Credit Rationing and Firm Exports: Micro Evidence from SMEs in China

Cheng, Dong and Tan, Yong and Yu, Jian

Economics Department, Vanderbilt University, School of international economics and trade, Nanjing University of Finance and Economics Vanderbilt University, School of Economics, Central University of Finance and Economics

12 October 2017

Credit Rationing and Firm Export: Micro Evidence From SMEs in China[¶]

Dong Cheng[†] Yong Tan[‡] Jian Yu[§]

Abstract

In this study we examine the effect of credit rationing on export performance for small and medium sized firms in China. We use a detailed firm-level data provided by the Small and Medium-sized Enterprises Dynamic Survey (SMEDS) to conduct this analysis. SMEDS provides firm-specific measures of credit rationing based directly on firm-level responses to the survey rather than indirectly from firm-level financial statements. We find that, at the extensive margin, weak and strong credit rationing reduce SMEs' export probability by 22% and 36%, respectively. At the intensive margin, they decrease SMEs' export values by more than 32% and over 66%, respectively. Different from existing literature, we construct valid firm-level instruments, firm-level housing investments and receivables, for credit rationing rather than using province-level instruments. In addition, credit rationing exhibits heterogeneous impacts on firms with different liquidity ratios, product portfolios, external collateral and capital utilization rates.

Keywords:

SMEs · Strong Credit Rationing · Weak Credit Rationing · Export Performance

JEL Classification: F10; G20

[¶]Corresponding Author: Jian Yu and Yong Tan are the corresponding authors.

[†]Department of Economics, Vanderbilt University, email: dong.cheng@vanderbilt.edu

[‡]School of International Economics and Trade, Nanjing University of Finance and Economics, email: yongtan_econ@163.com

[§]School of Economics, Central University of Finance and Economics, email: jianyu@cufe.edu.cn

1. Introduction

Financial market development has a pronounced influence on economic growth through offering external finance for firm expansion and exporting (Lizal and Svejnar, 2002; Guiso et al., 2004; Benfratello et al., 2008; Berman and Héricout, 2010; Feenstra et al., 2014; Mancusi and Vezzulli, 2014; Chaney, 2016). An advanced and frictionless financial market encourages firm-level R&D investment, innovation, and export entry (Lizal and Svejnar, 2002; Guiso et al., 2004; Luisa and Vezzulli, 2014). R&D and innovation are treated as key factors which determine firm export performance, but one characterized by high fixed costs.[1] At the same time, penetrating into foreign markets requires huge start-up fixed costs (Arkolakis, 2011; Minetti and Zhu, 2011; Manova, 2013; Bai et al., 2017). Berman and Héricout (2010) show that firms need to collect information on foreign markets, adapt products and packaging to fit foreign preferences, set up distribution networks and advertize for marketing penetration. Export entry costs, for instance, are estimated range from 347,549 to 538,986 U.S. dollars for Chilian exporters (see, Morales et al., 2011). These features highlight the importance of external finance on firm export performance.

With the availability of micro firm-level data, a growing body of literature has started to examine the link between financial market imperfections and firm-level export performance. However, causal evidence of link between financial constraints and firm export performance is still mixed. Greenaway et al. (2007), for instance,

[1] Aw et al. (2011) and Dai and Yu (2013), for instance, separately document that firms which invest in R&D prior to their export are more likely to success and gain productivity growth after export. However, despite the benefits of R&D, only large firms can afford the expensive fixed R&D costs and achieve export success.

find that financial constraints have a trivial effect on firm export participation. Berman and Héricout (2010), in contrast, document a strong link between financial development and firm-level extensive/intensive margins of exporting. The inconclusive results are due to the heterogeneous firm-level reliance on external finance.[2] In particular, large firms can finance their R&D and market entry costs using internal liquidity, and rely less on the external finance. In contrast, small and medium sized enterprizes (SMEs thereafter) often lack internal liquidity, and depend more on financial markets to finance R&D and market entry costs. Therefore, the objective of this paper is to fill the gap in the literature by studying the impact of *credit rationing* caused by financial market imperfections on SMEs' export performance.

China offers an ideal setting to investigate the causal effect of credit rationing on the export performance of SMEs. First, commercial banks in China issue their loans disproportionately across firms in the private sector, which contain the majority of SMEs. In particular, Firth et al. (2009) find that state-owned banks in China issue loans to SMEs according to their financial health and organizational efficiency. This feature provides variation in credit rationing at the firm-level, which helps to identify the effect of credit rationing on SMEs. Second, SMEs are likely to face higher costs of external finance in China relative to state-owned enterprises (SOEs thereafter), and are typically more constrained in their R&D investment decisions than large established firms.[3] As such, a considerable share of SMEs in China engage in exporting through state-owned intermediaries (see,

[2] Manova et al. (2015) also highlight the heterogeneous impact of financial constraints on firms of different productivity and belonging to different industries.

[3] Cull and Xu (2003) document that in China SOEs can obtain policy loans or transfers at relatively low costs, but this type of loan are not available to SMEs.

Bai et al., 2017). Bai et al. (2017) show that although the indirect exporting mode reduces the fixed costs of exporting, it also reduces firm-level export profits and the opportunity to learn from exporting. This makes evaluating credit rationing on SMEs' export behavior, like exporting mode, of policy importance. Third, SMEs account for over 90% of registered enterprises in China, and 60% of GDP (see, Lin et al., 2015). In addition, SMEs in China created 80% job openings in urban areas in 2014. The important role played by SMEs in Chinese economy makes it essential to alleviate financial market imperfections and financial constraints for SMEs, which will effectively boost Chinese economy. Fourth, SMEs are not contained in the commonly used data set called *Annual Survey of Industrial Production* (ASIP) since ASIP only records production information of SOEs and non-SOEs with annual sales exceeding 5 million RMB (which is roughly $770,000). Although some literature has examined the effect of credit rationing on firm export behaviors in developed countries, like Italy (e.g. Minetti and Zhu, 2011), the study on SMEs in developing countries, like China, are rare due to the difficulty of collecting reliable information.

With a novel and unique data set containing firm-level information on financial constraints and production of SMEs in the Zhejiang province,[4] we can identify the casual effect of credit rationing on firm export performance. In particular, each firm has to answer a question whether it has difficulty accessing external finance. If the answer is yes, the firm is defined as credit rationed.[5] We find that credit rationing has a statistically significant and negative effect on firm-level extensive

[4]Zhejiang province is an export oriented province. In 2014, trade values account for more than 50% of GDP in Zhejiang Province. In addition, SMEs in Zhejiang account for 97% of all registered firms.

[5]Please see section 2.2 for more details about the definition of firm-level credit rationing.

and intensive export margins. Specifically, credit rationing decreases SMEs' export probabilities by 22.1% to 36.0%. At the same time, credit rationing reduces firm-level export values by more than 32.2% (weak credit rationing) to more than 66.1% (strong credit rationing). In contrast, the effect of credit rationing on firm-level domestic sales is only marginally significant, and is estimated to have a smaller impact. Furthermore, we find that credit rationing has a more pronounced impact on an extensive margin of exporting for firms that face liquidity constraints, export multi-products, obtain collateral from other firms, and have a higher capital utilization rate. As a comparison, the effect of credit rationing on the intensive margin of exporting is stronger for firms that face liquidity constraints, export multi-products, obtain no external collateral, and have lower capital utilization rates. All results are robust even after accounting for endogeneity and sample selection issues.

Our work is closely related to Manova (2013) and Manova et al. (2015) which document the effect of financial constraints on firm-level export performance. However, different from Manova (2013) and Manova et al. (2015), we have a direct measure of firm-level financial constraints, credit rationing, rather than using the firm-level liquidity ratio or leverage ratio as an indirect proxy. The use of credit rationing can significantly reduce the effects of confounding factors, primarily the availability of alternative sources of external finance. Pecking order theory (Myers and Majluf, 1984) predicts that the firm would prefer debt finance to equity financing when internal liquidity is insufficient. As such, it is necessary to control for the availability of firm's equity financing and preferences over alternative sources of external finance when using indirect proxies of firm-level financial constraints. Our study is also in line with Minetti and Zhu (2011) who document the impact of

credit rationing on Italian firms' export behaviors. However, different from Minetti and Zhu (2011), we construct firm-level instruments for credit rationing rather than using province-level instruments. The advantage of using firm-level instruments is to avoid clustering the standard errors to a higher aggregate level, and alleviate weak instrument issues.[6] Furthermore, to our best knowledge, this is the first paper which uses firm-level data from a developing country, China, to anwer the question of how credit rationing affect export performance for SMEs. SMEs in developing countries can be very different from their counterparts in developed countries. For instance, lack of alternative external finance sources may lead SMEs in China rely more on bank loans.

The rest of the paper proceeds as follows: in section 2 we introduce the background of SMEs in China, and section 3 outlines the features of our data and variables. Section 4 presents the estimation strategy and empirical results. In section 5, we report the heterogeneous effect of credit rationing on different firms. Section 6 displays robustness check and section 7 concludes.

2. Background

We first introduce background information on Chinese small and medium-sized enterprises to demonstrate that it is worth exploring the effect of credit rationing on these firms. Then, we discuss the nature of firm-level borrowing against collateral in China, in the hope of rationalizing the construction of our instrumental variables

[6] The correlation between province credit rationing ratio might be weakly correlated with firm credit rationing, but according to the policy in China, firm-level housing investments and receivables are strongly correlated with firm-level credit rationing.

for credit rationing.

2.1. Small and Medium-sized Enterprises

China provides an ideal setting for testing the impact of credit rationing on export decisions by SMEs, because SMEs are strategically important for the economy on the one hand and are more credit rationed by banks on the other. First, SMEs are an indispensable part of the economy. According to Lin et al. (2015), there were more than 80 million SMEs in 2014, accounting for over 90% of registered firms in China. Moreover, they contribute to over 50% of tax revenues, more than 60% of gross domestic product (GDP), nearly 70% of trade volume (imports and exports), and around 80% of urban employment. These figures indicate that SMEs play a crucial role in expanding tax base, building wealth, and creating jobs.

Second, SMEs disproportionately suffer from more severe credit rationing than large firms.[7] Like the Italian case documented by Minetti and Zhu (2011), firms in China also access external finance mainly through loans offered by banks. In 2014, the ratio between banking deposits and stock market capitalization was 130%, and the ratio between stock market capitalization and GDP was only 58.5%. These ratios suggest that stock markets are relatively underdeveloped in China, and banking loans are the main source of external finance for firms to cover investment and upfront export costs. Compared with large firms, SMEs are more likely to be credit rationed when applying for banking loans. As creditors, banks optimally support large firms that have greater collaterals and stronger cash flows. For SMEs,

[7]Compared with foreign affiliates and joint ventures, SMEs are also more credit constrained. Manova et al. (2015) demonstrate that foreign firms can overcome credit frictions by obtaining liquidity from their parent companies.

banks typically require higher interest rates and turn down their applications more frequently. In addition, large firms receive preferential treatment because they are more economically important to the local economy and hence have tighter political connection with local governments.[8] Lin et al. (2015) document that only 10% of SMEs in Zhejiang province successfully received loans from banks in 2014, while the rest had to rely on self-raised funds or private loans (like usurious loans).

Third, in recent years, the Chinese central government has initiated a slew of policies to help SMEs, including increasing government transfers as special funds, reducing or even exempting valued-added and sales taxes, and creating an equal business environment. Since fiscal transfers and tax reduction tend to have a short-run impact on easing the difficulty faced by SMEs, the central government has switched to relying more on creating an fair business environment for SMEs by reducing the frictions and distortions imposed on SMEs. A key component of a fair business environment is equal access to external finance provided by banks. Though the central government has taken measures like subsidizing banks to encourage them supply credit to SMEs, more changes along this line are needed to help the growth of SMEs. In this study, we explore the effects of credit rationing on SME export performance, and provide straightforward policy implications for the central government for supporting SMEs to expand beyond national borders. Equal access to external finance is of particular importance for SMEs to penetrate into foreign markets. As shown by Das et al. (2007), serving international markets involves

[8]State-owned banks are the dominating suppliers of banking credits in China. This feature, when combined with the strong political connection between large firms and local governments, implies that large firms are more likely to get loans from banks in an ex ante perspective. The ex post result generally could be that they receive loans with lower interest rates or their applications are rejected with much lower possibilities.

tremendous entry costs that mostly must be paid up front.

2.2. Firms' Borrowing against Collateral in China

Two important features of that characterize how firms borrow against collateral in China also determine how we construct firm-level instrumental variables for credit rationing. The first feature is the wide acceptance of housing as collateral in firms' borrowing, and the second one is the advocacy of pledging accounts receivable as collateral by the central government. Existing theoretical studies (e.g. Barro, 1976; Stiglitz and Weiss, 1981; Hart and Moore, 1994) have long recognized the role of collateral in enhancing firms' financial capacity when there exists incomplete contracting. Though empirical studies lag behind theoretical analysis, recent work by Gan (2007) and Chaney et al. (2012) provide supporting evidence for the economic significance of the collateral channel in affecting firms' financing capacity and hence investment. In this study, we relate firms' holding of collateral to credit rationing because the degree of credit rationing received by firms can be largely predicted by their ability to borrow against collateral.

Housing is the most widely accepted collateral against borrowing by banks in China, mainly due to the low risk to be transferred in defaults and high potential for appreciation.[9] When lending to firms, banks are more likely to accept immovable properties as collateral because it reduces the risk that firms can transfer the collateral with low costs before they formally default. Land and housing are two representative types of immovable properties, and employed as the main forms of

[9]For instance, Fang et al. (2015) point out that only housing can act as collateral for mortgage loans extended by commercial banks in China.

collateral for firm borrowing in developed economies.[10] In urban China, all land is publicly owned and firms can only rent land from local governments. The lease of land also devalues steadily as it approaches the expiring date of the lease. Consequently, Chinese commercial banks generally prefer housing to land as collateral for firms' borrowing.

In addition to low risk of transfer before default, housing collateral is welcomed by banks because it has strong capacity to maintain value against the backdrop of a decade-long housing boom in China. The value-preserving characteristic of housing helps banks to secure a greater amount of repayment in liquidation when firms default. This characteristic is closely related to the great Chinese real estate boom since 2003. Glaeser et al. (2017) document that, during 2003-2014, real housing prices in China rose by over 10% per year. Even the U.S. housing boom between 1996 and 2006 pales in comparison to the Chinese housing boom as real house prices grew by only 5% per year in the U.S. case. The continuing real estate boom bolsters the expected appreciation for housing, and hence lending strong support to housing when firms pledge it as collateral to borrow from banks.

Recently, a series of institutional reforms have been implemented by the central government to encourage firms to pledge their accounts receivable as an alternative type of collateral against external financing.[11] Pledging accounts receivable as collateral is of particular importance for SMEs. Compared to large firms, SMEs

[10] The importance of land and housing in firm's borrowing against collateral has inspired economists to quantify effects of the collateral channel. Liu et al. (2013) explore how changes in land values affect firms' borrowing capacity and investment by calibrating a DSGE model to the U.S. economy, while Chaney et al. (2012) investigate how increases in house prices lift firm-level collateral constraints and raise their investment using COMPUSTAT data for U.S. listed firms.

[11] Udell (2014) indicate that pledging accounts receivable as collateral has been growing in the United States since 2000, and argue that this asset-based financing is primarily targeting at SMEs.

in China generally tend to rent rather than own housing when doing business. The absence of property rights on immovable assets degrades their financing capacity from banks, and hence aggravating the credit constraints faced by SMEs. In October 2007, the Property Law of the People's Republic of China went into effect. This civil code lays the institutional foundation for firms to pledge movable properties like accounts receivable as collateral against external financing. Ever since 2007, more and more SMEs are employing accounts receivable as collateral for banking loans, especially in East China where financial markets are relatively developed. The central government has also made increasing efforts to promote the use of accounts receivable as collateral because both SMEs and banks need to learn the practice when it is newly introduced.

3. Data and Measurement

In this section, we first introduce the microeconomic data used in our empirical analysis, and then describe the measurement of key variables. We also briefly summarize these key variables in this section.

3.1. Data

The microeconomic data we use in this study is from the Small and Medium-sized Enterprises Dynamic Survey (henceforth, SMEDS). It has been conducted monthly by the department of Small and Medium-sized Enterprises, an affiliate of the Economics and Information Commission of Zhejiang Province in China, from August 2011 onwards. The survey is directed to SMEs within the Zhejiang province. We have access to SMEDS over fourteen months, from July 2015 to

August 2016.[12]

SMEDS has two key advantages for our study. The first advantage is that SMEDS is a microeconomic survey that is designed specifically for SMEs. Unlike the frequently used Annual Survey of Industrial Production (ASIP) that focuses on above-scale manufacturing firms (for a brief review of ASIP, see Brandt et al, 2014), SMEDS only surveys below-scale enterprises. According to China's National Bureau of Statistics (NBS), above-scale firms in 2011 and beyond are firms that have an annual sales value no less than 20 million yuan (equivalent to $3 million), while below-scale firms capture the remaining forms.[13] Below-scale firms are not included in ASIP. This omission has motivated local governments to design special surveys for them, in order to monitor the operation of these enterprises. SMEDS is one of the special surveys designed by the local government of Zhejiang province to follow the evolution of SMEs in that province. In this study we formally define SMEs as firms with an annual sales value between 5 million and 20 million yuan (roughly $775,000 to $ 3 million) during 2015-2016. This is exactly the same as the definition used by SMEDS, and SMEDS only collects information for SMEs defined in this way. Therefore, SMEDS provides a unique microeconomic data to investigate how credit rationing faced by SMEs affects their export performance.

A second advantage is that SMEDS is conducted in Zhejiang province where SMEs are particularly important for the local economy and the export sector

[12] A benefit of recent microeconomic data is that it helps us to obtain time-relevant policy implications. The recent data is an appropriate proxy of the status quo, so policy implications from them reflect measures needed to solve current problems.

[13] Note that the definition of above- and below-scale firms changes over time. Between 1998 and 2007, firms with annual sales value no less than 5 million yuan were counted as above-scale firms. In 2011, the cutoff value was raised by the NBS to 20 million yuan, somewhat reflecting the spectacular growth of Chinese economy. The new cutoff value was remained unchanged during 2011-2016.

is quite large. We know that SMEs are a strategically indispensable part for the Chinese economy as a whole. It is even more so for Zhejiang province because SMEs account for around 97% of firms in this province.[14] In fact, Zhejiang is well-known in China for the local agglomeration of SMEs. This coastal province is located in an economically advanced area of China (including also Shanghai and Jiangsu) that has a higher degree of financial development and a better institutional framework for small-scale businesses, and has accordingly attracted a large number of SMEs. Besides the economic significance of SMEs, Zhejiang also has a very strong export sector. In 2014, the ratio between trade volume (imports and exports) and GDP is around 55% in Zhejiang, while the ratio for China as a whole is barely larger than 40%. These two features make Zhejiang a particular interesting province in which to explore the effects of credit rationing on SMEs' export performance.

SMEDS is designed and conducted with caution to ensure representativeness and reliability of the sample. A stratified sampling method is employed to guarantee the representativeness of the data. At the province level, the department of Small and Medium-sized Enterprises distributes sample size to all prefectures within the province, where disproportionately larger weights are assigned to prefectures with a smaller number of SMEs to ensure representativeness at the bottom. Within the prefectures, a similar way of assignment is employed to distribute sample size to all counties. At the county level, SMEs are chosen using simple random sampling where all SMEs in the county are surveyed with equal probabilities. When a firm is chosen by SMEDS, it is required to report survey information through a unified online platform. Two complementary measures are taken to ensure the reliability

[14]More information on the importance of SMEs for Zhejiang Province can be found in the official website managed by the local government: http://www.zjsme.gov.cn/.

of data. First, the reported information is subject to several standard checks of logical consistency for local investigators. The checks are not only implemented at the firm-level, but also at the local administrative level (county or prefecture) by comparing summary statistics from SMEDS with other sources of data. Second, the quality of data within a local administrative level is attached to the transfer of special funds for supporting SMEs from the central government to the local area. This incentivizes local governments to closely monitor the reporting of data, in order to receive more fiscal transfers from the central government.

We utilize SMEDS for the year of 2015 to conduct our empirical analysis, in consideration of both the research question and data availability. In the current study, we are exploring how credit rationing affects SMEs' exporting behavior. As for this research question, it is more reasonable to use annual data rather than monthly data because firms' export behavior could exhibit strong seasonality. Furthermore, over the fourteen months from July 2015 to August 2016, SMEDS requires firms to report accumulated values within the year. This means that we could use information reported in December 2015 as the annual information for the year of 2015.[15] The 2015 SMEDS provides us detailed information on firm-level demographics (like address and sector code), exporting, credit rationing, production, and balance sheets. A total of 14249 firms are randomly chosen and surveyed by the 2015 round of SMEDS.

[15] Apparently, this also means that we could not conduct annual empirical analysis for the year of 2016 because our sample ends in August 2016.

3.2. Measurement

We describe the measurement of four types of variables: exports, credit rationing, control variables, and instruments. Summary statistics are reported in Table 1.

[Table 1 is to be here]

Exports Using SMEDS, we define both an extensive and an intensive margin of exporting for firms. If a firm reported with a positive, accumulated exporting value by December 2015, then we define it as an exporter. Otherwise, it is treated as a non-exporter. This characterizes the extensive margin of firm-level exporting. Even more straightforwardly, the intensive margin is represented by the self-reported export value in December that has been accumulated over the twelve months of 2015. Table 1 shows that around 45.2% SMEs in our sample of SMEDS exported in 2015. We exclude firms that report missing values for export and other control variables from our sample. There are 10,517 remaining firms of which 3,601 firms report positive export revenues. Average export revenues (foreign sales) of these exporters was around 31,000 yuan (approximately 4815 dollars in 2015). It also reveals that both margins of exporting have substantial variation across firms when we compare standard deviations with means. Table 1 further displays that SMEs in Zhejiang on average sold more domestically than abroad. Average domestic sales was more than 20,000 yuan higher than the average exporting value. Domestic sales are also massively dispersed as the standard deviation is around 1.5 times greater than the mean.

Credit Rationing SMEDS provides straightforward measures of credit rationing with regard to SMEs. Like Minetti and Zhu (2011), we could define two types of credit rationing, that is, strong and weak rationing. Firms in SMEDS are

viewed as weakly credit rationed in 2015 if they found it difficult to obtain external finance (mainly banking loans) but were never asked by the banks to pay higher interest rates when applying for loans. In contrast, strongly credit rationed firms are those that found it difficult to obtain external finance, and were also asked at least once by the banks to pay higher interest rates when applying for loans. As for the weak rationing, our definition is comparable to that defined by Minetti and Zhu (2011) because firms that found it difficult to obtain external finance would generally like to receive more credits at the market interest rate. In terms of the strong rationing, we argue that our definition is also essentially consistent with the definition by Minetti and Zhu (2011). Though we do not have firm-level information on whether firms' applications for loans were denied or not by banks, firms that were already asked by banks to pay higher interest rates yet still found it difficult to obtain external finance would generally be those that were rejected by banks when applying for loans.

Table 1 indicates that around 3.4% and 8.5% of SMEs in Zhejiang were strongly and weakly credit rationed, respectively. It is more noticeable that both measures of credit rationing show massive cross-sectional variation, hence providing us a great opportunity to identify the impacts of credit rationing on SMEs' exporting performance. To gain some intuition for the impacts, we plot county-level share of firms that were strongly credit rationed in 2015 against two margins of exporting, that is, the county-level share of exporters and the county-level log average export value.

[Figure 1 is to be here]

Figure 1 exhibits a strong negative correlation between credit rationing and both margins of exporting. It intuitively suggests that firms located in more credit rationed counties are less likely to export smaller amounts conditional on exporting.

Control Variables When we explore the effects of credit rationing on SME export performance, we control for a large set of firm characteristics recorded in SMEDS to avoid issues like omitted variables. Firm-level financial health is included to control for the case that financially healthier firms might be less likely to experience credit rationing and also more likely to participate in exporting or export more, conditional on exporting. Three measures of financial health (liquidity, leverage ratio, and cash flow) are employed in this study, in line with Minetti and Zhu (2011) and many others (e.g. Greenaway et al., 2007). Liquidity is defined as a binary variable which equals to 1 if a firm has sufficient liquidity and equals to 0 otherwise. It is taken from a survey response from firms rather than a measure inferred from firm-level financial status like the liquidity ratio defined as the ratio between liquid assets and short-term liabilities. We divide total liabilities by total assets to define the leverage ratio, while cash flow is directly obtained from the microeconomic data. Table 1 demonstrates that only around 70% of SMEs report that they have sufficient liquidity in the short term, while the rest face a shortage of liquidity. It also indicates that SMEs are highly leveraged in our data since the leverage ratio is around 2 and substantially dispersed (with a standard deviation of more than 200). SMEs have an average cash flow of 6,438.2 yuan, and it varies dramatically across firms.

We also include production-side information to control for the channel that larger, more productive, more capital-intensive, and more innovative firms might

show less credit rationing and have better export performance. We construct three variables to capture size, productivity, and capital intensity, respectively. Size is proxied by employment and is measured as the total number of workers, while labor productivity is captured by the output value per worker. Capital intensity is defined as the ratio between fixed assets and employment. It is shown in Table 1 that SMEs on average have 134.5 workers per firm, and that labor productivity is around 411.4 yuan per worker. SMEs further exhibit massive cross-sectional variation in employment and capital intensity because the standard deviations are much larger than means for these firms. In SMEDS, firm-level innovation can be recovered by checking the total sales of new products. We define innovation as a binary variable that equals to 1 if the firm reports positive sales for new products. Table 1 reveals that 22.3% SMEs were engaged in product innovation in 2015, and this specific type of innovation activity is quite dispersed.

Instruments We employ firm-level measures of housing investment and accounts receivable as instrumental variables for credit rationing.[16] As we discussed, housing and accounts receivable are two particular types of collateral for firm-level external financing in China. Housing has been widely accepted as collateral by banks ever since the marketization of housing in the late 1990s, while accounts receivable has been recently advocated by the central government to serve as collateral. SMEDS collects firms' housing information by asking the question "Does the firm have investment in housing?" Therefore, we define housing investment as a binary variable that equals to 1 if the firm has investment in housing markets in

[16]We also use sectoral credit rationing ratio as instrument for firm-level credit rationing in the robustness check section. The ratio is defined by the proportion of firms that are credit rationed to all firms in a particular sector.

2015. Accounts receivable is well recorded in SMEDS and can be used directly. We show in Table 1 that around 25% of SMEs invested in housing markets in 2015, and on average SMEs have an amount of accounts receivable as high as 29,885 yuan. This rationalizes the government's efforts to promote the use of accounts receivable as collateral against borrowing because it is quantitatively large even in comparison to total sales. Theoretically, a firm that invests more in housing or has greater accounts receivable would have greater financial capacity, and hence is less likely to be credit rationed by banks. Again, to gain some intuition, we plot the simple correlation patterns between county-level shares of credit rationed firms in 2015 and county-level measures of these two instruments, that is, the county-level share of firms that have investments in housing and the county-level log average accounts receivable.

[Figure 2 is to be here]

Figure 2 implies that SMEs doing business in counties with greater housing investments and accounts receivable have a lower probability of being credit rationed since these collateral measures show reasonably negative correlation with credit rationing.

4. Estimation and Results

In this section, we investigate the impact of credit rationing, either strong or weak, on firm-level export behavior. In particular, we first examine how firm-level credit rationing affects the firm's export participation decision (extensive margin); second, conditional on exporting, we study the influence of credit rationing on firm-

level exports; lastly, we document the heterogeneous impact of credit rationing on different firms.

4.1. Credit Rationing and Export Extensive Margins

We first examine the effect of credit rationing on the firm-level extensive margins of exporting, that is, the probability of exporting. Entering foreign markets typically involves large start-up costs (Feenstra et al., 2014; Chaney, 2016; Bai et al., 2017). In particular, Feenstra et al. (2014) show that exporters rely more on financial credits. Manova (2013) and Chaney (2016) establish theoretic models and both predict that financial constrained firms are more likely to be excluded from exporting.

Let π_i denote the difference between firm i's operating profits when exporting and its operating profits when not exporting.

$$\pi_i = \alpha_1 + \beta_1 C_i + X_i \gamma_1 + \varepsilon_i, \tag{1}$$

where C_i is a binary variable which takes the value 1 if firm i is credit rationed, 0 otherwise; X_i is a vector containing firm-level characteristics which affect firm i's operating profits across export status. Specifically, X_i contains the firm-level liquidity ratio, leverage ratio, cash flow, productivity in terms of value added per worker, firm size, capital intensity and innovation status.[17] ε_i captures unobservable firm-level factors which may also affect π_i.

[17]Innovation is a bivariate variable which takes the value 1 if firm i introduces new products, 0 otherwise. Cull and Xu (2003) demonstrate that when a firm introduces new products can be seen as a sign of the firm's future prospectives.

Firm i will export if $\pi_i > 0$. By assuming that ε_i follows a standard normal distribution with zero mean and unit variance,[18] firm i's export probability can be represented as:

$$\begin{aligned} prob(Export_i = 1) &= Prob(\alpha_1 + \beta_1 C_i + X_i\gamma_1 + \varepsilon_i > 0) \\ &= \Phi(\alpha_1 + \beta_1 C_i + X_i\gamma_1) \end{aligned} \tag{2}$$

where $\Phi(\cdot)$ represents the standard normal cdf. When a firm is credit rationed, it will be more difficult for this firm to start exporting. As such, we expect $\beta_1 < 0$.

We recognize that the degree of credit rationing, C_i, faced by each firm and the firm-level export participation decision might be simultaneously affected by unobservable firm-level characteristics. Also, the decision to enter export markets may generate an increase in profitability, which can significantly improve the firm's financial health (Greenaway et al., 2007). Firm-level financial health plays a signaling role to the financial market, and reduces the probability that a firm is credit rationed.[19] Either way, standard endogeneity issues arise. To address these endogeneity issues, we model the probability of firm i being credit rationed as follows:

$$prob(C_i = 1) = prob(Z_i\delta + X_i\lambda + \mu_i > 0) = \Phi(Z_i\delta + Z_i\lambda) \tag{3}$$

where Z_i contains variables which affect firm i's credit rationing status, but do not

[18] Since the dependent variable is also binary, exporting or not, we cannot identify the variance parameter, δ, as in linear regressions.

[19] Cull and Xu (2003) and Firth et al. (2009) both find that loans from commercial banks of China favor firms that indicate profitability and financial health.

affect the firm-level export participation decision. X_i represents the same firm-level characteristics as in equation (1) and μ_i is a normally distributed random error term with zero mean and unit variance. The reason we include firm-level characteristics in equation (3) is because the lenders, e.g. the commercial banks in China, give loans to firms based on their characteristics (credit risks), such as profitability and signal a firm reveals (Cull and Xu, 2003; Firth et al., 2009). In contrast to recent literature, we use firm-level variables, Z_i, rather than province-level or sector-level data, to predict the probability of firm-level credit rationing. As a robustness check, we also construct the sectoral rationing rate as an instrument for firm-level credit rationing.[20] Specifically, we use firm-level housing investment status and the value of receivables, along with other firm-level characteristics to predict the probability of credit rationing. As described in section 2, firms can use their housing investments and receivables to obtain mortgage loans. We expect $\delta < 0$, which implies that firms with housing investments or greater receivables are more likely to obtain loans from the financial market, e.g. commercial banks, and hence less likely to be credit rationed. At the same time, firm-level real estate investments and receivables are unlikely to correlate with unobserved characteristics which affect a firm's export decision. The advantage of using firm-level variables is that it allows us to avoid clustering the estimated standard errors to a more aggregate level; Also, the economic policy and features in housing markets in China make firm-level real estate investments and receivables strongly correlated with firm-level credit rationing. This strong correlation alleviates the concerns of weak instruments; Last, as our observed firms are all from

[20] All results are available in the robustness checks.

one province, Zhejiang province, province-level instruments will lack the necessary variation for identification.

In equation (2), the binary feature of the dependent variables leads to biased estimates from 2SLS (see, Greene (2002) for more details). Therefore, we estimate the recursive bivariate Probit model constituted by equations (2) and (3) through maximum likelihood estimation (MLE). Results are reported in Table 2 and Table 3.

[Table 2 is to be here]

[Table 3 is to be here]

Table 2 and Table 3 report the effect of strong and weak credit rationing on firms' export participation decisions, respectively. Column (1) of Table 2 (Table 3) displays the estimates of equation (2) by treating the measure of strong credit rationing (weak credit rationing) as exogenous. The results suggest that either strong or weak credit rationing has a statistically insignificant effect on the firm-level export participation decision.

Columns (2) and (3) report the estimates for the bivariate Probit model of equations (2) and (3), in which we use firm-level housing investment status as an instrument for credit rationing. The results reveal several pieces of information: first, a firm's housing investment status has a negative and statistically significant effect on the probability that a firm is credit rationed. In particular, it is less likely that a firm is credit rationed if the firm has invested in housing; second, credit rationing, either strong or weak, has a negative and significant impact on firm-level export participation decisions. That is, firms that face credit rationing are less likely to export. Third, the estimated correlation coefficient $corr(\varepsilon_i, \mu_i)$

is 0.45 for strong credit, and 0.32 for weak credit with standard errors of 0.08 and 0.06, respectively. This implies that the unobserved firm-level characteristics which determine firms' credit rationing (μ_i) and export participation decision (ε_i) are positively correlated. Therefore, we reject the hypothesis that credit rationing is exogenous. In addition, the coefficients for control variables have their expected signs. In particular, firm-level liquidity increases the firm-level export participation probability, and the leverage ratio reduces this probability.[21] Firm-level productivity measured by value added per worker and firm size both positively affect firm export participation although the effect is small. Further, firms that introduce new products are more likely to export.

Similar to columns (2) and (3), columns (4) and (5) show results for the bivariate probit model of equations (2) and (3), but we use both firm-level housing investments and receivables as instruments for credit rationing. The results again demonstrate a negative and statistically significant effect from credit rationing, either strong or weak, on the firm's export participation decision. In addition, a firm's housing investment status, and amount of receivables reduce the likelihood that the firm is credit rationed. Based on the estimates in columns (4) and (5) in Table 2 and Table 3, we separately compute the marginal effect of strong and weak credit rationing on firm-level export participation probabilities using $\Phi(\alpha_1 + \beta_1 + Z_i\gamma_1) - \Phi(\alpha_1 + Z_i\gamma_1)$. We obtain a value of -0.360 for strong credit rationing and -0.221 for weak credit rationing. This implies that strong (weak) credit rationing reduces firm-level export probabilities by 36.0% (22.1%). Our results are highly comparable to those in Minetti and Zhu (2011), in which they find

[21] However, the effect of leverage ratio on firm-level export participation probability is not statistically significant.

a marginal effect of -0.38 from credit rationing on firm-level export decisions in Italy.

A large fraction of the financial constraint literature uses firm-level liquidity ratios and leverage ratios to proxy firm-level credit constraints (e.g. Greenaway et al., 2007; Berman and Héricout, 2010; Manova, 2013). Minetti and Zhu (2011) address this literature by including these financial factors to proxy firm-level financial conditions and to avoid omitted variable problems. Controlling for these financial variables may also reduce the coefficient on the measure of credit rationing. To make a direct comparison, we estimate the bivariate probit model of equation (2) and (3) omitting liquidity ratio and leverage ratio. The results are reported in Table 4.

[Table 4 is to be here]

Panel A of Table 4 displays the different effect of strong credit rationing on firm-s' export participation probabilities with and without including financial variables. The results in columns (1) and (3) of Panel A are taken directly from columns (3) and (5) of Table 1, respectively. It is clear that after excluding financial variables, the magnitude of the coefficient on strong credit rationing increases. In panel B, we have very similar findings for weak credit rationing.

4.2. Credit Rationing and Export Intensive Margins

In this section, we investigate the impact of credit rationing on the firm-level intensive margin of exports. We replace the dependent variable, export probability,

in equation (2) by firm-level export value y_i, and have the following specification:

$$y_i = \alpha_2 + \beta_2 C_i + X_i \gamma_2 + v_i, \tag{4}$$

where C_i characterizes whether firm i faces credit rationing. It takes the value 1 if the answer is yes, 0 otherwise; X_i contains firm-level characteristics as in specification (2). Two caveats arise from OLS estimates from equation (4). First, C_i, may be endogenous in equation (4) due to omitted variables as in equation (2); second, only firms participating in exporting have positive export values, which leads to a sample selection issue. In order to alleviate the first concern, we still employ an instrument variable approach. However, we notice that the credit rationing measure, C_i, is binary which makes two-stage least square (2SLS) biased. Instead, we modify the 2SLS as follows: in the first stage, we estimate equation (2) to obtain the fitted probability of credit rationing, $\widehat{C}_i$; in the second stage, we use $\widehat{C}_i$ along with firm-level housing investment and receivable as instruments for C_i when estimating equation (4). This approach is also called the *forbidden regression*. To deal with the sample selection bias, we use a Heckman type sample selection model by adding an inverse Mill's ratio to equation (4). All results are reported in Table 5.

[Table 5 is to be here]

Columns (1)-(3) and columns (4)-(6) document the estimated effect of strong and weak credit rationing on firm-level export values, respectively. Columns (1) and (4) report the OLS estimates from equation (4) when we treat credit rationing as exogenous. The results suggest a negative and statistically significant effect of

both strong and weak credit rationing on firm-level export values. Columns (2) and (5) show the results for strong and weak credit rationing using IV estimation. Although the coefficient of credit rationing is still negative, it becomes statistically insignificant after taking endogeneity of credit rationing into account. Columns (3) and (6) separately report the IV estimates after adding an inverse Mill's ratio. Again, the coefficient on credit rationing is negative and statistically significant, and the magnitude is larger than that of the OLS estimates. Specifically, the point estimate from strong credit rationing is -3.622 (column (3)). This coefficient is large and has a 95% confidence interval of -1.052 to -6.192. This suggests that after controlling for all other factors, strong credit rationing reduces foreign sales by more than 66%.[22] Weak credit rationing will reduce foreign sales by more than 32% according to the same calculation.

All results imply that credit rationing has nontrivial effects on firm-level export behavior not only by preventing firms from paying the huge start-up fixed cost to start importing, but also through restricting firms from reducing their variable export costs which determine firm-level exports. Our results are consistent with Arkolakis (2011) and Aw et al. (2011). Arkolakis (2011) emphasizes the existence of huge fixed costs to penetrate the foreign market for new exporters, and firms that cannot afford this huge penetration cost cannot generate sufficient profits from exporting. Credit rationed firms cannot finance the huge marketing costs and hence choose not to export. In contrast, Aw et al. (2011) document that successful exporters spend huge investments in R&D to improve their productivity

[22]Since foreign sales are in logarithm, a coefficient of -1.052 implies that foreign sales by credit rationed firms are 34% (=exp(-1.052)) of those by non-rationed firms, which means that strong credit rationing reduces foreign sales more than 66%.

(lower marginal costs). For firms that face credit rationing, their R&D activities are refrained. Compared to firms that invest in R&D (not financially constrained firms), these credit rationed firms have relatively low exports due to their relatively high marginal production costs.

4.3. Credit Rationing and Domestic Sales

It is of both academic and policy interest to compare the influence of credit rationing on firms' foreign and domestic sales. Due to the comprehensive information offered by SMEDS, we can observe both firm-level foreign and domestic sales. In this section, we examine the effect of credit rationing on firm-level domestic sales. We estimate equation (4) by replacing export values with domestic sales. The results are reported in Table 6.

[Table 6 is to be here]

Since every firm in our sample reports positive domestic sales, there is no sample selection issue as in the export case. Columns (1) and (2) report the estimated effect of strong credit rationing on firm-level domestic sales. Column (1) reports the results from OLS regression when we treat credit rationing as exogenous, and in column (2) firm-level housing investments and receivables are used as instruments for credit rationing. Column (2) indicates that after controlling for endogeneity, strong credit rationing has a negative effect on firm-level domestic sales, but this effect only statistically significant at the 90% confidence level. In contrast, weak credit rationing has a statistically insignificant effect on firm-level domestic sales, no matter whether we consider the OLS estimates or IV estimates. Furthermore,

the magnitude of the estimated effect of credit rationing on domestic sales is smaller than that on foreign sales (-1.173 V.S. 0.096 for strong credit rationing; -0.475 V.S. -0.017 for weak credit rationing). These results are in line with Minetti and Zhu (2011) and suggest that credit rationing disproportionately affects firm-level export sales. One possible interpretation is that it is more costly to establish distribution systems in foreign markets, and credit rationed firms must incur greater distribution costs in foreign markets which in turn lead to fewer foreign sales.

5. Heterogeneous Effect of Credit Rationing

In the above analysis, we have characterized the average effect of credit rationing on firm-level export behaviors. A vast amount of literature indicates that financial constraints exhibit heterogeneous effects on firm-level export performance. Manova et al. (2015), for instance, demonstrate that financial constraints have more pronounced impact on less productive firms and firms that belong to more financially vulnerable sectors. Bai et al. (2017) and Cheng et al. (2017) show that relative to direct exporters, firms that engage in indirect exporting (exporting through intermediaries) are affected less by financial constraints due to their different cost structure. In this section, we study the heterogeneous effect of credit rationing across firms. The heterogeneous effects of credit rationing on export participation for different firms are reported in Table 7 and 8.

[Table 7 is to be here]

[Table 8 is to be here]

Table 7 and 8 display the heterogeneous effects of strong and weak credit rationing on firm export participation decisions, respectively. Columns (1) and (2) in Table 7 reveal the heterogeneous effect of strong credit rationing on firms with insufficient and sufficient liquidity. The results indicate that strong credit rationing reduces export participation probability only for firms with insufficient liquidity. In contrast, strong credit rationing has a statistically insignificant effect on firms with sufficient liquidity. One possible interpretation is that firms with sufficient liquidity can finance their start-up fixed costs in foreign markets using their own internal finance.

Columns (3)-(4) show the differential effects of strong credit rationing on multi-product and single-product firms, respectively. The results suggest that the impact of credit rationing is more pronounced for multi-product firms. This might be because that multi-product firms are also potential multi-product exporters. As such, they rely more on external finance to pay for a larger start-up fixed cost to enter into the foreign markets.[23]

Column (5) lists the estimated effect of strong credit rationing on firms that obtain collateral from other firms. Column (6) displays the estimated effect of strong credit rationing on firms which do not obtain collateral from other firms. The results indicate that firms that obtain collateral from other firms rely more on external finance to start exporting. One possible explanation is that obtaining collateral from other firms is a good signal of a firm's growth prospective. As such, firms that obtain collateral from other firms are more likely to expand and export

[23] Manova and Zhang (2012) document that multi-product exporters usually enter into more foreign markets, which require multiple market entry costs. This increases external finance reliance for multi-product firms.

if they access to external finance (not credit rationed). In contrast, due to the poor growth prospective, firms without external collateral are less likely to export even if they have access to external finance. Therefore, credit rationing has trivial effect on firms without external collateral. We calculate the different export ratios between firms with and without external collateral in our sample. We find that among firms that obtain external collateral the export ratio is 62.3%, while the export ratio for firms without external collateral is 34.0%. The significant gap in export ratio between the two groups of firms supports our explanation.

Columns (7) and (8) report the results for firms with a high capital utilization rate and low capital utilization rate, respectively. We treat firms whose capital utilization rates above the median utilization rate as high capital utilizing firms, and firms whose capital utilization rate below the median utilization rate as low capital utilizing firms. The results demonstrate that credit rationing has a more pronounced effect on firms with a high capital utilization rate. Low capital utilization rates may reveal organization or management inefficiency, which prevents firms from exporting regardless of whether these firms have access to external finance. This leads to a statistically insignificant effect of credit rationing on firms with low capital utilization rates. In contrast, high capital utilization rate firms are more efficiently organized, and hence more sensitive to external credit rationing.

In Table 8 we observe very similar patterns to those documented in Table 7. In particular, the results indicate that weak credit rationing exhibits stronger effects on firm-level export participation for firms with insufficient liquidity, multi-product firms, firms which obtain collateral from other firms, and firms with high capital utilization rates.

Next, we examine the heterogeneous effects of credit rationing on the firm-level intensive margin of exports. The results are reported in Table 9 and 10.

[Table 9 is to be here]

[Table 10 is to be here]

Tables 9 and 10 document the heterogeneous effect of strong and weak credit rationing on firm-level intensive margin of exports, respectively. Columns (1) and (2) in Table 9 report the effect of strong credit on export values for firms with insufficient and sufficient liquidity, respectively. Results show that although strong credit rationing reduces firm-level export values for both firms with sufficient liquidity and those without sufficient liquidity, the effect is only statistically significant for the former case. A possible reason could be that firms with sufficient liquidity can finance the R&D investment which decreases their marginal cost. As such, additional external credits do not help them to further decrease their marginal cost and hence have no significant effect on improving their sales.

Columns (3) and (4) report the heterogeneous effect of strong credit rationing on multi-product and single-product firms, respectively. The results imply that strong credit rationing reduces export values for both multi-product and single-product firms, and this effect is statistically significant.[24] The effect that strong credit rationing has on export values for multi-product firms almost double than that on single-product firms (-1.583 V.S. -0.854). We offer two possible interpretations for the observed evidence. First, firms can make use of external finance to improve their distribution system in foreign markets, which reduces the variable

[24]For multi-product firms, the effect is statistically significant at 99% confidence level, but for single-product firms, the effect is only statistically significant at 90% confidence level.

transportation costs and multi-product firms benefit more from a better functional distribution system as they can deliver various products through the same system (intensive margin). This leads to a larger effect from credit rationing on export sales for multi-product firms. Second, multi-product firms often export their core products and sell products far from their core competence in the domestic markets (see, Manova and Zhang, 2012; Bernard et al., 2010). Access to more external finance leads multi-product firms to export more varieties (extensive margin).

Column (5) reports the effect of strong credit rationing on firms that obtain collateral from other firms, while column (6) reports the effect on firms that do not obtain any external collateral. In contrast to the findings for extensive margin, strong credit rationing has no statistically significant effect on the intensive margin of exports for firms with external collateral. However, strong rationing does reduce firm-level export values for firms that do not have external collateral. One possible interpretation is that firms that do not obtain external collateral, are unable to do so because of their poor growth prospective, which usually due to their less developed production technology, or poor production organization, etc. External credits can better serve these firms by improving their productivity, reducing their marginal costs, and boosting their export values.

Columns (7) and (8) reveal the heterogeneous effect on firms with high and low capital utilization rates, respectively. The results demonstrate that strong credit rationing significantly reduce firm-level export values for firms with low capital utilization rates (column (8)). In contrast, the effect on firms with high capital utilization rates is statistically insignificant. The results might be driven by that firms with high capital utilization rates which are efficiently organized in their production, and additional external credits cannot help them further decrease

their marginal costs through improving organization efficiency.

Table 10 displays the heterogeneous effects of weak credit rationing on firm-level export values. We observe very similar patterns as those in Table 9, except that the magnitude on the coefficient for weak credit rationing is smaller than that of strong credit rationing. This implies that weak credit rationing plays a less pronounced role on firm export values relative to strong credit rationing.

6. Robustness

In this section, we check the robustness of our results using different instruments for credit rationing. In the literature, province-level financial market development is usually used as an instrument for an individual firm's credit rationing. However, in our case, all firms are located in the same province, Zhejiang, which invalidates any instrument constructed at province level. Therefore, in a robustness check, we attempt to use the sectoral credit rationing rate as an instrument for the individual firm's degree of credit rationing.

The Chinese government has enacted a series of policies aiming to relieve firm financial constraints in clean energy and high-tech industries. The state council of the People's Republic of China in 2013, for instance, announced "Guiding opinions of the State Council on resolving the serious surplus of production capacity " to alleviate the negative effect of financial constraints on firms within steel, cement, Nonferrous metal smelting and rolling processing, transport equipment industry (State Council document no.41 [2013]). In 2014, the general office of the state council of the People's Republic of China issued "Guidance on Duocuobingju efforts to alleviate the problem of high cost of corporate finance" (State Council

document no.39 [2014]) to reduce SMEs' financial costs in service, clean energy, and agriculture sectors. In addition, to boost high-tech, information technology (IT), clean energy and strategic emerging industries, the state council enacted "Guiding opinions on financial support, economic restructuring and upgrading" to increase the financial support to these industries in 2013. All these policies suggest heterogeneous degrees of financial constraints at the sector-level.

We construct the rationing rate in industry j as $sector_j = \frac{rnum_j}{num_j}$, where $sector_j$ represent the ratio of firms that face strong (weak) rationing in industry j. $rnum_j$ denotes the number of firms that face strong (weak) credit rationing in industry j, and num_j is the total number of firms in industry j. $sector_j$ captures the degree of financial constraints in industry j, which will affect the credit rationing of firms in that industry. However, it is not likely to be correlated with firm i's unobserved characteristics which, in turn, determine firm i's export behaviors. We use $sector_j$ as an instrument for firm-level credit rationing and estimate the impact of credit rationing on firm-level export extensive and intensive margins, respectively. Results are reported in Table 11.

[Table 11 is to be here]

The results in Table 11 show that sector-level credit rationing rate has a positive effect on an individual firm's credit rationing. This implies that a representative firm that belongs to a more financially constrained industry is more likely to be credit rationed. Furthermore, both strong and weak credit rationing have negative and statistically significant effects on firm-level extensive and intensive export margins. The magnitude of the coefficients in each regression are highly comparable to our previous results where we use firm-level housing investment and receivables

as instruments for credit rationing.

7. Conclusion

In this paper, we investigate the impact of credit rationing on export performance for SMEs in China. The results indicate that SMEs which are credit rationed are less likely to export and conditioning on exporting will export fewer. The effect of credit rationing is more pronounced on firm export participation for firms that with insufficient liquidity, produce multi-product, obtain more external collateral, and with a higher capital utilization rate. In contrast, the effect of credit rationing on firm export values is stronger for firms with insufficient liquidity, multi-product firms, firms without external collateral, and firms with a lower capital utilization rate.

In order to alleviate the endogeneity concern of credit rationing, we construct novel firm-level instruments for credit rationing rather than using province-level instruments, that is, firm-level housing investments and receivables. We find that the probability that firm-level credit rationing is significantly decreasing in firm-level housing investments and receivables, which may suggest that state-owned banks in China use firm-level signals to allocate their loans across SMEs, and there are significant differences in the opportunity to access external finance. These firm-level instruments can effectively eliminate the concern of weak instruments and allow us to avoid aggregating the standard error.

The effect of credit rationing on export performance for SMEs in China has no significant difference from that on SMEs in developed countries, like Italy. This may suggest that SMEs in China are quite similar to their counterparts in

developed countries, at least in terms of their reliance on external finance.

Reference

Arkolakis, C. 2011. Market Penetration Costs and the New Consumers Margin in International Trade. *Journal of Political Economy*, 118(6), 1151–1199.

Aw, B.Y., Y. Xu, and M. Roberts 2011. R&D Investment, Exporting, and Productivity Dynamics. *American Economic Review*, 101(4), 1312–1344.

Bai, X., K. Krishna, and H. Ma 2017. How You Export Matters: Export Mode, Learning and Productivity in China. *Journal of International Economics*, 104, 122–137.

Barro, R. 1976. The Loan Market, Collateral, and Rates of Interest. *Journal of Money, Credit and Banking*, 8(4), 439-456.

Berman, N., and J. Héricout 2010. Financial Factors and the Margins of Trade: Evidence from Cross-country Firm-level Data. *Journal of Development Economics*, 93, 206–217.

Benfratello, L., F. Schiantarelli, and A. Sembenelli 2017. Banks and Innovation: Microeconomic Evidence on Italian Firms. *Journal of Finacial Economics*, 90, 197–217.

Bernard, A. B., S. Redding, and P.K. Schott 2010. Multi-Product Firms and Product Switching. *American Economic Review*, 100(1), 70–97.

Brant, L., J.V. Biesebroeck and Y. Zhang 2014. Challenges of Working with the Chinese NBS Firm-level Data. *China Economic Review*, 30, 339-352.

Chaney, T. 2016. Liquidity Constraint Exporters. *Journal of Economic Dynamics and Control*, 72, 141–154.

Chaney, T., D. Sraer, and D. Thesmar 2012. The Collateral Channel: How Real Estate Shocks Affect Coporate Investment. *American Economic Review*, 102(6), 2381–2409.

Cheng, D., Z. Hu, and Y. Tan 2017. Time-Varying impacts of Financial Credits on Firm Exports: Evidence from Trade Deregulation in China. *Working paper*,

Cull, R., and L. Xu 2003. Who Gets Credit? The Behavior of Bureaucrats and State Banks in Allocating Credit to Chinese State-owned Enterprises. *Journal of Development Economics*, 71, 533–559.

Dai, M., and M. Yu 2013. Firm R&D, Absotive Capacity and Learning by Exporting: Firm-Level Evidence from China. *The World Economy*, 36(9), 837-873.

Das, S., J. Roberts, and J.R. Tybout 2007. Market Entry Costs, Production Heterogeneity, and Export Dynamics. *Econometrica*, 75(3), 837-873.

Fang, H., Q. Gu, W. Xiong and L. Zhou 20015. Demystifying the Chinese Housing Boom. *Chapter 2 in NBER Macroeconomics Annual 2015*, 30, University of Chicago Press.

Feenstra, R. C., Z. Li, and M. Yu 2014. Exports and Credit Constraints under Imcomplete Information: Theory and Evidence from China. *Review of Economics and Statistics*, 96(4), 729–744.

Firth, M., C. Lin, P. Liu, and S. Wong 2009. Inside the Black Box: Bank Credit

Allocation in China's Private Sector. *Journal of Banking & Finance*, 33, 1144–1155.

Gan, J. 2007. The Real Effects of Asset Market Bubbles: Loan- and Firm-level Evidence of a Lending Channel. *Review of Financial Studies*, 20(6), 1941–1973.

Glaeser, E., W. Huang, Y. Ma, and A. Shleifer 2017. A Real Estate Boom with Chinese Characteristics. *Journal of Economic Perspectives*, 31(1), 93–116.

Greenawy, D., A. Guariglia, and R. Kneller 2007. Financial Factors and Exporting Decisions. *Journal of International Economics*, 73, 377–395.

Greene, W. 2002. Econometric Analysis. *Prentice Hall, Upper Saddle River, New Jersey*,

Guiso, L., S. Paola, and L. Zingales 2004. Does Local Financial Development Matter. *The Quarterly Journal of Economics*, 119(3), 929–969.

Greene, W. 2002. Econometric Analysis. *Prentice Hall, Upper Saddle River, New Jersey*.

Hart, O., and J. Moore 1994. A Theory of Debt Based on the Inalienbility of Human Capital. *Quarterly Journal of Economics*, 109(4), 841–879.

Lin, H., Z. Qin, and R. Chi 2015. China Small and Medium Enterprises Development Report 2015. Peking University Press, Beijing.

Liu, Z., P. Wang and T. Zha 2013. Land-Price Dynamics and Macroeconomic Fluctuations. *Econometrica*, 81(3, 1147–1184.

Lizal, L., and J. Svejnar 2002. Investment, Credit Rationing, and the Soft Budget Constraint: Evidence from Czech Panel Data. *The Review of Economics and Statistics*, 84(2), 353–370.

Luisa, M., and A. Vezzulli 2014. R&D and Credit Rationing in SMEs. *Economic Inquiry*, 52(3), 1153–1172.

Mancuisi, M. L., and A. Vezzulli 2014. R&D and Credit Rationing in SMEs. *Economic Inquiry*, 52(3), 1153–1172.

Manova, K. 2013. Credit Constraints, Heterogeneous Firms, and International Trade. *Review of Economic Studies*, 80, 711–744.

Manova, K., S.J. Wei, and Z. Zhang 2015. Firm Exports and Multinational Activity under Credit Constraints. *Review of Economic Studies*, 97(3), 574–588.

Manova, K., and Z. Zhang 2012. Export Price across Firms and Destinations. *Quarterly Journal of Economics*, 127, 379–436.

Minetti, R., and C. Zhu 2011. Credit Constraints and Firm Export: Mcroeconomic Evidence from Italy. *Journal of International Economics*, 83, 109–125.

Morales, E., G. Sheu, and A. Zahler 2014. Gravity and Extended Gravity: Estimating a Structural Model of Export Entry. *Unpublished Working Paper.*

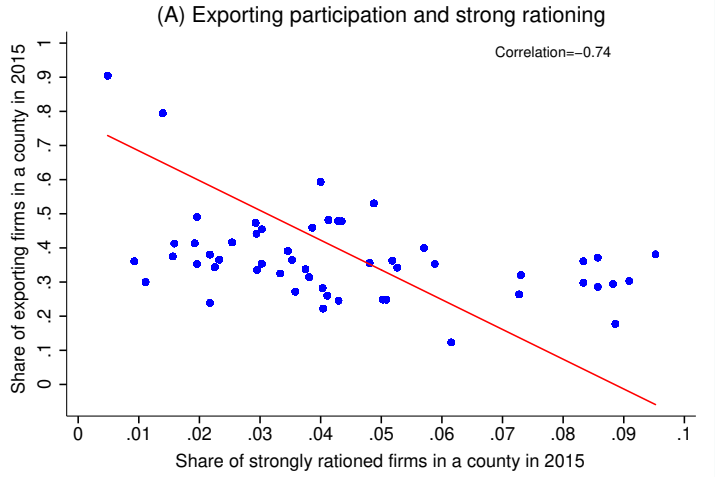
Myers, S.C., and N. Majluf 1984. Corporate Financing and Investment Decisions When Firms have Information That Investors Do Not Have. *Journal of Finacial Economics*, 13(2), 187–221.

Stiglitz, J., and A. Weiss 1981. Credit Rationing in Markets with Imperfect Information. *American Economic Review*, 71(3), 393–410.

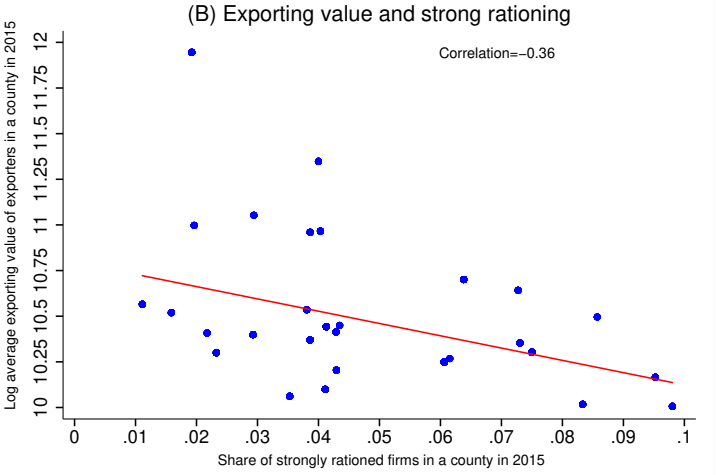
Udell, G. 2014. Asset Based Finance: Proven Disciplines for Prudent Lending. The Commercial Finance Association, New York.

Whited, T. M., and G. Wu 2006. Financial Constraints Risk. *Review of Financial Studies*, 19(2), 531–559.

Appendix (Figures and Tables)



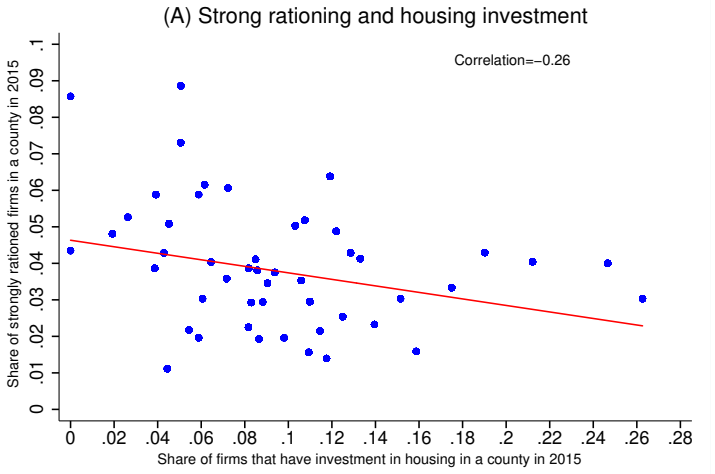
(a)



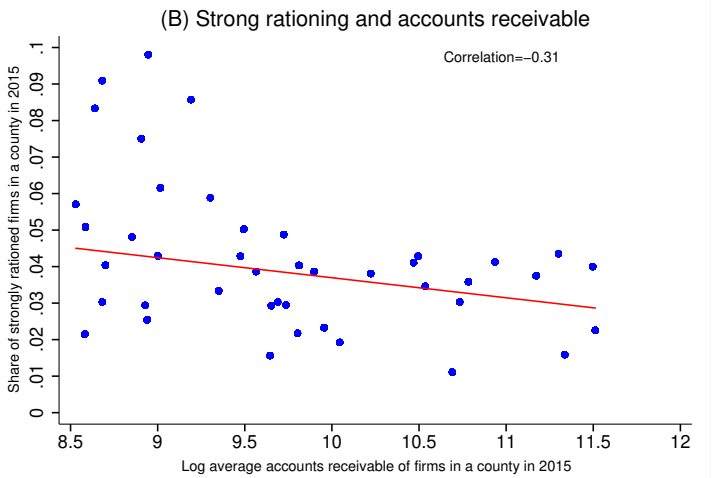
(b)

Figure 1: Simple correlations between credit rationing and exporting

Notes. Panel (A) plots county-level share of firms that are strongly rationed and county-level share of exporters among all firms. Both shares are constructed for 2015. Panel (B) plots county-level share of strongly rationed firms and county-level log average exporting value. The average exporting value is constructed for 2015 as well. The red solid lines are the linear fitted lines.



(a)



(b)

Figure 2: Simple correlations between credit rationing and its instruments

Notes. Panel (A) plots county-level share of firms that have investment in housing markets and county-level share of firms that are strongly rationed. Both shares are constructed for 2015. Panel (B) plots county-level log average accounts receivable and count-level share of strongly rationed firms. The average accounts receivable is constructed for 2015. The red solid line is the linear fitted line.

Table 1: Summary statistics.

Variables	Mean	Standard deviation	Number of observations
Credit rationing:			
Strong rationing	0.034	0.182	14249
Weak rationing	0.085	0.279	14249
Exporting and Sales:			
Export participation	0.452	0.498	14249
Foreign sales of exporters	31062.2	467417.5	6336
Domestic sales	51802.6	771773.8	14028
Firm Characteristics:			
Liquidity	0.707	0.455	12119
Leverage ratio	2.055	202.745	11932
Cash flow	6438.2	96398.6	11685
Labor productivity	411.4	17174.9	11772
Employment	134.5	634.4	12089
Fixed assets/employment	255.3	9022.3	10838
Innovation	0.223	0.416	14249
Housing investment	0.247	0.431	14249
Accounts receivable	29885.0	429981.0	12102

Notes. This table reports summary statistics of key variables used in our empirical analysis. Strongly rationed firms find it difficult to obtain external finance and are asked by banks to pay higher interest rates, while weakly rationed firms only satisfy the first condition. Export participation equals to 1 if the firm is an exporter and 0 otherwise. Foreign and domestic sales are measured in Chinese yuan. Liquidity is a binary variable taking a value of 1 if the firm has sufficient liquidity and 0 otherwise. Leverage ratio is defined as total liabilities/total assets. Cash flow denoted with Chinese yuan. Labor productivity is output value (in Chinese yuan) per worker. Employment is the total number of workers, and fixed assets/employment defines capital intensity. Innovation is a binary variable equal to 1 if the firm is engaged in product innovation and 0 otherwise. Housing investment takes a value of 1 if the firm invests in housing markets and 0 otherwise. Accounts receivable is measured in Chinese yuan.

Table 2: Credit Rationing and Export Extensive Margin (Strong Rationing)

	Probit	Bivariate Probit (IV1)		Bivariate Probit (IV2)	
	Exporting	Credit Rationing	Exporting	Credit Rationing	Exporting
	(1)	(2)	(3)	(4)	(5)
rationing_s	-0.054		-1.274***		-1.228***
	(0.067)		(0.258)		(0.294)
LR_a	0.002	1.142***	0.078**	1.146***	0.075**
	(0.029)	(0.1072)	(0.033)	(0.108)	(0.035)
Leverage	-0.019	0.057**	-0.008	0.059**	-0.009
	(0.018)	(0.027)	(0.018)	(0.027)	(0.018)
Cash_flow	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
TFP	0.000	-0.000	0.000*	-0.000	0.000*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Size	0.001***	-0.000	0.001***	-0.000	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Capital_int	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Innovation	0.570***	0.102*	0.559***	0.102*	0.560***
	(0.029)	(0.052)	(0.030)	(0.053)	(0.030)
House		-0.134**		-0.131*	
		(0.068)		(0.073)	
Receivables				-0.001**	
				(0.000)	
Industry FE	Yes	Yes	Yes	Yes	Yes
Ownership FE	Yes	Yes	Yes	Yes	Yes
Corr(ε, μ)		0.450***		0.440***	
		(0.078)		(0.099)	
Psudo R^2	0.09	0.19		0.19	
Obs	10,517	10,517		10,517	

Note: The table reports estimates of Eqs.(2) and (3). Column 1 reports the estimates from the single probit model, while columns (2)-(3) and columns (4)-(5) reports the results from the bivariate Probit model with different sets of IV, respectively. $***$,**,* indicate significance at the levels of 1%, 5% and 10% respectively.

Table 3: Credit Rationing and Export Extensive Margin (Weak Rationing)

	Probit	Bivariate Probit (IV1)		Bivariate Probit (IV2)	
	Exporting	Credit Rationing	Exporting	Credit Rationing	Exporting
	(1)	(2)	(3)	(4)	(5)
rationing_w	0.020		-0.478**		-0.510**
	(0.044)		(0.245)		(0.251)
LR_a	-0.003	1.555***	0.068*	1.552***	0.072*
	(0.029)	(0.092)	(0.044)	(0.092)	(0.048)
Leverage	-0.020	0.077***	-0.012	0.072***	-0.021
	(0.018)	(0.021)	(0.018)	(0.023)	(0.019)
Cash_flow	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
TFP	0.000*	-0.000*	0.000*	-0.000**	0.000*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Size	0.001***	0.000	0.001***	0.000	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Capital_int	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Innovation	0.570***	0.092**	0.571***	0.088**	0.566***
	(0.030)	(0.063)	(0.030)	(0.041)	(0.030)
House		-0.274***		-0.275***	
		(0.060)		(0.060)	
Receivables				-0.000*	
				(0.000)	
Industry FE	Yes	Yes	Yes	Yes	Yes
Ownership FE	Yes	Yes	Yes	Yes	Yes
Corr(ε, μ)		0.321***		0.319***	
		(0.060)		(0.066)	
Psudo R^2	0.09	0.17		0.17	
Obs	10,517	10,517		10,517	

Note: The table reports estimates of Eqs.(2) and (3). Column 1 reports the estimates from the single probit model, while columns (2)-(3) and columns (4)-(5) report the results from the bivariate probit model with different sets of IV, respectively. $***$,**,* indicate significance at the levels of 1%, 5% and 10% respectively.

Table 4: Exporting Participation: financial variables

	Bivariate (IV1)		Bivariate (IV2)	
	(1)	(2)	(3)	(4)
Panel A: Strong Rationing				
rationing_s	**−1.274*****	**−1.304*****	**−1.228*****	**−1.649*****
	(0.258)	(0.204)	(0.0751)	(0.098)
LR_a	0.078**		0.075**	
	(0.033)		(0.035)	
Leverage	-0.008		-0.009	
	(0.018)		(0.018)	
Panel B: Weak Rationing				
rationing_w	**−0.478****	**−0.515****	**−0.510*****	**−0.560****
	(0.245)	(0.243)	(0.251)	(0.241)
LR_a	0.068*		0.072*	
	(0.044)		(0.048)	
Leverage	-0.012		-0.021	
	(0.018)		(0.008)	

Note: Columns (1)-(2) report estimates for exporting equation of the bivariate probit model by using house investment as IV for credit rationing. Compared to column (1), column (2) excludes financial variables, liquidity ratio and leverage ratio. Similarly, columns (3)-(4) report estimates for exporting equation by using both house investment and receivable payments as IV for credit rationing. Panel A contains results for strong credit rationing, and Panel B contains results for weak credit rationing. $***$,$**$,$*$ indicate significance at the levels of 1%, 5% and 10% respectively.

Table 5: Credit Rationing and Export Intensive margins

	Strong Rationing			Weak Rationing		
	OLS	2SLS	2SLS+Selection	OLS	2SLS	2SLS+Selection
	(1)	(2)	(3)	(4)	(5)	(6)
rationing_s	-0.110	-0.732	-3.622***	-0.268***	-1.104	-0.768***
	(0.150)	(0.503)	(1.311)	(0.099)	(1.199)	(0.191)
LR_a	-0.068	0.031	0.660**	-0.036	-0.073	0.280*
	(0.066)	(0.072)	(0.295)	(0.067)	(0.182)	(0.168)
Leverage	-0.000	-0.040	-0.017	-0.000	-0.035	-0.017
	(0.001)	(0.037)	(0.042)	(0.001)	(0.040)	(0.038)
Cash_flow	0.081***	0.081***	0.103***	0.080***	0.091***	0.087***
	(0.021)	(0.021)	(0.025)	(0.021)	(0.022)	(0.022)
TFP	0.260***	0.270***	0.224***	0.261***	0.283***	0.266
	(0.036)	(0.037)	(0.044)	(0.036)	(0.037)	(0.037)
Size	0.569***	0.580***	0.630***	0.568***	0.542***	0.608***
	(0.040)	(0.041)	(0.049)	(0.040)	(0.042)	(0.045)
Capital_int	-0.025	-0.028	-0.018***	-0.025	-0.025	-0.025
	(0.019)	(0.019)	(0.022)	(0.019)	(0.020)	(0.020)
Innovation	0.027	0.020	0.151*	0.030	0.088	0.114***
	(0.063)	(0.065)	(0.088)	(0.063)	(0.069)	(0.034)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Ownership FE	Yes	Yes	Yes	Yes	Yes	Yes
First stage regression						
of credited rationing			0.310**			0.865***
fitted Prob of rationing			(0.203)			(0.084)
R^2	0.19	0.10	0.19	0.19	0.20	0.20
Obs	3,601	3,601	3,601	3,601	3,601	3,601

Note: The table reports estimates of Eq.(4). Column 1 reports the estimates from the single Probit model, while columns (2)-(3) and columns (4)-(5) reports the results from the bivariate Probit model with different sets of IV, respectively. $***$,**,* indicate significance at the levels of 1%, 5% and 10% respectively.

Table 6: Credit Rationing and Domestic Sales

	Strong Rationing		Weak Rationing	
	OLS	2SLS	OLS	2SLS
	(1)	(2)	(3)	(4)
rationing_s	0.054***	-0.096*	0.042***	-0.017
	(0.019)	(0.052)	(0.012)	(0.027)
LR_a	0.072***	0.080***	0.069***	0.077***
	(0.008)	(0.011)	(0.008)	(0.011)
Leverage	-0.014***	-0.014**	-0.015***	-0.015**
	(0.005)	(0.006)	(0.005)	(0.006)
Cash_flow	0.090***	0.106***	0.090***	0.106***
	(0.002)	(0.003)	(0.002)	(0.003)
TFP	0.370***	0.413***	0.347***	0.413***
	(0.007)	(0.006)	(0.005)	(0.006)
Size	0.347***	0.662***	0.591***	0.662***
	(0.005)	(0.006)	(0.005)	(0.006)
Capital_int	0.032***	0.038***	0.032***	0.038
	(0.002)	(0.003)	(0.002)	(0.003)
Innovation	0.084***	0.035	0.083***	0.035***
	(0.009)	(0.012)	(0.009)	(0.012)
Industry FE	Yes	Yes	Yes	Yes
Ownership FE	Yes	Yes	Yes	Yes
First stage regression				
of credited rationing		-7.566***		-6.907
fitted Prob of rationing		(0.063)		(0.042)
R^2	0.49	0.43	0.49	0.44
Obs	10,517	10,517	10,517	10,517

Note: The table reports estimates of Eq.(4). Column 1 reports the estimates from the single probit model, while columns (2)-(3) and columns (4)-(5) report the results from the bivariate probit model with different sets of IV, respectively. $***$,**,* indicate significance at the levels of 1%, 5% and 10% respectively.

Table 7: Heterogeneous Impact: Export Extensive Margin (Strong Rationing)

	Liquidity		# of Products		Collateral		Utilization Rate	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
rationing_s	-0.961***	0.642	-1.038***	-0.062	-0.846***	-0.592	-1.439***	-0.584
	(0.227)	(2.536)	(0.168)	(0.370)	(0.218)	(0.065)	(0.161)	(0.360)
LR_a			0.061***	-0.002	0.145***	0.065***	0.037*	0.100***
			(0.018)	(0.035)	(0.036)	(0.024)	(0.021)	(0.032)
Leverage	0.023**	-0.059***	-0.019**	0.162***	-0.015	0.040***	0.082***	-0.073***
	(0.011)	(0.013)	(0.009)	(0.033)	(0.014)	(0.011)	(0.016)	(0.012)
Cash_flow	0.000	-0.000	-0.000	0.000*	-0.000	0.000	-0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
TFP	0.000***	0.000	-0.000	0.000**	0.000**	0.000*	0.000**	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Size	0.001***	0.001***	0.001***	0.000***	0.000***	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Capital_int	0.000	-0.000	-0.000	0.000	-0.000	0.000	0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Innovation	0.542***	0.623***	0.583***	0.478***	0.446***	0.612***	0.573***	0.559***
	(0.017)	(0.025)	(0.015)	(0.032)	(0.025)	(0.016)	(0.020)	(0.020)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ownership FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Corr(ε, μ)	0.456***	-0.183***	0.519***	0.440***	0.444***	0.247	0.645***	0.316
	(0.146)	(0.068)	(0.111)	(0.099)	(0.116)	(0.200)	(0.143)	(0.198)
Psudo R^2	0.07	0.13	0.10	0.10	0.08	0.09	0.09	0.08
Obs	7,370	3,147	8,254	2,263	3,029	7,488	4,480	6,037

Note: Table 7 reports the heterogeneous impact of strong credit rationing on the firm-level export participation decision. Columns (1) and (2) compare the different impacts of credit rationing on firms that face liquidity constraint and without liquidity constraint, respectively; columns (3) and (4) compare firms that produce multiple products and singular products; column (5) and (6) compare firms with or without access to collateral from other firms; columns (7) and (8) compare firms that are of high and low capital utilization rate. $***,**,*$ indicate significance at the levels of 1%, 5% and 10% respectively.

Table 8: Heterogeneous Impact: Export Extensive Margin (Weak Rationing)

	Liquidity		# of Products		Collateral		Utilization Rate	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
rationing_s	-0.408***	0.469	-0.487***	0.051	-0.375***	-0.017	-0.089***	-0.190
	(0.164)	(0.979)	(0.125)	(0.290)	(0.135)	(0.055)	(0.130)	(0.227)
LR_a			0.069***	-0.014	0.142***	0.010**	0.074***	0.082**
			(0.024)	(0.035)	(0.043)	(0.005)	(0.026)	(0.041)
Leverage	0.011	-0.051***	-0.021**	0.160***	-0.012	0.038***	-0.086***	-0.081***
	(0.012)	(0.014)	(0.009)	(0.034)	(0.019)	(0.010)	(0.017)	(0.013)
Cash_flow	0.000	-0.000	-0.000	0.000*	-0.000	0.000	-0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
TFP	0.000**	0.000	-0.000	0.000**	0.000*	0.000*	0.000*	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Size	0.001***	0.001***	0.001***	0.001***	0.000***	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Capital_int	0.000	-0.000	-0.000	0.000	-0.000	0.000	0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Innovation	0.549***	0.622***	0.591***	0.476***	0.441***	0.615***	0.571***	0.566***
	(0.016)	(0.025)	(0.015)	(0.033)	(0.025)	(0.016)	(0.020)	(0.020)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ownership FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Corr(ε, μ)	0.242**	-0.104	0.281***	0.010	0.309***	-0.038	0.485***	0.127
	(0.096)	(0.338)	(0.075)	(0.155)	(0.086)	(0.018)	(0.072)	(0.128)
Psudo R^2	0.06	0.13	0.07	0.10	0.07	0.08	0.09	0.07
Obs	7,370	3,147	8,254	2,263	3,029	7,488	4,480	6,037

Note: Table 8 reports the heterogeneous impact of weak credit rationing on the firm-level export participation decision. Columns (1) and (2) compare the different impacts of credit rationing on firms that face liquidity constraint and without liquidity constraint, respectively; columns (3) and (4) compare firms that produce multiple products and singular products; column (5) and (6) compare firms with or without access to collateral from other firms; columns (7) and (8) compare firms that are of high and low capital utilization rate. $***,**,*$ indicate significance at the levels of 1%, 5% and 10% respectively.

Table 9: Heterogeneous Impact: Export Intensive Margin (Strong Rationing)

	Liquidity		# of Products		Collateral		Utilization Rate	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
rationing_s	-0.512***	-0.762	-1.583***	-0.854*	-0.096	-2.691***	-0.514	-1.637***
	(0.154)	(5.192)	(0.424)	(0.475)	(0.348)	(0.738)	(0.587)	(0.513)
LR_a			0.333**	0.530***	-0.074	0.490***	0.147	0.503**
			(0.147)	(0.188)	(0.216)	(0.167)	(0.172)	(0.206)
Leverage	0.028	-0.149***	-0.032**	0.163***	-0.028	-0.030	-0.005	-0.053
	(0.026)	(0.062)	(0.025)	(0.053)	(0.041)	(0.029)	(0.031)	(0.041)
Cash_flow	0.125***	0.072***	-0.100	0.076***	0.104***	0.102***	0.085***	0.135***
	(0.012)	(0.020)	(0.011)	(0.018)	(0.018)	(0.013)	(0.015)	(0.016)
TFP	0.194**	0.350	0.247***	0.171***	0.237***	0.258***	0.242***	0.257***
	(0.021)	(0.032)	(0.019)	(0.030)	(0.028)	(0.023)	(0.028)	(0.025)
Size	0.653***	0.618***	0.645***	0.514***	0.724***	0.599***	0.651***	0.574***
	(0.031)	(0.052)	(0.027)	(0.043)	(0.044)	(0.032)	(0.032)	(0.043)
Capital_int	-0.035***	-0.018	-0.045***	-0.041	-0.008	-0.043***	-0.029**	-0.051
	(0.011)	(0.017)	(0.001)	(0.016)	(0.016)	(0.011)	(0.013)	(0.014)
Innovation	0.122***	0.114***	0.061*	0.253***	0.027	0.119***	0.026	0.125***
	(0.037)	(0.062)	(0.034)	(0.055)	(0.056)	(0.037)	(0.044)	(0.048)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ownership FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.19	0.24	0.19	0.24	0.16	0.13	0.22	0.18
Obs	2,398	1,203	2,735	866	1,142	2,459	1,569	1,569

Note: Table 9 reports the heterogeneous impact of strong credit rationing on the firm-level export values. Columns (1) and (2) compare the different impacts of credit rationing on firms that face liquidity constraint and without liquidity constraint, respectively; columns (3) and (4) compare firms that produce multiple products and singular products; column (5) and (6) compare firms with or without access to collateral from other firms; columns (7) and (8) compare firms that are of high and low capital utilization rate. $***,**,*$ indicate significance at the levels of 1%, 5% and 10% respectively.

Table 10: Heterogeneous Impact: Export Intensive Margin (Weak Rationing)

	Liquidity		# of Products		Collateral		Utilization Rate	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
rationing_s	-0.445***	0.556	-0.745***	-0.481*	-0.208	-0.771**	-0.349	-0.653***
	(0.086)	(5.244)	(0.180)	(0.259)	(0.165)	(0.315)	(0.276)	(0.225)
LR_a			0.359**	0.489***	-0.091	0.431**	0.262	0.328*
			(0.143)	(0.203)	(0.192)	(0.175)	(0.199)	(0.190)
Leverage	0.020	-0.126	-0.034	0.309***	-0.023	-0.039	-0.002	-0.064
	(0.025)	(0.086)	(0.024)	(0.055)	(0.039)	(0.028)	(0.032)	(0.040)
Cash_flow	0.116***	0.062***	-0.095***	0.050***	0.101***	0.094***	0.084***	0.125***
	(0.012)	(0.021)	(0.011)	(0.016)	(0.017)	(0.012)	(0.014)	(0.015)
TFP	0.202**	0.147***	0.250***	0.183***	0.239***	0.268***	0.244***	0.258***
	(0.021)	(0.028)	(0.019)	(0.028)	(0.028)	(0.022)	(0.027)	(0.025)
Size	0.637***	0.477***	0.638***	0.533***	0.709***	0.579***	0.661***	0.531***
	(0.030)	(0.048)	(0.025)	(0.042)	(0.040)	(0.030)	(0.014)	(0.037)
Capital_int	-0.024**	-0.024*	-0.036***	-0.007	-0.010	-0.036***	-0.023*	-0.042
	(0.011)	(0.013)	(0.010)	(0.016)	(0.016)	(0.011)	(0.013)	(0.014)
Innovation	0.152***	0.146**	0.098***	0.226***	0.023	0.162***	0.051	0.154***
	(0.042)	(0.066)	(0.038)	(0.059)	(0.059)	(0.042)	(0.049)	(0.054)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ownership FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.19	0.20	0.20	0.26	0.26	0.18	0.22	0.20
Obs	2,398	1,203	2,735	866	1,142	2,459	1,569	1,569

Note: Note: Table 10 reports the heterogeneous impact of weak credit rationing on the firm-level export values. Columns (1) and (2) compare the different impacts of credit rationing on firms that face liquidity constraint and without liquidity constraint, respectively; columns (3) and (4) compare firms that produce multiple products and singular products; column (5) and (6) compare firms with or without access to collateral from other firms; columns (7) and (8) compare firms that are of high and low capital utilization rate. $***$,**,* indicate significance at the levels of 1%, 5% and 10% respectively.

Table 11: Robustness: Sectoral Rationing Rate as IV

	Strong Rationing			Weak Rationing		
	Credit Rationing	Extensive	Intensive	Credit Rationing	Extensive	Intensive
	(1)	(2)	(3)	(4)	(5)	(6)
rationing_s		-1.283***	-2.185**		-0.482**	-0.612***
		(0.259)	(0.543)		(0.240)	(0.186)
LR_a	1.225***	0.078**	0.094	1.569***	0.069	0.148
	(0.052)	(0.033)	(0.158)	(0.043)	(0.048)	(0.157)
Leverage	0.063***	-0.009	-0.000	0.073***	-0.012	-0.024
	(0.011)	(0.018)	(0.001)	(0.009)	(0.018)	(0.038)
Cash_flow	0.000	0.000	0.079***	0.000	0.000	0.083***
	(0.000)	(0.000)	(0.023)	(0.000)	(0.000)	(0.022)
TFP	-0.000	0.000*	0.252***	-0.000***	0.000	0.270***
	(0.000)	(0.000)	(0.038)	(0.000)	(0.000)	(0.038)
Size	0.000*	0.001***	0.559***	0.000**	0.001***	0.596***
	(0.000)	(0.000)	(0.042)	(0.000)	(0.000)	(0.038)
Capital_int	0.000	-0.000	-0.023	0.000	-0.000	-0.024
	(0.000)	(0.000)	(0.019)	(0.000)	(0.000)	(0.020)
Innovation	0.043*	0.558***	0.031	0.061***	0.570***	0.044
	(0.024)	(0.030)	(0.066)	(0.018)	(0.030)	(0.070)
sector_s	10.375***			5.096***		
	(0.685)			(0.259)		
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Ownership FE	Yes	Yes	Yes	Yes	Yes	Yes
Corr(ε, μ)	0.407***			0.252***		
	(0.082)			(0.066)		
Psudo R^2	0.08		0.13	0.07		0.14
Obs	10,517		10,517	10,517		10,517

Note: Columns (1) and (2) report the estimated effect of strong credit rationing on firm-level extensive margin of export from bivariate probit model, while columns (4) and (5) report the estimated effect of weak credit rationing on firm-level extensive margin of export from bivariate probit model. Columns (3) and (6) display the estimated effect of strong and weak credit rationing on firm-level intensive margin of export. $***$,**,* indicate significance at the levels of 1%, 5% and 10% respectively.