,302	27,302	27,302	27,272	27,272	27,272

Notes: The sample consists of Chinese manufacturing firms contained in the Oriana dataset over the period of 2005-2013. In the three columns of each panel, *tightness* is measured by the minus growth rate of M2 (*-m2g*), a VAR-based monetary tightening shock (*t-var*), and a narrative-based monetary tightening shock (*t-narrative*), respectively. *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.