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

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Abstract

This paper examines the effect of credit rationing on export performance by 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) during 2015-2016 to conduct this analysis. The SMEDS provides firm-specific measures of credit rationing based directly on firm-level responses to the survey rather than indirect ones, based on firm-level financial statements. We find that, at the extensive margin, weak and strong credit rationing reduce export probability of small and medium-sized enterprises (SMEs) by 15.1% and 39.6%, respectively. At the intensive margin, they decrease SMEs' export values by more than 20.0% and over 28.8%, respectively. Different than existing literature, we construct valid firm-level instruments, firm-level housing stock, for credit rationing rather than using province-level instruments. We also employ county-industry-level instruments and obtain consistent estimates. In addition, credit rationing exhibits heterogeneous impacts on firms with different liquidity ratios, product portfolios, external collateral, and capital utilization rates.

JEL Codes: F10, G20
Keywords: SMEs, Strong Credit Rationing, Weak Credit Rationing, Firm Exports

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1. Introduction

The strength of a country's financial markets and the availability of capital have a pronounced influence on economic growth, considering that external finance supports firm-level expansion and export activity (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). A robust financial market where frictions are minimal encourages firm-level R&D investment, innovation, and export participation (Lizal and Svejnar, 2002; Guiso et al., 2004; Mancusi and Vezzulli, 2014). R&D and innovation are key factors that affect a firm's export performance, but they are characterized by high fixed costs.[1] At the same time, penetrating foreign markets involves significant start-up fixed costs (Arkolakis, 2011; Minetti and Zhu, 2011; Manova, 2013; Bai et al., 2017). Berman and Héricout (2010) show that to be successful as exporters, firms must collect information on foreign markets, design products to fit foreign preferences, set up distribution networks, and advertise to achieve market awareness and penetration. For example, estimates of the cost of entering a foreign market range from 347,549 to 538,986 U.S. dollars for Chilean exporters (Morales et al., 2019). This highlights the importance of external financing on firm export performance.

With the availability of micro firm-level data, a growing body of research has examined the link between financial market imperfections and firm-level export performance. However, causal evidence of the link between financial constraints and export performance is still mixed. Greenaway et al. (2007), for instance, find that financial constraints have a trivial effect on firm export participation. In contrast, Berman and Héricout (2010) document a strong link between financial development and firm-level extensive/intensive margins of exporting. These contrasting results are due to differences in the extent to which firms rely on external finance.[2] In particular, large firms can finance their R&D and market entry costs from internal liquidity and rely less on external financing. In contrast, small and medium-sized enterprises (SMEs) often lack internal liquidity and depend more on financial markets to finance R&D and market entry costs. The goal 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.

[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 succeed 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.

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

China offers an ideal setting to investigate the effect of credit rationing on the export performance by SMEs for a number of reasons. First, commercial banks in China provide loans disproportionately across firms in the private sector, which contains the majority of SMEs. In particular, Firth et al. (2009) find that state-owned banks in China issue loans to SMEs based on their financial health and organizational efficiency. This feature generates variation in the extent to which credit is available at the firm level and can be used to identify the effect of credit rationing on SMEs. Second, SMEs are likely to face higher costs of external finance relative to state-owned enterprises (SOEs) and are typically more constrained in their R&D investing than large established firms.[3] As such, a considerable percentage of SMEs in China engage in exporting through state-owned intermediaries (Bai et al., 2017), which reduces firm-level export profits. This makes studying the impact of credit rationing on SMEs' export activities economically important. Third, SMEs account for over 90% of registered enterprises in China and 60% of the gross domestic product (GDP) (Lin et al., 2015). Furthermore, SMEs in China have created 80% of the job openings in urban areas in 2014. Given the important role of SMEs in the Chinese economy, reducing financial market imperfections and financial constraints for SMEs would provide a boost to China's economy.

Using a novel data set containing firm-level information on financial constraints and production of SMEs in Zhejiang province during 2015-2016,[4] we identify the casual effect of credit rationing on SMEs' export performance. This data set is compiled from a survey in which firms answer a question about whether they have faced difficulties in 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 and intensive export margins. Specifically, credit rationing decreases SMEs' export probabilities by 15.1% to 39.6%. At the same time, credit rationing reduces the value of firm-level exports by more than 20.0% (due to weak credit rationing) to more than 28.8% (due to strong credit rationing). In contrast, the effect of credit rationing on firm-level domestic sales is found to be only marginally significant and is estimated to have a smaller magnitude on domestic revenues. Furthermore, we find that credit rationing has a more pronounced impact on the extensive margin of exporting for firms that face liquidity constraints, export multi-products, obtain collateral from other firm-

[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 is not available to SMEs.

[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 3.2 for more details about the definition of firm-level credit rationing.

s, and have a higher capital utilization rate. By comparison, the effect of credit rationing on the intensive margin of exporting is stronger for firms that face liquidity constraints, export multi-products, obtain collateral from other firms, 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, in contrast with those studies, we have a direct measure of firm-level financial constraints, credit rationing, rather than relying on a firm-level liquidity ratio or leverage ratio as an indirect proxy. The use of credit rationing can significantly reduce the effects of confounding factors, particularly the availability of alternative sources of external financing. Pecking order theory (Myers and Majluf, 1984) predicts that a firm would prefer debt financing to equity financing when internal liquidity is insufficient. However, the alternative approach that emphases control rights (Aghion and Bolton, 1992) suggests the opposite. As such, it is necessary to control for the availability of equity financing and preferences versus 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, we differ from Minetti and Zhu (2011) in the average size of SMEs, which in our sample is quite small. Annual sales average 82,000 RMB for our SMEs and the highest annual sales are no more than 600,000 RMB. This size restriction makes these firms' export decisions more likely to be financially constrained. In addition, we construct both firm-level and county-industry-level instruments for credit rationing, rather than use province-level instruments. Furthermore, to the best of our knowledge, this is the first study that uses firm-level data from a developing country to answer the question of how credit rationing affects export performance of SMEs. SMEs in developing countries can be very different from their counterparts in developed countries. For instance, a lack of alternative external finance sources may lead SMEs in China to rely more heavily on bank loans.

The rest of the paper proceeds as follows: in Section 2 we introduce the background of SMEs in China. 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 concludes.

2. Background

We first introduce background information on Chinese SMEs to demonstrate that the effect of credit rationing on these firms is worth exploring. Then, we discuss firm-level borrowing in China to support the construction of our instrumental variables 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 of SMEs, because SMEs are strategically important to the Chinese economy and are often credit rationed by banks. First, SMEs are an indispensable part of China's economy. According to Lin et al. (2015), there were more than 80 million SMEs accounting for over 90% of registered firms in China in 2014, they contributed to over 50% of tax revenues, more than 60% of 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 suffer more severe credit rationing than large firms.[6] As in the Italian case documented by Minetti and Zhu (2011), firms in China access external finance mainly through bank loans. In 2014, the ratio of banking deposits to China's 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 to large firms, SMEs are more likely to be credit rationed when applying for banking loans, either obtaining a smaller amount of credit than what they had been seeking, or being denied a loan completely. As creditors, banks are understandably more willing to support large firms that have substantial collaterals and sufficient cash flows. For SMEs, banks typically require higher interest rates and turn down their applications more frequently.[7] Furthermore, large firms receive preferential treatment because they are more economically important to

[6] 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.

[7] Song et al. (2011), for instance, document that compare to private firms, SOEs on average have better access to external credit in terms of a larger bank loan size and a lower interest rate. Firth et al. (2009) also show that Chinese banking sector serve as a conduit to channel low-cost capital to SOEs, and private sector has been virtually excluded from the formal credit market.

the local economy and, hence, have stronger political connections with the local governments.[8] Lin et al. (2015) document that only 10% of SMEs in Zhejiang province received loans from banks in 2014, while the rest had to rely on self-raised funds or private loans (such as usurious loans).[9] It is hard to infer the share of SMEs which were credit rationed from Lin et al. (2015) since they only ex-post observe the fraction of SMEs that obtained bank loans among all SEMs not the firms that applied for bank loans. In this study, our micro data could instead offer direct evidence on the share of SMEs that are credited rationed.

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. Because 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 a fair business environment for SMEs, working to reduce the frictions and distortions imposed on them. A key component of a fair business environment is the equal access to bank financing. Though the central government has taken measures such as subsidizing banks to encourage them to supply credit to SMEs, more changes along this line are needed to encourage SMEs' growth. In this study, we explore the effects of credit rationing on the export performance of SMEs and provide straightforward policy implications for the central government in supporting SMEs to expand beyond China's borders. Equal access to external capital is of particular importance to help SMEs penetrate into foreign markets. As shown by Das et al. (2007), serving international markets involves substantial upfront entry costs.

2.2. Firms' Borrowing in China

Two important features that characterize how firms borrow in China also determine how we construct instrumental variables for firm-level credit rationing. The first is the wide acceptance of housing stock as collateral for borrowing; the second is the external financing environment specific to the firm's industry and location. Existing theoretical studies (e.g., Barro, 1976;

[8]State-owned banks are the dominant suppliers of bank credits in China (Song et al., 2011 and Firth et al., 2009). When combined with the strong political connections between large firms and local governments, this implies that, *ex ante*, large firms are more likely to get loans from banks. The *ex post* result is that generally, large firms receive loans with lower interest rates or their applications are rejected far less frequently.

[9]This implies that it is difficult for SMEs to successfully obtain external financing from banks, which are the main sources of external finance sources in China (Song, et al., 2011). Instead, most SMEs have to rely on internally generated cash flows or private loans (often usurious loans) to finance their production activities (see, Dollar et al., 2007 and Song et al., 2011).

Stiglitz and Weiss, 1981; Hart and Moore, 1994) have long recognized the role of collaterals in enhancing firms' financial capacity in the presence of incomplete contracting. Though empirical studies lag behind these theoretical analyses, recent works 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' collateral holding to credit rationing because the degree of credit rationing can be largely predicted by a firm's ability to borrow against its collateral.

Housing is the most widely accepted form of collateral for banks in China, primarily due to the low risk of default and high potential for appreciation.[10] When lending to firms, banks are more likely to accept real estate as collateral because it reduces the risk that firms can physically transfer (or hide) collateral before a formal default. Land and housing are the main forms of collateral for firms that borrow in developed economies.[11] In urban China, all land is publicly owned; firms can only rent land from the local government. The value of a lease on land declines steadily as the lease's expiration date approaches. Consequently, Chinese commercial banks generally prefer housing to land as collateral.

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 price boom in China. The value-preserving feature of housing helps banks to secure a greater amount of repayment in liquidation when firms default. This is closely related to the great Chinese real estate boom that has been taken place since 2003. Glaeser et al. (2017) document that, during 2003-2014, real housing prices in China rose by over 10% per year. Even the home price appreciation seen in the U.S. between 1996 and 2006 pales in comparison to the Chinese housing boom as real house prices grew by only 5% per year (on average) in the U.S. over that period. The continuing real estate boom bolsters the expected appreciation for housing prices and lends strong support to housing as collateral for firms to pledge when borrowing from banks.

Borrowing by SMEs in China is also affected by the external financing environment of a firm's industry and location. This feature determines how we construct a county-industry-level

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

[11]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) use COMPUSTAT data for U.S. listed firms to investigate how rising home prices relieve firm-level collateral constraints and increase investment.

instrumental variable for credit rationing. In recent years, the Chinese central government has enacted a series of policies aimed at relieving financial constraints for firms in the clean energy and high-tech industries. For example, in 2013 the State Council of the People's Republic of China announced "Guiding opinions of the State Council on resolving the serious surplus of production capacity" to reduce the negative effect of financial constraints on firms within steel, cement, nonferrous metal smelting, rolling and processing and 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 multiple efforts to alleviate the problem of the high cost of corporate finance" (State Council Document No.39 [2014]) to reduce SMEs' financial costs in the service, clean energy, and agriculture sectors. Moreover, to boost high-tech, information technology, clean energy and strategic emerging industries, in 2013 the State Council enacted "Guiding opinions on financial support, economic restructuring and upgrading" to increase financial support to these industries. In addition, Chandra and Long (2013) document that the financial deficit status of local governments affects local firms' credit rationing, i.e., firms in a region with heavy financial deficits are less likely to obtain external financing. All of these suggest heterogeneity in financial constraints at the county-industry-level. Therefore, a county-industry-level credit rationing rate is a valid instrument to capture the degree of financial constraints in a particular industry and region when measuring firm-level credit rationing. This rate affects the credit rationing of firms within a given industry and region.

3. Data and Measurement

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

3.1. Data

The microeconomic data used in this study are from the Small and Medium-sized Enterprises Dynamic Survey (thereafter SMEDS). This survey 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, since August 2011. The survey is sent to SMEs

within the Zhejiang province and we have access to SMEDS data for the fourteen months, from July 2015 to August 2016.[12]

SMEDS offers two key advantages for our study. The first is that SMEDS is a survey designed specifically for SMEs. Unlike the frequently used 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, above-scale firms in 2011 and later are defined as firms that have an annual sales of at least 20 million yuan (equivalent to $3 million), while the remaining firms are considered below-scale firms.[13] Below-scale firms are NOT INCLUDED IN ASIP. This omission motivated local governments to design special surveys to include them, in order to monitor the operations of these enterprises. The SMEDS is one of the surveys designed by the local government of Zhejiang province to track the evolution of SMEs in the province. In this study, SMEs are defined as firms with an annual sales less than 600,000 yuan (roughly $92,000) during 2015-2016. This is the same definition used by SMEDS, and SMEDS collects information only for SMEs defined in this way. Therefore, SMEDS provides 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 to the local economy and the export sector is quite large. SMEs are strategically indispensable part to the Chinese economy as a whole, and in particular for Zhejiang province because SMEs account for around 97% of firms in the province.[14] In fact, Zhejiang is well-known in China for its local agglomeration of SMEs. This coastal province is located in an economically advanced area of China (that also includes Shanghai and Jiangsu) that has a relatively high degree of financial development and a superior institutional framework for small-scale businesses and has accordingly attracted a large number of SMEs. Aside from the economic significance of SMEs, Zhejiang also has a strong export sector. In 2014, the ratio between trade volume (imports and exports) and GDP was around 55% in Zhejiang, while the ratio for China as a whole was barely larger than 40%. These two characteristics

[12]A benefit of using recent microeconomic data is that it helps us to obtain time-relevant policy implications. The recent data is an appropriate proxy for the status quo, so policy implications from the analysis applicable to solving 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 remained unchanged over the period 2011-2016.

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

make Zhejiang a particularly interesting province for exploring the effects of credit rationing on SMEs' export performance.

SMEDS is carefully designed and conducted to ensure the sample is representative and reliable. A stratified sampling method is employed to ensure the survey data represents the overall population. At the province level, the Department of Small and Medium-sized Enterprises distributes sample sizes to all prefectures within the province, where disproportionately large weights are assigned to prefectures with a small 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 probability. 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 of data. First, the reported information is subject to several standard checks of logical consistency by local investigators. The checks are implemented at the firm-level and at the local administrative level (county or prefecture) by comparing summary statistics from SMEDS to other data sources. Second, the quality of data within a local administrative level affects the transfer of special funds for supporting SMEs from the central government to the local area. This incentivizes local governments to closely monitor the data reporting and verification to receive more funds from the central government.

We use SMEDS data for 2015 to conduct analysis, based on both the research question and data availability. In the current study, we explore how credit rationing affects SMEs' exporting behavior. For this research question, it is more appropriate to use annual data rather than monthly data because firms' export behavior can exhibit strong seasonality. Furthermore, over the 14 months from July 2015 to August 2016, SMEDS requires firms to report accumulated values for the past 12 months. This means that we could use information reported in December 2015 to obtain annual information for the calendar year of 2015.[15] The 2015 SMEDS provides us detailed information on firm-level demographics (including address and sector code), exporting, credit rationing, production, and balance sheet. A total of 14,249 firms were randomly chosen and surveyed in the 2015 round of SMEDS.

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

3.2. Measurement

Here we describe how we measure 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 the extensive and intensive margins of exporting for firms. If a firm reported a positive accumulated exporting value by December 2015, we define it as an exporter. Otherwise, it is treated as a non-exporter. This defines the extensive margin of firm-level exporting. The intensive margin is represented by the self-reported export value in December accumulated over the twelve months of 2015. Table 1 shows that around 45.2% SMEs in our sample exported in 2015. Totally, we have 14,249 observations, and the average export revenues (foreign sales) of these exporters was around 31,000 yuan (approximately 4,815 USD in 2015). We exclude firms that do not report values for export and for other control variables. There are 10,328 remaining firms of which 3,518 firms report positive export revenues.[16] The data reveals that both margins of exporting vary substantially across firms. Table 1 also shows that SMEs in Zhejiang, on average, sold more domestically than abroad. Average domestic sales were about 20,000 yuan higher than the average export values.

Credit Rationing SMEDS provides straightforward measures of credit rationing with regard to SMEs. Like Minetti and Zhu (2011), we can define two types of credit rationing, that is, strong and weak rationing. Firms in SMEDS are viewed as having been weakly credit rationed in 2015 if they did not receive the amount of external financing (mainly bank loans) they requested at the current market interest rate [17]. In contrast, strongly credit rationed firms were those who could not obtain sufficient external finance to satisfy their request even if they were willing to pay a higher interest rate than the market interest rate when applying for loans. Our definition of weak rationing is comparable to Minetti and Zhu (2011) because firms that cannot obtain sufficient external financing at the market interest rate might still be able to borrow at a higher than market rate. However, a higher interest rate would affect the size of loans these SMEs can afford. In terms of strong rationing, we argue that our definition

[16] We also report the summary statistics for the sample we use in the empirical analyses in Table 9 in the Online Appendix.

[17] In the survey, each firm is asked: (1). *"Can you obtain the amount of banking loans that you requested (demanded) at the current interest rate?"* (2). *"Can you obtain the amount of banking loans you requested (demanded) at an interest rate which is higher than the current interest rate?"* If the answer to (1) is *no*, the firm is treated as weakly rationed; and if the answer to (2) is *no*, the firm is treated as strongly rationed.

is also essentially consistent with Minetti and Zhu (2011). Though we do not have firm-level information on whether or not firms' applications for loans were denied by banks, firms that were already asked by banks to pay higher interest rates yet still found it difficult to obtain sufficient external financing would generally be those that had been rejected by banks when applying for loans, or at least a portion of their loan applications were rejected.

Table 1 indicates that around 3.4% and 8.5% of SMEs in Zhejiang were strongly and weakly credit rationed, respectively.[18] We note that both measures of credit rationing exhibit substantial cross-sectional variation, providing us a great opportunity to identify the impacts of credit rationing on SMEs' exporting performance.[19]

Control Variables When we explore the effects of credit rationing on SME export performance, we control for a large set of firm characteristics that are recorded in SMEDS to address issues with omitted variables. Firm-level financial health is included to control for the fact that financially healthier firms might be less likely to experience credit rationing and also more likely to participate in exporting or to export more, conditional on exporting. We employ two measures of financial health (leverage ratio and cash flow) in this study, in line with Minetti and Zhu (2011) and many others (e.g., Greenaway et al., 2007). We divide total liabilities by total assets to define the leverage ratio, while cash flow is directly obtained from the data. Table 1 demonstrates that the SMEs in our sample are highly leveraged with an average leverage ratio of approximately 2 and are also heterogeneous in terms of leverage (with a standard deviation of more than 200). SMEs have an average cash flow of 6,438 yuan, which also varies dramatically across firms.

We also include production-side information to control for channels 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 annual average 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

[18] In Table 9 of the Online Appendix, we report the summary statistics for the sample we employ in our empirical exercise, which exhibits very similar pattern as the full sample.

[19] 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, namely, the county-level share of exporters and the county-level log average export value in Figure 1 of the Online Appendix. Figure 1 exhibits a strong negative correlation between credit rationing and both margins of exporting. It suggests that firms located in more credit rationed counties are less likely to export at all and are likely to export less conditional on exporting.

shown in Table 1 that SMEs on average have 17 workers per firm,[20] and the labor productivity is around 3,450 yuan per worker. SMEs further exhibit extremely high cross-sectional variation in employment and capital intensity as the standard deviations are much larger than means for these firms. In SMEDS, firm-level innovation can be determined using 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 that this specific type of innovation activity is quite dispersed.

Instruments We employ a firm-level measure of housing investment and a county-industry-level credit rationing rate as instrumental variables for firm-level credit rationing. As previously discussed, housing is the major type of collateral used by firms to obtain external financing in China. Housing has been widely accepted as collateral by banks since the privatization of housing in the late 1990s. SMEDS collects firms' housing stock information by asking the question "Does the firm hold housing investment? If yes, since which year (i.e., even before the current survey year)?" Therefore, we define housing investment (stock) as a binary variable that equals to 1 if a firm made housing investment before 2015.[21] Table 1 shows that around 25% of SMEs had housing investments in the 2015 survey.[22] Theoretically, a firm that invests in housing would have collateral to offer a lender, and, therefore would be less likely to experience credit rationing by banks.[23]

In addition, we construct the credit rationing rate in industry j of county h as $s_{jh} = \frac{rnum_{jh}}{num_{jh}}$, where s_{jh} represents the share of firms that face strong (weak) rationing in industry j of county h. $rnum_{jh}$ denotes the number of firms that face strong (weak) credit rationing in industry j of county h, and num_{jh} is the total number of firms in industry j of county h. s_{jh} captures the degree of financial constraints in industry j of county h, which will affect the credit rationing

[20] According to the World Bank's definition of SMEs in the EU (No.117357), small enterprises are legal entities in which the average number of employees ranges between 1 and 49; medium-sized enterprises are legal entities whose average number of employees between 49 to 249. For China, we find that the surveyed small and medium-size enterprises by World Bank have employees ranging from 5 to 19 and 20 to 99, respectively. The employee figure in our sample is within an appropriate range.

[21] The binary variable of housing investment measures whether an SME invested in hosing before 2015. If this measure is 1, it implies that the firm already owns housing stock at the beginning of 2015. We thank an anonymous referee to point out this issue.

[22] The share of firms which own housing stock in the sample we employ in the empirical exercise is around 21%, as reported in Table 9 of the Online Appendix.

[23] Again, to gain some intuition, we plot the relationship between county-level shares of firms that were credit rationed in 2015 and the county-level shares of firms that hold investments in housing in Figure 2 of the Online Appendix. Figure 2 shows a reasonably negative correlation between the percentage of SMEs that own housing as an investment and the percentage that have experienced credit rationing, at the county level. This implies that SMEs in counties with larger housing investments have a lower probability of being credit rationed.

for firms in a given industry and region.[24]

4. Estimation and Results

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

4.1. Credit Rationing and Export Extensive Margins

We first examine the effect of credit rationing on the firm-level extensive margin 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, and 0 otherwise; X_i is a vector containing firm-level characteristics that affect firm i's operating profits across export statuses. Specifically, X_i contains a firm-level leverage ratio, cash flow, productivity in terms of value added per worker, firm size, capital intensity and innovation status.[25] ε_i captures unobservable firm-level factors which may also affect π_i.

Firm i will export if $\pi_i > 0$. By assuming that ε_i follows a standard normal distribution

[24] When constructing the county-industry- level credit rationing rate, we use 2-digit rather than 4-digit classification. As some industries defined using 4-digit have very few observations in a given county.

[25] Innovation is a binary 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, it can be viewed as a sign of the firm's future prospectives and innovative activities.

with zero mean and unit variance, firm i's export probability can be represented as follows:

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

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

We recognize that the degree of credit rationing, C_i, experienced by each firm, as well as firm-level export participation decision might be simultaneously affected by unobservable firm-level characteristics. Also, entering export markets may increase profitability, which can significantly improve a 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 will be credit rationed.[26] Either way, standard endogeneity issues arise. To address these 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 is a vector that contains variables which affect firm i's credit rationing status but do not 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. We include firm-level characteristics in equation (3) because lenders, e.g., commercial banks in China, give loans to firms based on their characteristics (credit risks), such as profitability and other signals that a firm reveals (Cull and Xu, 2003; Firth et al., 2009). In contrast to recent literature, we use both firm-level variables, and county-industry-level credit rationing rate, to predict the probability of firm-level credit rationing. Specifically, we use firm-level housing stock status along with other firm-level characteristics to predict the probability of credit rationing. As described in Section 2, firms can use their housing stock as collateral to obtain bank loans. We expect $\delta < 0$ meaning that we expect firms with housing investments will be more likely to obtain loans from commercial banks, and therefore are less likely to be credit rationed. At the same time, a firm's initial real estate stock is unlikely to correlate with unobserved characteristics that affect its current export decision. The advantage of using firm-level variables is that we can avoid clustering the estimated standard

[26] Cull and Xu (2003) and Firth et al. (2009) both find that loan approval from commercial banks in China favors firms that indicate profitability and financial health.

errors at a more aggregate level. Also, economic policies and features in housing markets in China tend to make firm-level real estate investments strongly correlated with firm-level credit rationing. This strong correlation alleviates the concerns of weak instrumental variables. Last, as our observed firms are all from one province, Zhejiang province, province-level instrumental variables will lack the variation necessary for identification. Therefore, we employ a county-industry-level measure rather than province-level credit measure as an alternative way of capturing firm-level credit rationing.

In equation (2), the binary nature of the dependent variable leads to biased estimates from two-stage least squares (see, Greene, 2002, for more details). Therefore, we estimate the recursive bivariate probit model constituted by equations (2) and (3) through maximum likelihood estimation. 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 effects of strong and weak credit rationing on firms' export participation decisions, respectively. Column (1) in 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 neither strong nor weak credit rationing has a statistically significant 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 stock 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, i.e., a firm is less likely to be credit rationed if it 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 0.57 for strong credit, and 0.35 for weak credit with standard errors of 0.15 and 0.12, respectively. This implies that the unobserved firm-level characteristics that 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 of the control variables have their expected signs.

In particular, the leverage ratio reduces the probability of exporting.[27] Firm-level productivity as measured by value added per worker and firm size both positively affect firm export participation although the productivity effect is not statistically significant.[28] Lastly, 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 stock status and the county-industry-level credit rationing rate as instruments for firm-level credit rationing. The results again demonstrate a negative and statistically significant effect of credit rationing, either strong or weak, on a firm's export participation decision. In addition, a firm is more likely to be credit rationed if it faces a higher county-industry-level credit rationing rate.

Based on the estimates in columns (2) and (3) in Tables 2 and 3, we compute the marginal effects of strong and weak credit rationing on firm-level export participation probabilities using $\Phi(\alpha_1+\beta_1+Z_i\gamma_1)-\Phi(\alpha_1+Z_i\gamma_1)$. The results indicate that strong (weak) credit rationing reduces firm-level export probabilities by 39.6% (15.1%).[29] Our results are highly comparable to those shown in Minetti and Zhu (2011), who find a marginal effect of -0.38 from credit rationing on firm-level export decisions in Italy.

A large portion of the financial constraint literature uses firm-level leverage ratios and cash flow to proxy firm-level credit constraints (e.g., Greenaway et al., 2007; Berman and Héricout, 2010; Manova, 2013, among many others). Minetti and Zhu (2011) include 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) by omitting the leverage ratio and cash flow. The results are reported in Table 10 of the Online Appendix. The results clearly show that after excluding financial variables, the magnitude of the coefficient on credit rationing increases.

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

[28] Note that results for the extensive margin of exports demonstrate a trivial effect of TFP on the export decision of firms. These results are in line with Berman and Héricout (2010), who find that productivity is only a significant determinant of the export decision if firms have sufficient access to external finance. SMEs have limited access to external finance; hence the positive link between firm-level TFP and the export decision breaks down.

[29] All calculations are based on IV2, i.e., the case uses both housing stock and county-industry-level credit rationing rate as instrumental variables.

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 in equation (2), export probability, with firm-level export value y_i, and obtain the following specification:

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

where C_i characterizes whether or not firm i faces credit rationing. It takes the value 1 if the answer is yes, and 0 otherwise; X_i contains firm-level characteristics as specified in equation (2).

Two caveats arise from OLS estimates of equation (4). First, C_i in equation (4), may be endogenous due to omitted variables as in equation (2); second, only firms that participate in exporting have positive export values, which leads to a sample selection issue. To alleviate the first concern, we again employ an instrumental variable approach. However, we notice that the credit rationing measure, C_i, is a binary variable that 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 or county-industry-level credit rationing 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). We implement the correction for selection for both firm-level and county-industry-level instruments. All results are reported in Table 4.

[Table 4 is to be here]

Columns (1)-(3) and columns (4)-(6) document the estimated effects 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 weak credit rationing on firm-level export values. Columns (2) and (5) show the results for strong and weak credit rationing using IV estimation and sample selection model, where the instrument is firm-level housing stock. Columns (3) and (6) report the IV estimates by using both firm-level housing stock and county-industry-level credit rationing rate as instruments. In both IV estimation cases, the coefficient on credit rationing is negative and statistically significant, with a magnitude larger than that of the

OLS estimates. Specifically, the point estimate from strong credit rationing is -2.201 (column (2)) or -1.378 (column (3)) for the first IV estimation. This coefficient is large and has a 95% confidence interval of -0.34 to -2.41 (calculation based on column (3)). This suggests that after controlling for all other factors, strong credit rationing reduces foreign sales by more than 28.8%.[30] Weak credit rationing will reduce foreign sales by more than 20.0% 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 substantial fixed costs required to start exporting, but also by restricting firms from reducing variable export costs that determine firm-level export values. Our results are consistent with Arkolakis (2011) and Aw et al. (2011). Arkolakis (2011) emphasizes the existence of huge fixed costs required for new exporters seeking to penetrate into a foreign market. Credit rationed firms cannot finance these upfront costs and, therefore choose not to export. In contrast, Aw et al. (2011) document that successful exporters make large investments in R&D to improve productivity (decrease marginal costs). For firms that face credit rationing, R&D activities are constrained. Compared to firms that are able to invest more in R&D (not financially constrained firms), these credit-rationed firms have relatively low exports due to their relatively high marginal production costs.

Another concern is that the entire sample contains 14,429 firms and the sample we used only contains 10,328 firms. As such, our results might be contaminated by sample selection. To address this concern, we estimate the extensive and intensive regressions using the selected sample and the full sample by controlling only firm productivity and size. This allows us to use as many observations as possible. The results are reported in Tables 12 and 13 in the Online Appendix. The results show that the estimated impact of credit rationing on the extensive and intensive margins of firm-level export is quite similar across both samples. In Table 14 of the Online Appendix, we re-estimate our regressions using lagged value of productivity and innovation.[31] All results exhibit patterns similar to those described in the main text.

We further examine the impact of credit rationing on firm-level domestic sales. To do so, we estimate equation (4) by replacing export values with domestic sales. The results are re-

[30] Since foreign sales are expressed in logarithm, the lower bound of the confidence interval, -0.34, implies that foreign sales by credit rationed firms are 71.2% (=exp(-0.34)) of sales made by non-rationed firms, which means that strong credit rationing reduces foreign sales by more than 28.8%.

[31] Although we only have cross-sectional data, some firms in our sample report the growth of sales, employment, etc. As such, we can recover these firm-level variables for the previous year. Note that there are many missing values for the growth rate variables. This happens either because some firms are new or because some firms did not report these variables. Therefore, the sample size in Table 14 is greatly reduced.

ported in Table 11 of the Online Appendix. The results imply that neither strong nor weak credit rationing exhibits a statistically significant effect on firm-level domestic sales. These results are in line with Minetti and Zhu (2011), and suggest that credit rationing disproportionately affects firm-level export sales more than domestic sales. One possible interpretation is that it is costly to establish distribution systems in foreign markets, and since credit rationed firms incur greater distribution costs in foreign markets, this leads to lower foreign sales.

5. Heterogeneous Effects of Credit Rationing

In the above analysis, we have characterized the average effects of credit rationing on firm-level export behaviors. A substantial number of studies indicate that financial constraints have heterogeneous effects on firm-level export performance. Manova et al. (2015), for instance, demonstrate that financial constraints have a more pronounced impact on less productive firms and on firms in more financially vulnerable sectors. Bai et al. (2017) and Cheng et al. (2019) show that relative to direct exporters, firms that engage in indirect exporting (exporting through intermediaries) are less affected by financial constraints due to their different cost structures. In this section, we study the heterogeneous effect of credit rationing across firms.[32] The heterogeneous effects of credit rationing on export participation are reported in Table 5 and 6.

[Table 5 is to be here]

[Table 6 is to be here]

Tables 5 and 6 show the heterogeneous effects of strong and weak credit rationing on firm export participation decisions, respectively. In Table 5, Columns (1) and (2) reveal the heterogeneous effect of strong credit rationing on firms with insufficient versus sufficient liquidity.[33] The results indicate that strong credit rationing reduces the probability of export participation only for firms with insufficient liquidity. In contrast, strong credit rationing has a statistically

[32]Notice that for regressions in this section, we employ both firm-level housing investment and county-industry-level credit rationing rate as IVs for credit rationing.

[33]In traditional finance theory, sufficient liquidity means that a firm has a sufficient amount of liquid assets to meet its financial obligations (e.g., Holmström and Tirole, 1998). In our survey question, we explain the meaning of sufficiency of liquidity to firms as follows: do you have a sufficient amount of liquid assets (like cash) to meet your payment obligations? If yes, we denote this variable as 1 and 0 otherwise; therefore, the liquidity variable is a binary variable in our study.

insignificant effect on firms with sufficient liquidity. A possible interpretation of this result is that firms with sufficient liquidity can finance their start-up fixed costs in foreign markets using their own internal cash flows.

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 caused by the fact that multi-product firms are also potential multi-product exporters. As such, they are more reliant on external financing to pay for larger start-up fixed costs to enter foreign markets.[34]

Column (5) shows 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 that do not obtain collateral from other firms. The results indicate that firms that obtain collateral from other firms rely more on external financing to begin exporting. One possible explanation is that obtaining collateral from other firms is a good signal of a firm's growth prospect. As such, firms that obtain collateral from other firms are more likely to expand and export if they have access to external financing (not credit rationed). In contrast, due to the poor growth prospects, firms without external collateral are less likely to export even if they have access to external financing. Therefore, credit rationing has a trivial effect on firms that do not obtain external collateral. We calculate export ratios for firms with and without external collateral in our sample. We find that among firms that had obtained 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 ratios between the two groups of firms supports our explanation.

Columns (7) and (8) report results for firms with high and low capital utilization rates, respectively. We treat firms whose capital utilization rates are above the median utilization rate as high capital utilizing firms, and firms with a capital utilization rate below the median utilization rate as low capital utilizing firms. The results show that credit rationing has a more pronounced effect on firms with a high capital utilization rate. Low capital utilization rates may reveal organizational or management inefficiency, which could prevent firms from exporting regardless of whether or not they have access to external financing. This leads to a statistically insignificant effect of credit rationing on firms with low capital utilization rates. In contrast, firms with high capital utilization rates may be more efficiently organized, and therefore, more sensitive to external credit rationing.

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

In Table 6 we observe patterns similar to those documented in Table 5. In particular, the results indicate that weak credit rationing has a stronger effect on export participation among firms that have insufficient liquidity, produce multiple products, obtain collateral from other firms, and exhibit 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 7 and 8.

[Table 7 is to be here]

[Table 8 is to be here]

Tables 7 and 8 document the heterogeneous effects of strong and weak credit rationing on firm-level intensive margin of exports, respectively. Columns (1) and (2) in Table 7 report the effect of strong credit on export values of 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 statistically significant only for the former case. A possible reason could be that firms with sufficient liquidity can finance their own R&D investment, which decreases their marginal cost. As such, additional external financing does not help them to further decrease their marginal cost and, hence, has no significant effect on improving sales.

Columns (3) and (4) report the heterogeneous effects of strong credit rationing on multi-product and single-product firms, respectively. The results indicate that strong credit rationing reduces export values for both multi-product and single-product firms, but the effect is statistically significant only for multi-product exporters. We offer two possible interpretations for this result. First, firms can make use of external financing to improve their distribution systems in foreign markets, which reduces the variable transportation costs and multi-product firms benefit more from a better functioning distribution system as they can deliver multiple 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 only their core products while they may sell products that are outside of their core competence into the domestic markets (Manova and Zhang, 2012; Bernard et al., 2010). Access to more external financing may lead multi-product firms to export more product 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 collat-

eral. Similar to the findings for extensive margin, strong credit rationing has a negative and statistically significant effect on the intensive margin of exports for firms that obtain external collateral. Meanwhile, strong credit rationing does not 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 prospects, which is typically due to having outdated production technology, poor production organization, etc. As such, external financing cannot be used effectively by these firms to improve their productivity or to boost their export values.

Columns (7) and (8) reveal the heterogeneous effects of strong credit rationing on firms with high and low capital utilization rates, respectively. The results demonstrate that strong credit rationing significantly reduces firm-level exports 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 the likelihood that firms with high capital utilization rates are more efficiently organized with respect to production, and additional external financing cannot help them to further decrease their marginal costs.

Table 8 displays the heterogeneous effects of weak credit rationing on firm-level exports. We observe very similar patterns as those in Table 7, except that the magnitude for the coefficient on weak credit rationing is smaller than for strong credit rationing. This implies that weak credit rationing plays a less pronounced role on firm export values relative to strong credit rationing.

6. Conclusion

In this study, we investigate the impact of credit rationing on export performance for SMEs in China. The results indicate that SMEs that are credit rationed are less likely to export and if they do export, will export less than firms that are have access to credit. The effect of credit rationing is more pronounced on export participation for firms that have insufficient liquidity, produce multiple products, obtain external collateral, and exhibit higher capital utilization rates. In contrast, the effect of credit rationing on export values is stronger for firms with insufficient liquidity, those that sell multiple products, obtain more external collateral, and have a lower capital utilization rate.

To alleviate the endogeneity concern regarding credit rationing, we construct novel firm-

level instrumental variables for determining credit rationing rather than using province-level instruments, namely, firm-level housing investments. In addition, we employ a county-industry-level instrumental variable to cross-validate our estimation results based on firm-level instruments. We find that the probability that a firm experiences credit rationing is significantly decreasing in firm-level housing investments, which may suggest that state-owned banks in China use firm-level signals to allocate loans across SMEs, and that there are significant differences in the availability of external financing. This firm-level instrument can also effectively eliminate the concern of weak instruments and allow us to avoid aggregating the standard errors.

The effect of credit rationing on the export performance of SMEs in China is not significantly different from the effect 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 financing to engage in exporting.

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Table 1. Summary Statistics.

Variables	Mean	Standard deviation	Min	Max	Obs
Credit rationing:					
Strong rationing	0.034	0.182	0	1	14249
Weak rationing	0.085	0.279	0	1	14249
Exporting and Sales:					
Export participation	0.452	0.498	0	1	14249
Foreign sales of exporters	31062.2	467417.5	0	147844.2	6336
Domestic sales	51802.6	771773.8	1578.2	466248.1	14028
Firm Characteristics:					
Liquidity	0.707	0.455	0	1	12119
Leverage ratio	2.055	202.745	0.011	2.866	11932
Cash flow	6438.2	96398.6	21	65523	11685
Labor productivity	3451.3	87651.4	686.6	51386.6	14249
Employment	16.76	237.1	7	85	14249
Fixed assets per worker	255.3	9022.3	22.976	5462.3	14249
Innovation	0.223	0.416	0	1	14249
Housing investment	0.247	0.431	0	1	14249

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 annual average 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 invested in housing markets before 2015 and takes value 0 otherwise.

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)
Credit Rationing	-0.074		-0.962***		-1.225***
	(0.067)		(0.358)		(0.286)
Leverage Ratio	-0.014	0.085***	0.023	0.077***	0.023
	(0.019)	(0.029)	(0.019)	(0.026)	(0.018)
Cash Flow	-0.001	0.031	-0.001	0.037	0.001
	(0.030)	(0.045)	(0.030)	(0.041)	(0.030)
TFP	0.059	-0.066	0.050	-0.142	0.056
	(0.141)	(0.637)	(0.140)	(0.822)	(0.140)
Size	0.417***	-0.313	0.405***	-0.339	0.378***
	(0.068)	(0.268)	(0.068)	(0.248)	(0.072)
Capital Intensity	-0.043	-0.022	-0.039	-0.037	-0.041
	(0.088)	(0.020)	(0.087)	(0.211)	(0.086)
Innovation	0.568***	0.092*	0.581***	0.098*	0.575***
	(0.030)	(0.054)	(0.030)	(0.053)	(0.031)
Housing		-0.136**		-0.142**	
		(0.064)		(0.072)	
Industry-level Credit Rationing				0.769***	
				(0.112)	
Industry FE	Yes	Yes	Yes	Yes	Yes
Ownership FE	Yes	Yes	Yes	Yes	Yes
Corr(ε, μ)		0.444***		0.572***	
		(0.174)		(0.150)	
Psudo R^2	0.09	0.10		0.08	
Obs	10,328	10,328		10,328	

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 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)
Credit Rationing	0.003		-0.296**		-0.629**
	(0.044)		(0.137)		(0.269)
Leverage Ratio	-0.014	0.078***	-0.019	0.075***	-0.021
	(0.19)	(0.022)	(0.019)	(0.022)	(0.019)
Cash Flow	-0.001	0.019	-0.001	0.026	0.000
	(0.030)	(0.040)	(0.030)	(0.039)	(0.030)
TFP	0.060	-0.322	0.053	-0.409	0.054
	(0.141)	(0.686)	(0.141)	(0.698)	(0.141)
Size	0.418***	0.135	0.418***	0.159	0.423***
	(0.070)	(0.104)	(0.068)	(0.103)	(0.068)
Capital Intensity	-0.043	-0.011	-0.041	-0.026	-0.042
	(0.088)	(0.160)	(0.088)	(0.165)	(0.087)
Innovation	0.586***	0.082**	0.587***	0.089**	0.583***
	(0.030)	(0.041)	(0.030)	(0.041)	(0.030)
Housing		-0.271***		-0.275***	
		(0.061)		(0.060)	
Industry-level Credit Rationing				0.472***	
				(0.054)	
Industry FE	Yes	Yes	Yes	Yes	Yes
Ownership FE	Yes	Yes	Yes	Yes	Yes
Corr(ε, μ)		0.271***		0.352***	
		(0.093)		(0.120)	
Psudo R^2	0.10	0.09		0.10	
Obs	10,328	10,328		10,328	

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. Credit Rationing and Export Intensive Margins

	Strong Rationing			Weak Rationing		
	OLS	2SLS+Selection (IV1)	2SLS+Selection (IV2)	OLS	2SLS+Selection (IV1)	2SLS+Selection (IV2)
	(1)	(2)	(3)	(4)	(5)	(6)
Credit Rationing	-0.171	-2.201**	-1.378***	-0.308***	-0.848**	-0.769***
	(0.153)	(0.961)	(0.528)	(0.099)	(0.419)	(0.297)
Leverage Ratio	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Cash Flow	0.222***	0.185***	0.185***	0.222***	0.191***	0.192***
	(0.019)	(0.020)	(0.019)	(0.019)	(0.020)	(0.020)
TFP	0.159	0.166***	0.170***	0.157	0.183***	0.183***
	(0.227)	(0.038)	(0.037)	(0.226)	(0.036)	(0.036)
Size	0.137***	0.141***	0.146***	0.136***	0.123***	0.124***
	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)
Capital Intensity	-0.023	-0.036*	-0.038*	-0.023	-0.031	-0.032
	(0.020)	(0.020)	(0.020)	(0.020)	(0.019)	(0.019)
Innovation	0.115*	0.166**	0.170***	0.119*	0.193***	0.176***
	(0.065)	(0.066)	(0.065)	(0.064)	(0.064)	(0.063)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Ownership FE	Yes	Yes	Yes	Yes	Yes	Yes
First stage regression		0.945**	1.168***		0.889***	0.924***
of credit rationing		(0.099)	(0.063)		(0.066)	(0.062)
R^2	0.13	0.19	0.18	0.13	0.15	0.14
Obs	3,518	3,518	3,518	3,518	3,518	3,518

Note: The table reports estimates of Eq.(4). Column 1 reports the estimates from the OLS regression, while columns (2)-(3) and columns (4)-(5) report the results from the 2SLS estimation with two different sets of IV, respectively. In both IV estimation cases, we have corrected for sample selection. $***,**,*$ indicate significance at the levels of 1%, 5% and 10%, respectively.

Table 5. Heterogeneous Impact: Export Extensive Margin (Strong Rationing)

	Liquidity		# of Products		External Collateral		Utilization Rate	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Credit Rationing	-0.878***	0.611	-1.038***	-0.397	-0.742***	-0.475	-1.576***	-0.112
	(0.253)	(4.684)	(0.233)	(0.415)	(0.334)	(0.574)	(0.066)	(0.220)
Leverage Ratio	0.012	0.013	-0.011	0.141***	-0.013	0.017*	0.006	-0.011
	(0.012)	(0.012)	(0.009)	(0.033)	(0.020)	(0.010)	(0.010)	(0.011)
Cash Flow	-0.035	0.027	-0.028	0.052*	-0.040	0.013	-0.016	-0.012
	(0.025)	(0.021)	(0.019)	(0.027)	(0.037)	(0.018)	(0.016)	(0.016)
TFP	0.109	0.047	0.278**	0.424**	0.013	0.087	0.168***	0.003
	(0.253)	(0.068)	(0.135)	(0.000)	(0.303)	(0.075)	(0.095)	(0.007)
Size	0.057***	0.020***	0.031***	0.098***	0.040***	0.033***	0.109***	0.104***
	(0.004)	(0.004)	(0.003)	(0.012)	(0.005)	(0.003)	(0.007)	(0.007)
Capital Intensity	0.091	-0.070	-0.044	0.002	-0.124	0.080	-0.065	-0.108
	(0.080)	(0.077)	(0.064)	(0.129)	(0.100)	(0.084)	(0.072)	(0.078)
Innovation	0.546***	0.658***	0.593***	0.494***	0.439***	0.643***	0.519***	0.555***
	(0.017)	(0.026)	(0.017)	(0.032)	(0.027)	(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)	0.406***	0.204***	0.501***	0.214***	0.357**	0.161	0.797***	0.061
	(0.128)	(0.070)	(0.115)	(0.039)	(0.171)	(0.249)	(0.037)	(0.106)
Psudo R^2	0.07	0.13	0.10	0.10	0.08	0.09	0.09	0.08
Obs	7,246	3,082	8,139	2,169	2,897	7,431	4,390	5,938

Note: Table 5 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 single product; columns (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 6. Heterogeneous Impact: Export Extensive Margin (Weak Rationing)

	Liquidity		# of Products		External Collateral		Utilization Rate	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Credit Rationing	-0.634***	0.611	-0.622***	-0.280	-0.390***	-0.073	-0.989***	0.081
	(0.163)	(0.468)	(0.227)	(0.179)	(0.173)	(0.137)	(0.254)	(0.113)
Leverage Ratio	0.014	0.013	0.009	0.168***	-0.012	0.014	-0.089***	-0.013
	(0.012)	(0.011)	(0.010)	(0.003)	(0.020)	(0.009)	(0.017)	(0.011)
Cash Flow	-0.034	-0.027	-0.029	-0.047*	-0.046	0.014	-0.072*	-0.012
	(0.025)	(0.021)	(0.020)	(0.027)	(0.039)	(0.018)	(0.041)	(0.016)
TFP	0.072	0.047	0.274**	0.001**	0.052	0.091	0.217*	0.001
	(0.253)	(0.068)	(0.134)	(0.000)	(0.305)	(0.075)	(0.130)	(0.001)
Size	0.058***	0.020***	0.031***	0.021***	0.041***	0.033***	0.022***	0.104***
	(0.004)	(0.004)	(0.003)	(0.001)	(0.005)	(0.003)	(0.003)	(0.007)
Capital Intensity	0.092	-0.070	-0.041	0.026	-0.127	0.078	0.016	-0.110
	(0.080)	(0.077)	(0.064)	(0.120)	(0.101)	(0.084)	(0.088)	(0.078)
Innovation	0.546***	0.658***	0.601***	0.486***	0.440***	0.644***	0.592***	0.556***
	(0.017)	(0.026)	(0.017)	(0.032)	(0.026)	(0.016)	(0.022)	(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)	0.363***	0.204	0.322***	0.180*	0.267***	0.003	0.508***	0.029
	(0.092)	(1.54)	(0.122)	(0.99)	(0.099)	(0.070)	(0.139)	(0.063)
Psudo R^2	0.06	0.13	0.07	0.10	0.07	0.08	0.09	0.07
Obs	7,246	3,082	8,139	2,169	2,897	7,431	4,390	5,938

Note: Table 6 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 single products; columns (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 7. Heterogeneous Impact: Export Intensive Margin (Strong Rationing)

	Liquidity		# of Products		External Collateral		Utilization Rate	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Credit Rationing	-1.676***	1.346	-2.335***	-0.716	-1.194**	-1.186	-0.501	-1.799**
	(0.294)	(2.610)	(0.625)	(0.838)	(0.569)	(0.966)	(0.853)	(0.706)
Leverage Ratio	-0.001	-0.203**	-0.001	0.119	0.098	-0.001	-0.017	-0.103
	(0.001)	(0.095)	(0.001)	(0.112)	(0.126)	(0.001)	(0.046)	(0.090)
Cash Flow	0.233***	0.192***	0.222***	0.144***	0.226***	0.229***	0.215***	0.263***
	(0.022)	(0.034)	(0.021)	(0.033)	(0.034)	(0.022)	(0.026)	(0.029)
TFP	0.147***	0.211	0.260**	0.109	0.170	0.195	0.502**	0.308**
	(0.041)	(0.263)	(0.011)	(0.172)	(0.464)	(0.263)	(0.226)	(0.143)
Size	0.136***	0.127***	0.139***	0.087**	0.221***	0.080***	0.157***	0.079***
	(0.022)	(0.033)	(0.020)	(0.043)	(0.034)	(0.021)	(0.023)	(0.030)
Capital Intensity	-0.026	-0.003	-0.042*	-0.029	-0.018	-0.019	-0.001	-0.043
	(0.024)	(0.033)	(0.022)	(0.035)	(0.035)	(0.023)	(0.030)	(0.029)
Innovation	0.122	0.267**	0.058	0.291***	0.214*	0.127*	0.079	0.101
	(0.078)	(0.115)	(0.079)	(0.110)	(0.117)	(0.077)	(0.093)	(0.103)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ownership FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.19	0.19	0.16	0.17	0.20	0.12	0.18	0.19
Obs	2,364	1,154	2,683	835	1,122	2,396	1,759	1,759

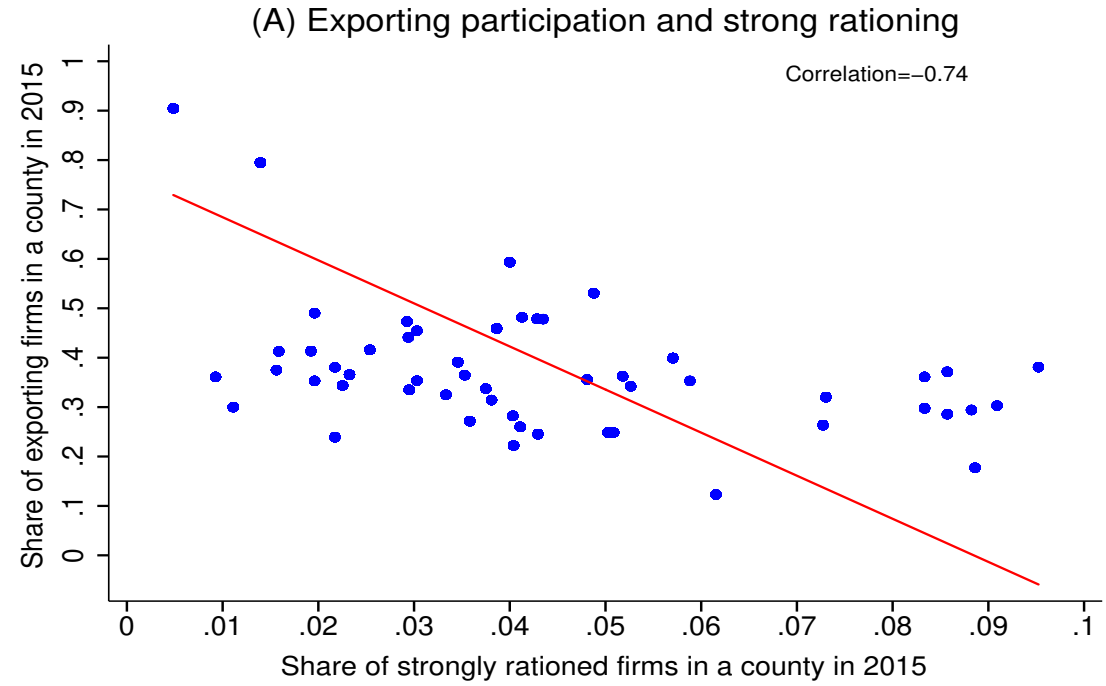
Note: Table 7 reports the heterogeneous impact of strong credit rationing on the firm-level export values. Columns (1) and (2) compare the different impacts of credit rationing on firms that face liquidity constraint and without liquidity constraint, respectively; columns (3) and (4) compare firms that produce multiple products and single product; columns (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 Intensive Margin (Weak Rationing)

	Liquidity		# of Products		External Collateral		Utilization Rate	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Credit Rationing	-0.292**	0.206	-0.395**	0.018	-0.235***	-0.274	-0.037	-0.458**
	(0.137)	(0.842)	(0.167)	(0.379)	(0.093)	(0.260)	(0.241)	(0.220)
Leverage Ratio	-0.001	-0.209**	-0.001	-0.126	0.110	-0.001	-0.014	-0.170**
	(0.001)	(0.104)	(0.001)	(0.132)	(0.125)	(0.001)	(0.044)	(0.084)
Cash Flow	0.258***	0.219***	0.234***	0.259***	0.224***	0.231***	0.202***	0.273***
	(0.028)	(0.049)	(0.020)	(0.043)	(0.035)	(0.022)	(0.027)	(0.027)
TFP	0.090	0.172	0.216**	0.063	0.135	0.193	0.324***	0.819
	(0.419)	(0.274)	(0.106)	(0.241)	(0.462)	(0.261)	(0.137)	(1.176)
Size	0.126***	0.152***	0.133***	0.027	0.226***	0.080***	0.162***	0.043
	(0.025)	(0.041)	(0.019)	(0.048)	(0.034)	(0.021)	(0.023)	(0.028)
Capital Intensity	0.023	0.004	-0.034	0.020	-0.012	-0.019	-0.017	-0.049*
	(0.023)	(0.034)	(0.021)	(0.046)	(0.035)	(0.023)	(0.030)	(0.028)
Innovation	0.303**	0.361*	0.236***	0.303**	0.293**	0.238***	0.145	0.286***
	(0.143)	(0.224)	(0.074)	(0.155)	(0.123)	(0.080)	(0.096)	(0.105)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ownership FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.19	0.19	0.20	0.18	0.21	0.14	0.16	0.17
Obs	2,364	1,154	2,683	835	1,122	2,396	1,759	1,759

Note: Table 8 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 single product; columns (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.

Online Appendix (Additional Figures and Tables)



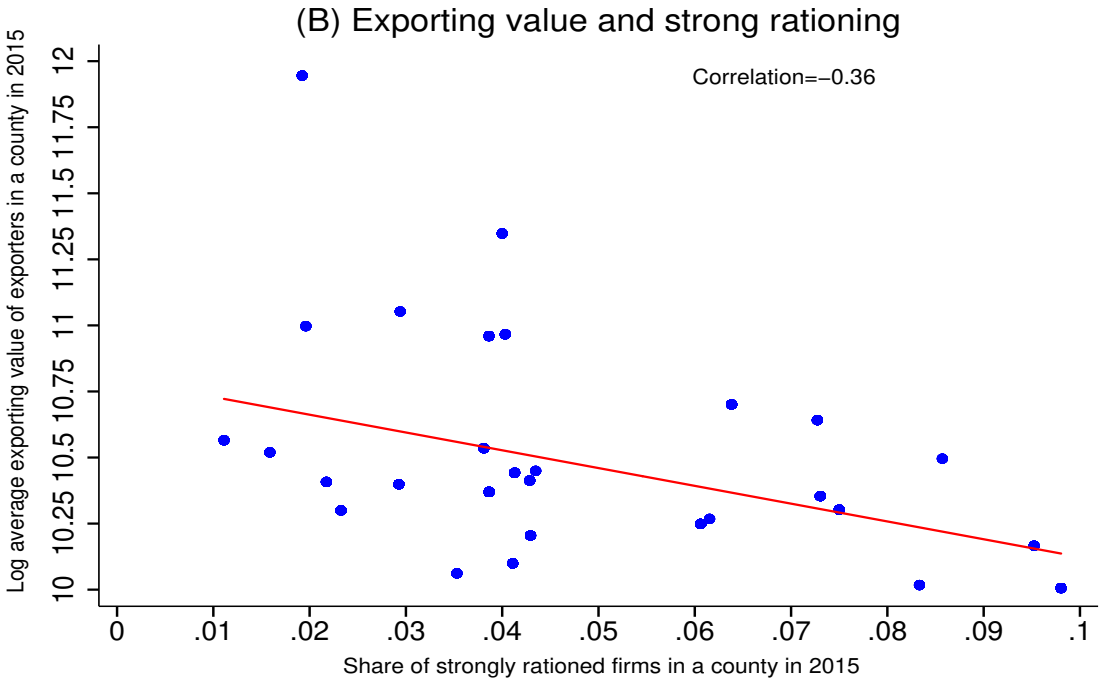


Figure 1. Sample correlations between credit rationing and exporting.

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.

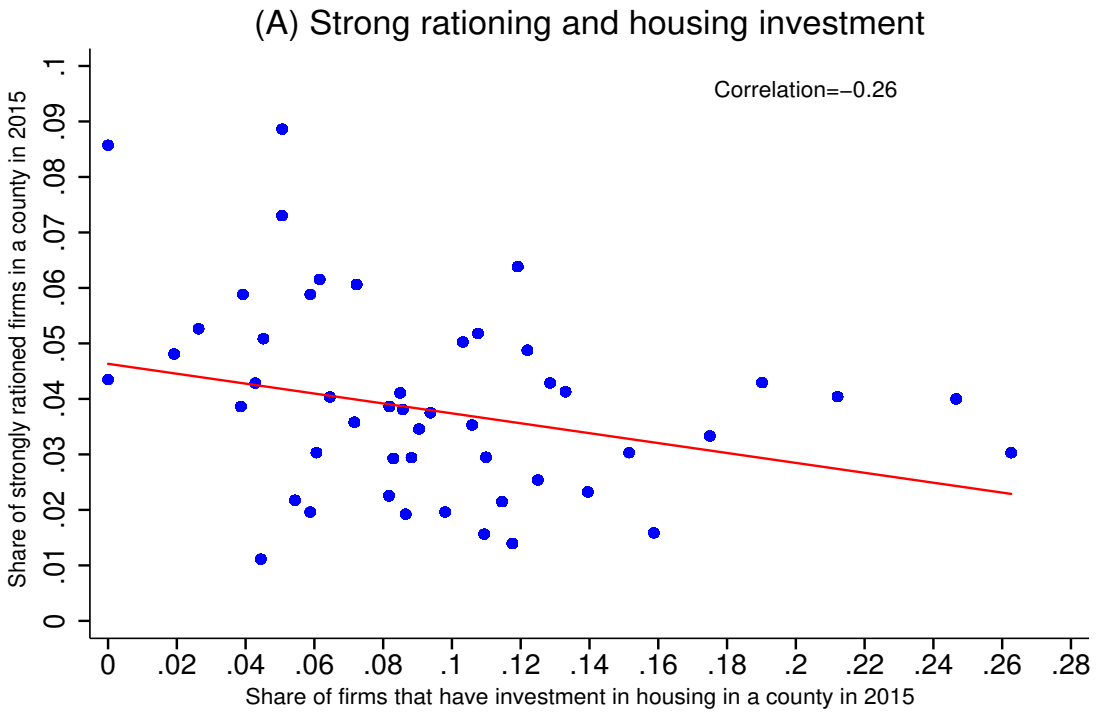


Figure 2. Sample correlations between credit rationing and housing investment.

Notes. This figure plots county-level share of firms that have investment in housing markets and county-level share of firms that are strongly rationed. The red solid line is the linear fitted line.

Table 9. Summary statistics for the sample we used

Variables	Mean	Standard deviation	Min	Max	Obs
Credit rationing:					
Strong rationing	0.042	0.201	0	1	10328
Weak rationing	0.102	0.303	0	1	10328
Exporting and Sales:					
Export participation	0.341	0.474	0	1	10328
Foreign sales of exporters	35023.2	478706.6	0	143241.2	3518
Domestic sales	52057.1	855572.2	1635.6	443250.3	10328
Firm Characteristics:					
Liquidity	0.702	0.457	0	1	10328
Leverage ratio	1.858	171.3	0.013	2.825	10328
Cash flow	6520	97079.7	26	64962	10517
Labor productivity	3789.6	90232.3	921.272	50784.6	10328
Employment	19.46	169.3	7	85	10328
Fixed assets per worker	32.3	8788.3	32.657	5432.3	10328
Innovation	0.225	0.418	0	1	10328
Housing investment	0.213	0.314	0	1	10328

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 annual average 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 before 2015 and takes value of 0 otherwise.

Table 10. Exporting Participation: Financial Variables

	Bivariate Probit (IV1)		Bivariate Probit (IV2)	
	(1)	(2)	(3)	(4)
Panel A: Strong Rationing				
Credit Rationing	**−0.962*****	**−1.327*****	**−1.225*****	**−1.332*****
	(0.358)	(0.229)	(0.286)	(0.229)
Cash Flow	-0.001		0.037	
	(0.030)		(0.041)	
Leverage Ratio	0.023		0.023	
	(0.019)		(0.018)	
Panel B: Weak Rationing				
Credit Rationing	**−0.296****	**−0.646****	**−0.629****	**−0.654****
	(0.137)	(0.258)	(0.240)	(0.286)
Cash Flow	-0.001		0.000	
	(0.030)		(0.030)	
Leverage Ratio	-0.019		-0.021	
	(0.019)		(0.019)	

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 and leverage ratio. Similarly, columns (3)-(4) report estimates for exporting equation by using county-industry-level credit rationing as IV for firm-level credit rationing. Panel A contains results for strong credit rationing, and Panel B reports results for weak credit rationing. $***,**,*$ indicate significance at the levels of 1%, 5% and 10%, respectively.

Table 11. Credit Rationing and Domestic Sales

	Strong Rationing		Weak Rationing	
	OLS	2SLS	OLS	2SLS
	(1)	(2)	(3)	(4)
Credit Rationing	0.057***	-0.106	0.051***	-0.014
	(0.018)	(0.088)	(0.012)	(0.095)
Leverage Ratio	-0.002	-0.004	-0.002	-0.001
	(0.006)	(0.005)	(0.006)	(0.001)
Cash Flow	0.105***	0.128***	0.105***	0.128***
	(0.002)	(0.003)	(0.002)	(0.003)
TFP	0.348***	0.399***	0.348***	0.399***
	(0.004)	(0.006)	(0.004)	(0.006)
Size	0.595***	0.667***	0.595***	0.668***
	(0.005)	(0.006)	(0.005)	(0.006)
Capital Intensity	0.048***	0.063***	0.048***	0.064***
	(0.002)	(0.003)	(0.002)	(0.003)
Innovation	0.073***	0.171***	0.072***	0.177***
	(0.009)	(0.011)	(0.009)	(0.012)
Industry FE	Yes	Yes	Yes	Yes
Ownership FE	Yes	Yes	Yes	Yes
First stage regression of credit rationing		1.639***		1.085
		(0.103)		(0.081)
R^2	0.50	0.43	0.51	0.44
Obs	10,328	10,328	10,328	10,328

Note: The table reports estimates of Eq.(4) with domestic sales as the dependent variable. Columns (1)-(2) and columns (3)-(4) report the estimates for strong and weak credit rationing, respectively. $***,**,*$ indicate significance at the levels of 1%, 5% and 10%, respectively.

Table 12. Exporting Participation: Selected Sample and Full Sample

	Bivariate Probit (IV1)			Bivariate Probit (IV2)		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Strong Rationing						
Credit Rationing	−0.962***	−1.474***	−1.308***	−1.225***	−1.462***	−1.259***
	(0.358)	(0.160)	(0.219)	(0.286)	(0.167)	(0.238)
TFP	0.050	0.164	0.654	0.056	0.165	0.658
	(0.140)	(0.119)	(0.486)	(0.140)	(0.120)	(0.493)
Size	0.405***	0.601***	0.547***	0.378***	0.603***	0.548***
	(0.068)	(0.061)	(0.053)	(0.072)	(0.061)	(0.053)
Obs	10,328	10,328	14,249	10,328	10,328	14,249
Panel B: Weak Rationing						
Credit Rationing	−0.296**	−0.572**	−0.593**	−0.629**	−0.689***	−0.524***
	(0.137)	(0.290)	(0.238)	(0.269)	(0.245)	(0.244)
TFP	0.053	0.168*	0.640	0.054	0.166*	0.684
	(0.141)	(0.100)	(0.589)	(0.141)	(0.105)	(0.586)
Size	0.418***	0.613***	0.543***	0.423***	0.611***	0.546***
	(0.068)	(0.061)	(0.053)	(0.068)	(0.060)	(0.053)
Obs	10,328	10,328	14,249	10,328	10,328	14,249

Note: Columns (1)-(3) report estimates for exporting equation of the bivariate probit model by using house investment as IV for credit rationing. In contrast, Columns (4) - (6) report estimates for exporting equation of the bivariate probit model by using house investment and county-industry level credit rationing rate as IVs for firm-level credit rationing. Columns (1) and (4) are from Table 2 directly; Columns (2) and (5) are estimated using the selected sample but control for limited firm-level variables; Columns (3) and (6) are estimated using the full sample and control for limited firm-level variables. Panel A contains results for strong credit rationing, and Panel B reports results for weak credit rationing. $***,**,*$ indicate significance at the levels of 1%, 5% and 10%, respectively.

Table 13. Intensive Margin: Selected Sample and Full Sample

	Bivariate Probit (IV1)			Bivariate Probit (IV2)		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Strong Rationing						
Credit Rationing	−2.201**	−1.701**	−1.892**	−1.378***	−1.360**	−1.539***
	(0.961)	(0.776)	(0.829)	(0.528)	(0.578)	(0.503)
TFP	0.166***	0.302***	0.184***	0.170***	0.294***	0.182***
	(0.038)	(0.035)	(0.025)	(0.037)	(0.034)	(0.024)
Size	0.141***	0.206***	0.207***	0.146***	0.208***	0.205***
	(0.018)	(0.017)	(0.017)	(0.018)	(0.017)	(0.017)
Obs	3,518	3,518	3,926	3,518	3,518	3,926
Panel B: Weak Rationing						
Credit Rationing	−0.848**	−0.890**	−0.967**	−0.769***	−1.002**	−1.059***
	(0.419)	(0.437)	(0.436)	(0.297)	(0.392)	(0.398)
TFP	0.183***	0.294***	0.182***	0.183***	0.293***	0.180***
	(0.036)	(0.034)	(0.024)	(0.036)	(0.034)	(0.024)
Size	0.123***	0.202***	0.202***	0.124***	0.202***	0.201***
	(0.018)	(0.017)	(0.017)	(0.018)	(0.017)	(0.017)
Obs	3,518	3,518	3,926	3,518	3,518	3,926

Note: Columns (1)-(3) report estimates for exporting equation by using house investment as IV for credit rationing. In contrast, Columns (4) - (6) report estimates for exporting equation by using house investment and county-industry level credit rationing rate as IVs for firm-level credit rationing. Columns (1) and (4) are from Table 4 directly; Columns (2) and (5) are estimated using the selected sample but control for limited firm-level variables; Columns (3) and (6) are estimated using the full sample and control for limited firm-level variables. Panel A contains results for strong credit rationing, and Panel B reports results for weak credit rationing. $***,**,*$ indicate significance at the levels of 1%, 5% and 10%, respectively.

Table 14. Credit Rationing and Export Performance–Lagged Values

	Strong Rationing		Weak Rationing	
	Extensive	Intensive	Extensive	Intensive
	(1)	(2)	(3)	(4)
Credit Rationing	-1.114***	-1.476***	-0.534***	-0.423***
	(0.159)	(0.627)	(0.176)	(0.076)
Leverage Ratio	-0.014*	-0.004	-0.023	-0.003
	(0.008)	(0.003)	(0.031)	(0.003)
Cash Flow	0.002	0.231***	0.001	0.242***
	(0.019)	(0.015)	(0.043)	(0.019)
TFP	0.087	0.200***	0.058	0.198***
	(0.213)	(0.041)	(0.137)	(0.041)
Size	0.243***	0.175***	0.346***	0.141***
	(0.045)	(0.023)	(0.076)	(0.025)
Capital Intensity	-0.033	-0.042	-0.054	-0.039*
	(0.020)	(0.034)	(0.037)	(0.020)
Innovation	0.231***	0.156***	0.375***	0.210***
	(0.025)	(0.032)	(0.043)	(0.038)
Industry FE	Yes	Yes	Yes	Yes
Ownership FE	Yes	Yes	Yes	Yes
R^2	0.14	0.21	0.20	0.15
Obs	4,725	1,567	4,725	1,567

Note: The table reports estimates the impact of credit rationing on firm-level extensive and intensive margin of export. In this table, TFP and Innovation are constructed using variables in the previous year. In all regressions, we use firm-level housing stock and county-industry-level credit rationing rate to instrument firm-level credit rationing (IV2).***,**,* indicate significance at the levels of 1%, 5% and 10%, respectively.