The Importance of Small Banks for Exporting: Micro-Evidence from China

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Abstract

This paper leverages data from banking reform in China in 2007 to highlight the essential role of small banks in export expansion of Chinese exporters. Using model-consistent micro evidence, I show that reduction of bank concentration increases credit availability for exporting firms, especially smaller ones, only when it is caused by the entry of small banks. These results are robust across various considerations. My findings provide the important policy implication that lowering entry barriers for small banks is an effective way to foster exports.

JEL Classifications: G21,G28, L11, F14
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1 Introduction

The banking sector is essential to the global exchange of goods and services, especially for financially more vulnerable sectors. Substantial literature tends to proxy the ease of access to credit with the ratio of private credit to GDP.\(^1\) Alternatively, other literature argues that access to credit could depend on the bank concentration in a given country. In this paper, I am bridging and extending these two strands of literature by showing how bank concentration, and, more importantly, bank composition affects firm-level exports.

The role of bank concentration in affecting credit accessibility is theoretically ambiguous. Some argue that a more concentrated banking market increases banks’ market power, which results in higher interest rates and less loan supply (e.g., Klein, 1971). On the other hand, other studies suggest that a rise in bank concentration increases credit availability as the risk of lending could be compensated with a higher interest rate (e.g., Petersen and Rajan, 1995). In the meantime, empirical studies that mainly focus on detecting effects of bank concentration on small businesses also fail to reach a consensus regarding the role of bank concentration in shifting credit allocation towards small or large firms, let alone its role in shaping international trade.

To reconcile the debates on the impact of bank concentration, this paper highlights the role of small banks in shaping the effect of bank concentration on firms with different sizes. Substantial evidence has documented that small banks are more accessible to the small firms because small business lending relies more on soft information and relationships (Petersen and Rajan 1994, 1995; Berger and Udell 1995; DeYoung et al., 1999), but larger banks with more complicated hierarchical structure interfere with the collection and the flow of the soft information (Berger and Udell, 2002; Stein 2002; Berger et al., 2005; Levine et al., 2020), which impede the small business lending.\(^2\) Therefore, even though both newly

\(^1\)See Beck (2002, 2003), Svaleryd and Vlachos (2005), Hur et al. (2006), Manova (2013), Becker et al. (2013), and Iacovone (2019). Other than the private credit, studies also use liquid liabilities, commercial–central bank ratio (see Beck, 2003), repudiation of contracts, accounting standards, and the risk of expropriation (see Manova, 2013) as robust indicators of financial development.

\(^2\)Another strand of research also documented the importance of small banks to small business (Peek and
established small and large banks can reduce the level of bank concentration, differences in banks’ incentives would lead to contrasting credit allocation across businesses and result in conflicting impacts on economic activities accordingly.

To demonstrate the importance of small bank in export markets, I extend Manova’s (2013) model by explicitly modelling the cost differential between large and small banks when dealing with large and small firms. The key novel assumption is that small banks have a comparative advantage in collecting soft information. As a result, the change in the bank concentration has different effects on credit availability for large and small firms depending on whether this change is induced by large or small banks. In particular, the bank concentration affects the credit availability by two channels: the interest rate channel and the collateral channel. On one hand, the entry of any new banks (including both large and small banks) lowers the bank concentration and intensifies the competition in the credit market, which drives down the equilibrium market interest rate. To maintain profitability, banks require a larger amount of collateral to compensate for the loss of interest rate, which in turn crowding out the small exporters with less pledgeable assets. On the other hand, however, when the new entrants are small banks, they tend to require a lower amount of collateral given their comparative advantage in collecting the soft information, which favors the small exporters, while if the new entrants are large banks, the collateral requirement is less likely to be lowered given their higher screening and monitoring costs. In sum, as the market interest rate is less volatile due to the government regulation, the model predicts that the collateral channel dominates so that the bank market with lower concentration allocates credits towards much-needed small exporters and helps them to expand their export scales only when the new entrants are small banks.

The theoretical model clearly suggests that it’s crucial to isolate the effect of small or large banks when analyzing the impact of bank concentration on exports, which has been ignored

Rosengren, 1998; Strahan and Weston, 1998; Cole and Walraven, 1998; Jayaratne and Wolken, 1999; Berger et al., 1998, 2017). These studies focus on the impacts of bank consolidation on financially constrained small firms and they show that the influences depend on the size of a bank to merge with, i.e., the consolidation of small banks have positive effects on small firms, while the consolidation of large banks acts oppositely.
in previous literature. Taking advantage of China’s bank entry reform in 2007, I construct an exogenous measurement for the change of bank concentration induced only by the entry of small banks. In particular, China’s 2007 bank entry reform lifted the restriction on the source of capital to enter the banking sector and largely lowered the requirement of registered and working capital to start a new bank and conduct branch expansion, which contributed to a substantial increase of small commercial banks. To measure the change of bank concentration induced by the entry of small banks, I subtract the actual bank concentration level from the bank concentration level in the counterfactual scenario, in which the reform is assumed to be nonexistent and the small banks have no chance to establish. The validity of this key measurement is further verified by the random assignment approach, the test against strategy interaction between large and small banks, as well as the test against reverse causality.

Using this measurement as the key of identification and employing Chinese manufacturing firms dataset, I provide micro-level evidence in supporting of the model prediction. I find that firms in cities that experienced greater reductions in bank concentration (induced by the entry of small bank) are subject to larger exports, supporting the critical role of small banks in shaping the impact of bank concentration on firm exports. In addition, I show that this effect is more salient for firms endowed with less fixed assets, which has been shown to have larger increase in their short-term debts and interest payments. Moreover, the aforementioned effects are shown to be stronger for firms that cannot finance the working capital by business partners or foreign capital, and those do not have tight relationship with large banks. These results are consistent with the model implication that bank market that is less concentrated with large banks provide more opportunities for constrained exporting firms to access to bank credit, and the increased credit availability fulfills their needs of working capital, which helps them expand their exports significantly.

This article contributes to the growing literature on the link between the financial market and international trade. Substantial evidence suggests that a highly developed financial market could mitigate a firm’s financial constraints, especially for sectors and firms with
more reliance on external finance, resulting in an expansion of trade in various aspects, such as the intensive and extensive margins of trade (e.g., Beck, 2002; Fisman and Love, 2003; Manova, 2013). However, most studies treated the financial market as a homogeneous entity without considering its structure, except for Lin and Huang (2014), Claessens and Van Horen (2020), and Minetti et al (2021). In particular, using the cross-country data, Lin and Huang (2014) emphasized the positive effect of bank concentration on exports, Claessens and Van Horen (2020) underscored the role of foreign bank entry on bilateral trade, while Minetti et al (2021) focused on the relative importance of banks and capital markets as well as the importance of domestic and foreign banks on export dynamics. Unlike previous studies, this paper is the first to analyze the link between a firm’s exports and cross-city variations of bank concentration induced by the entry of small banks. After showing the mechanism through which bank concentration affects a firm’s exports theoretically, I find model-consistent micro-evidence regarding the impacts of bank concentration on exports and highlight the role of small banks in allocating credits to the much-needed small exporters, carrying out a fuller assessment of the credit allocation effects of bank market structure.

Moreover, this paper reconciles the debates about the effects of bank concentration on financially vulnerable firms. Studies have documented conflicting impacts of bank concentration on financially vulnerable firms, while rarely justified such contradiction. One strand of the literature shows positive effects of bank concentration and support arguments that a highly concentrated banking market increases bank’s market power, which either results in higher interest rates and more available bank credits thereafter (Berger and Hannan, 1989; Hannan, 1991), or incentivizes banks to establish a lending relationship with smaller or younger firms as they can extract rents in the future (Petersen and Rajan, 1995; Cetorelli and Gambera, 2001; Ratti et al., 2008). Another strand of studies supported the opposing view that a more concentrated bank market creates more financing obstacles for smaller firms, as banks with market power tend to support the profitability of their existing clients by restricting credit supply for emerging small firms (Ceterelli and Strahan, 2006;
Cetorelli, 2001, 2004; Beck, Demirguc-Kunt, and Maksimovic, 2004). However, these studies ignore the role of small banks when analyzing the impact of bank concentration, which is essential for financially vulnerable firms, especially small firms. This paper bridges the gap by showing that the conflicting impacts of bank concentration could be driven by different compositions of small and large banks, in which small banks play an essential role in helping the financially vulnerable small-sized firms.

Lastly, this paper also related to studies about bank concentration, competition, and credit allocation in China. Using survey data of Chinese private enterprises in 2006, Chong et al. (2013) show that the lower bank concentration alleviates financial constraints for small- and medium-sized enterprises. Similarly, using Chinese provincial-level data from 1997 through 2008, Hasan et al. (2015) found that bank concentration negatively affects small business development, but this effect is mitigated by the larger short-term loans from large banks. Gao et al. (2019) use the loan-level data of 17 largest commercial banks in China and estimated the impacts of removing the geographical branching restrictions for joint-stock banks in 2009. They found that the new entrant bank branches tend to lend to the SOEs over more productive private firms. Unlike their research, I highlight the role of small banks (rural financial institutions, which are much smaller than the joint-stock banks) in shaping the credit allocation effect of bank concentration on firm exports, which has not been examined in the past. Moreover, I develop a better identification strategy to address the endogenous issues of analyzing the impact of bank concentration and competition, which can be well applied to the future studies.

The rest of this paper is organized as follows. Section 2 introduces the institutional background of China’s banking system and the bank entry reform. Section 3 provides the theoretical model, Section 4 explains the empirical methodology and describes the data. Section 5 presents the main empirical results and robustness checks. Section 6 discusses the heterogeneous effects. The last section concludes.
2 Institutional Background

China’s banking system has undergone major changes since 1978, which gradually transforms into a market-based banking sector. Since then, the state-owned banks, i.e., Agricultural Bank of China, Bank of China, China Construction Bank, and the Industrial and Commercial Bank of China have been established and commercialized through recapitalization and IPOs, and becoming the Big Four state-owned commercial banks in China and dominating the bank market. In the 1980s, several joint-stock commercial banks such as China’s Bank of Communications, CITIC Industrial Bank, and China Merchants Bank emerged. Apart from the state-owned and joint-stock commercial banks, some of the urban and rural credit cooperatives have gradually transitioned to city commercial banks, rural commercial banks, and rural cooperative banks since 1979 at a relatively slow pace and small market shares, which are designed to mainly serve the local customers and enterprises. These banks are prohibited from lending to clients outside their designed jurisdictions.

To reinforce the supervision of the financial markets, the Chinese government implemented the Law on Commercial Banks in 1995, which subjected financial institutions to specific requirements, restrictions and guidelines. It’s worth noting that this regulation pointed that the registered capital for starting a national commercial bank, city commercial bank, and rural commercial bank should be no less than 1 billion Yuan, 100 million Yuan, and 50 million Yuan, respectively; moreover, a bank’s headquarter should appropriate a minimum amount of working capital to establish a branch office and the total amount of appropriated working capital should not exceed 60% of the bank’s total capital, creating high entry barriers to the banking market in China. Consequently, China’s banking market has been dominated by large banks for a long time, especially dominated by the big four state-owned banks.

The entry of small banks in China has been speeded up since 2007. On December 20, 2006, China Banking Regulatory Commission (CBRC) implemented a new bank entry policy Adjusting and Relaxing the Access Policies for Banking Financial Institutions in Rural
Areas (CBRC Decree No.90, 2006) to promote the entry of rural financial institutions in six provinces, namely, Sichuan, Qinghai, Gansu, Inner Mongolia, Jilin, and Hubei. First, this policy lifts the restriction on the source of capital to invest in, acquire, and establish banking financial institutions in the rural areas. Specifically, domestic and foreign bank capitals, industrial capitals and private capitals are encouraged to invest in, acquire, and establish new rural financial institutions (including village banks, rural credit cooperatives, and rural commercial banks), which is not allowed in the past. Second, this policy lowers the registered capital requirement for starting a bank in the rural area: (i) as a new type of small commercial bank in China, government gives a lot of preferential treatments for village banks. For instance, the registered capital requirement for establishing a village bank is as low as 1 million Yuan, which is much lower than other type of banks; (ii) the registered capital requirements for a rural commercial bank has also been reduced to 10 million Yuan. Third, this policy also cancels the working capital requirement for branching.

After the pilot program has been implemented for ten months, CBRC started to execute the nationwide program on October 24, 2007, which implemented the same policy in all provinces (CBRC Decree No.78, 2007). This policy contributed to substantial entries and expansions of rural financial institutions (i.e., village banks, rural commercial banks, and rural credit cooperatives), which are much smaller than the traditional large banks in China (e.g., state-owned banks and joint-stock commercial banks), resulting in a less concentrated bank market in China.

3 Model

I incorporate bank heterogeneity into a static, partial equilibrium model à la Manova (2013). The model analyses firms in two countries, Home \((h)\) and Foreign \((f)\). Firms in the home country freely export to the foreign country. A continuum of firms borrow from banks and produce differentiated goods in both countries and \(K\) sectors. Before producing
goods, each firm is endowed with total asset $s$ that is drawn from a cumulative distribution function $G(s)$ with support $[s_l, s_h]$, $s_h > s_l > 0$.

**Foreign Consumers** The representative consumer in the foreign country has a CES utility function $U_f = \prod_{k} C_{fk}^{\theta_k}$ over sector-specific CES consumption indices $C_{fk} = \left[ \int_{\omega \in \Omega_{fk}} q_{fk}(\omega) \alpha d\omega \right]^{\frac{1}{\alpha}}$, where $\Omega_{fk}$ is the set of available products. $\varepsilon = \frac{1}{1-\alpha} > 1$ is the elasticity of substitution. The share of each sector in total expenditure of the foreign market $Y_f$ is $\theta_k \in (0, 1)$ and $\sum_k \theta_k = 1$. Foreign country’s demand for a variety $\omega$ with price $p_{fk}(\omega)$ is thus $q_{fk}(\omega_s) = \frac{r_{fk}(\omega)\theta_k Y_f}{P_{1-\varepsilon}^{1-\varepsilon}}$, where $P_{fk} = \left[ \int_{\omega \in \Omega_{fk}} p_{fk}(\omega) \left( \frac{1}{1-\varepsilon} \right) d\omega \right]^{\frac{1}{1-\varepsilon}}$ is the price index.

**Home Exporters** The unit cost of producing goods in the home country and delivering them to the foreign country is equal to $\tau_{hf} a_h w_h$, where $w_h$ is the exogenous wage rate in the home country. $\tau_{hf}$ is the iceberg trade costs from the home country to the foreign country, and $\frac{1}{a_h}$ is the productivity level of exporters in the home country. Exporters face liquidity constraints, they need to borrow the amount of $L$ from a bank to finance a fraction $\eta \in [0, 1]$ of their variable costs for the export project. $\eta$ is exogenously given à la Manova (2013). Each exporter has a probability of default $\lambda \in (0, 1)$, which is exogenous given and determined by the Home country’s financial institution. In the case of default, the bank will seize the collateral $C$. The amount of pledgeable asset increases in the amount of its total asset $s$.

**Home Banks** There are two types of banks in the home country, i.e., small banks and large banks, denoted by the superscript $j = b, B$ respectively. Suppose all banks in the credit market offer loan interest rate $r \in (0, 1)$ and there is no shortage of funds in the credit market. In addition, in line with Holmstrom and Tirole (1997), there is a cost of screening and monitoring the borrower, denoted by $\kappa^j(C)$, where $\kappa^j(C)$ decreases in the amount of collateral the borrower can provide. Given that the large bank tends to have higher $\kappa$ since it’s more costly for the large bank to screen and monitor the borrower, especially for those have less pledgeable assets, since the large bank has a comparative disadvantage in collecting and acting on soft information than small banks (Berger et al., 2005), therefore, we have the lowest cost for the small banks given any amount of collateral, i.e., $\kappa^b(C) < \kappa^B(C)$,
∀C ∈ [0, +∞). As shown in Figure 1, given the same κ, small bank has lower collateral requirement than the large bank. The risk-free interest rate is denoted by \( r_f \). Based on the above descriptions, given the loan size \( L \) and collateral \( C \), the expected bank profits when lending to a firm is \( \Pi^j = \lambda L(1 + r) + (1 - \lambda)C - \kappa^j(C) - L(1 + r_f) \).

[Insert Figure 1]

3.1 Disadvantages of Small Exporters in the Credit Market

The exporter from the home country maximizes profits by choosing the optimal price, taking the interest rate \( r \) as given:

\[
\max_{p_{h,j}} \pi_h = p_{h,j} q_{h,j} - (1 - \eta) q_{h,j} \tau_{h,j} \omega_h - \lambda(1 + r)L - (1 - \lambda)C
\]

s.t. (1.1) \( q_{h,j} = \frac{p_{h,j} \theta_k Y_f}{P_{j,k}^{1-\varepsilon}} \)

(1.2) \( p_{h,j} q_{h,j} - (1 - \eta) q_{h,j} \tau_{a,h} w_h \geq (1 + r)L \)

(1.3) \( \lambda(1 + r)L + (1 - \lambda)C \geq \kappa^j(C) + L(1 + r_f) \)

The expression for profits reflects the fact that the exporter finances a fraction \( 1 - \eta \) of its variable costs internally, pays the bank \( (1 + r_j)L \) when the contract is enforced (with probability \( \lambda \)), and replaces the collateral \( C \) in case of default (with probability \( 1 - \lambda \)). In the absence of credit constraints, exporters maximize profits subject to demand (1.1). With external financing, two additional conditions bind exporters’ decisions. Conditions (1.2) is the participation constraints of the exporter, which ensure the exporter capable of repayment. Conditions (1.3) is the participation constraints of the bank, requiring that the bank’s expected returns cover at least the screening and monitoring cost \( \kappa^j(C) \) and the opportunity cost of the funds \( L(1 + r_f) \). Therefore, we have

\[
L \geq \frac{\kappa^j(C) - (1 - \lambda)C}{\lambda(1 + r) - (1 + r_f)} \equiv L
\]

which indicates that the exporter should borrow at least \( L \) to incentivize the bank to offer loans.
With competitive credit markets, banks always break even in expectation. This implies that exporters will adjust their loan size $L$ so as to bring the bank to his participation constraint, i.e. Condition (1.3) binds. If the Condition (1.2) does not bind, firms thus export at their first-best price $p^*_hfk$, quantity $q^*_hfk$, total revenues $R^*_hfk$, and net revenues $r^*_hfk$ as follows:

$$p^*_hfk(\omega) = \frac{(1-\eta)\tau_h f a_h w_h}{\alpha}$$  \hspace{1cm} (3)

$$q^*_hfs(\omega) = \left[\frac{(1-\eta)\tau_h f a_h w_h}{\alpha}\right]^{-\varepsilon} \frac{\theta_k Y_f}{P_{fs}^{1-\varepsilon}}$$  \hspace{1cm} (4)

$$R^*_hfs(\omega) \equiv p^*_hfs q^*_hfs = \left[\frac{(1-\eta)\tau_h f a_h w_h}{\alpha}\right]^{1-\varepsilon} \frac{\theta_k Y_f}{P_{fs}^{1-\varepsilon}}$$  \hspace{1cm} (5)

$$r^*_hfs(\omega) \equiv p^*_hfs q^*_hfs - (1-\eta)q^*_hfs \tau_h f a_h w_h = (1-\alpha) \left[\frac{(1-\eta)\tau_h f a_h w_h}{\alpha P_{fk}}\right]^{-\varepsilon} \theta_k Y_f$$  \hspace{1cm} (6)

However, since the term $\kappa^j(C) - (1-\lambda)C$ decreases in the amount of collateral $C$, Conditions (1.2) is binding for borrowers who try to borrow from the bank $j$ but provide the collateral lower than $C^j$. The cut-off $C^j$ is given by the condition

$$(1-\alpha) \left[\frac{(1-\eta)\tau_h f a_h w_h}{\alpha P_{fk}}\right]^{1-\varepsilon} \theta_k Y_f = (1+r)\frac{\kappa^j(C^j) - (1-\lambda)C^j}{\lambda(1+r) - (1+r_f)}$$  \hspace{1cm} (7)

Intuitively, firms endowed with less assets cannot provide enough collateral, which increases the screening and monitoring cost and drives down the bank’s profit, because the bank has to exert more effort to collect more soft information from the borrower. Therefore, firms endowed with less assets cannot obtain external funds from banks.

Given that $\kappa^b(C) < \kappa^B(C), \forall C \in [0,+\infty)$, $C^b < C^B$. In other words, large banks require more collateral as they are less capable of collecting soft information. It’s notable that I assume identical interest rate for all banks in the baseline model for simplicity. However, small banks always charge higher interest rate than large banks in reality, i.e., $r^b > r^B$. In this case, small banks will require even lower amount of collateral as the higher cost of screening and monitoring is compensated with the higher interest rate, therefore, $C^b < C^B$ still holds.
Lemma 1. Because lack of pledgeable assets, small exporters are less likely to borrow from banks, especially from large banks.

For exporters with pledgeable asset below $C^j$, they cannot get access to the bank credits. As a result, they have to reduce their export scale from the unconstrained optimum. This occurs because their internal funding cannot fully cover their costs under the unconstrained optimal export scale. Their maximizing problem becomes

$$
\text{max} \quad \pi_{hfk} = p_{hfk}q_{hfk} - q_{hfk} \tau_h \alpha_h w_h \\
\text{s.t.} \quad (8.1) \quad q_{hfk} = \frac{\bar{L}_{hfk}^\varepsilon \theta_k Y_f}{P_{fk}^{1-\varepsilon}} \\
(8.2) \quad q_{hfk} \tau_h \alpha_h w_h \leq (1 - \eta)q_{hfk}^* \tau_h \alpha_h w_h
$$

Condition (8.2) is binding since $\frac{\partial \pi_{hfk}}{\partial q_{hfk}} > 0$ when $q_{hfk} \leq (1 - \eta)q_{hfk}^*$. Therefore, we get the constrained price $p_{hfk}^*(\omega)$ and constrained quantity $q_{hfk}^*(\omega)$, where $R_{hfk}^*(\omega) = p_{hfk}^* q_{hfk}^* = (1 - \eta)\alpha p_{hfk}^* q_{hfk}^* < R_{hfk}^*(\omega)$.

As a result, when the cut-off goes down from $C^j$ to $C^j'$, firms with pledgeable asset $C \in [C^j', C^j)$ become eligible of bank credits, resulting in the increase of their total export revenue from $R_{hfk}^*(\omega)$ to $R_{hfk}^*(\omega)$.

Lemma 2. The lower cut-off for the amount of collateral enables the constrained small exporters to get access to the bank credits, which therefore increases their total export revenue.

Proof See Supplementary Appendix A.1.

3.2 Impact of Bank Concentration

In this subsection, I model the determination of market interest rate $r$ in the context of Cournot competition. Suppose there are $n$ equal-sized banks in the market that are funded with fully insured deposits and invest in business loans. Followed Martinez-Miera and Repollo (2010), I assume that the supply of deposit is perfectly elastic and banks compete for loans à la Cournot. The supply of loans for bank $j$ is denoted as $\bar{L}^j$, so the aggregate supply
of loans $\bar{L} = \sum_{j=1}^{n} \bar{L}^j$ determines the loan interest rate $r(\bar{L})$. As presented above, bank $j$’s profit function for the loan project of firm $\omega$ is $\Pi^j = \lambda L(1+r) + (1-\lambda)C - \kappa^j(C) - L(1+r_f)$, therefore, bank’s maximizing problem is given by:

$$\Pi^j = \sum_{\omega} \Pi^j = [R(\bar{L}) - c] \bar{L}^j + \bar{K}^j$$

(9)

where $\bar{L}^j \equiv \sum L$, $R(\bar{L}) \equiv \lambda [1 + r(\bar{L})]$, $c \equiv (1 + r_f)$, $\bar{K}^j \equiv \sum [(1 - \lambda)C - \kappa^j(C)]$. Bank $j$ maximizes the profit with respect to $\bar{L}^j$, treating the $\bar{L}^j$’s for other banks as given:

$$\frac{\partial \Pi^j}{\partial \bar{L}^j} = R(\bar{L}) - c + \bar{L}^j \frac{dR}{d\bar{L}} \frac{\partial \bar{L}}{\partial \bar{L}^j} = 0$$

(10)

Therefore, the reaction function for bank $j$ is:

$$R(\bar{L}) + \bar{L}^j \frac{dR}{dL} = c$$

(11)

In equilibrium, $\bar{L}^j = \bar{L}/n$. As the Herfindahl–Hirschman Index ($H$) for the banking sector is $H = \sum_{j=1}^{n} S_j^2 = n(1/n)^2 = \frac{1}{n}$, where $S_j$ is the market share of bank $j$, Equation (11) can be re-arranged as

$$\frac{R - c}{R} = -\frac{1}{n} \frac{dR}{dL} \frac{\partial \bar{L}}{\partial \bar{L}^j} \equiv -\frac{1}{nE_D} = \frac{H}{|E_D|}$$

(12)

where $E_D$ is the market elasticity of demand. Therefore, we have $\frac{dR}{dH} > 0$, or equivalently, $\frac{dr}{dH} > 0$, given the fixed $E_D$, $c$ and $\lambda$. In other words, the market interest rate will be lower if there are more banks entering the market.\(^3\)

It is notable that $\kappa^j(\cdot) = \kappa^B(\cdot)$ for $\forall j$ if we only have large banks in the market. However, if there are new small banks entering the market, we will have $\kappa^j(\cdot) = \kappa^b(\cdot)$ for some $j$ and $\kappa^b(\cdot) < \kappa^B(\cdot)$. Therefore, $\frac{\partial \kappa^j}{\partial H} > 0$ for the small-bank-induced reduction of $H$, whereas $\frac{\partial \kappa^j}{\partial H} = 0$ the large-bank-induced reduction of $H$. Equation (7) can be re-arranged as

\(^3\)The relationship between $H$ and $r$ still holds when assuming $n$ unequal-sized banks in the market.
\[
F \equiv [1 + r(H)]^{j} \frac{\kappa^j(C^j, H) - (1 - \lambda)C^j}{\lambda [1 + r(H)]} - (1 - \alpha) \left( \frac{(1 - n) \tau_{h} \alpha_{h} \omega_{h} \theta_{h} Y_{f}}{\alpha P_{jk}} \right)^{1 - \varepsilon} \theta_{h} Y_{f} \tag{13}
\]

By the Implicit Function Theorem, we can derive the impact of \( H \) on the collateral cut-off \( C^j \) as follows:

\[
\frac{\partial C^j}{\partial H} = -\frac{\partial F/\partial H}{\partial F/\partial C^j} = A \left[ \frac{\partial F}{\partial r} \frac{\partial r}{\partial H} + \frac{\partial F}{\partial \kappa^j} \frac{\partial \kappa^j}{\partial H} \right] \tag{14}
\]

where \( A \equiv \frac{[1 + r(H)](1 - \lambda - \partial \kappa^j/\partial C^j)}{\lambda [1 + r(H)] - (1 + r_f)} > 0, \frac{\partial F}{\partial r} < 0, \frac{\partial r}{\partial H} > 0, \frac{\partial F}{\partial \kappa^j} > 0 \). Therefore, \( \frac{\partial C^j}{\partial H} < 0 \) if there is no small banks entering the market, while \( \frac{\partial C^j}{\partial H} > 0 \), or \( < 0 \) otherwise. In reality, because of the interest rate regulation, especially in China, \( \frac{\partial r}{\partial H} \) is relatively small. As a result, the reduction of \( H \) due to the entry of large banks is expected to increase the collateral cut-off marginally, while the reduction of \( H \) due to the entry of small banks is expected to significantly decrease the collateral cut-off. Based on Lemma 2, the model only predicts a positive effect on exports for the small-bank-induced bank deconcentration.

Intuitively, when new banks enter the credit market, bank concentration goes down, which increases the competition in the banking sector, resulting in a lower equilibrium interest rate. To maintain profitability, banks require a larger amount of collateral to compensate for the loss of interest rate, which in turn crowding out the small firms with less pledgeable assets. However, if the reduction of bank concentration results from the entry of small banks, they have a comparative advantage in collecting the soft information, therefore, they only require a lower amount of collateral. When the latter effect is strong enough, small firms will be beneficial from the lower bank concentration.

**Proposition 1.** Reduction of bank concentration promotes firms exports only when it is induced by the entry of small banks. Such effect is more salient for small exporting firms with less pledgeable assets, as small banks compete for loans and reallocate funds to exporting firms with collateral constraints.
### 4 Empirical Identification and Data

#### 4.1 Measuring exogenous change of bank concentration

In this paper, I use China’s bank entry reform in 2007 as an exogenous shock to measure the change in bank concentration induced by the entry of small banks, which is similar to Garmaise and Moskowitz (2006), who captured the change in bank concentration caused by the banking market mergers and acquisitions. Since the nature of the bank entry reform in 2007 is to promote the entry of small banks (rural financial institutions) in the rural areas, including towns, villages, counties, and county-level cities, which are typically not allow to make loans outside the jurisdiction of a prefecture-level city\(^4\), identification for impacts of bank concentration on exporting firms needs to focus exclusively on the city level. The city-level bank concentration measures the concentration in the local banking market in which the firm is located and go beyond measures of concentration at the country-level and provincial-level (which may not be a good proxy of the actual financial environment that firms face in their local markets). In short, obtaining the cross-city variations of the bank concentration should be the key for my empirical estimations.

The bank concentration in this paper is measured by the Herfindahl–Hirschman Index (HHI), where a lower HHI indicates a more competitive bank market. Followed the previous literature (e.g., Degryse and Ongena, 2007; Canales and Nanda, 2012), the HHI is calculated by the share of each bank’s branches in a given city and year. Thus, my first measure of actual bank concentration \(HHI_{jt}^{\text{Actual}}\) in each city and each year is calculated as follows:

\[
HHI_{jt}^{\text{Actual}} = \sum_{b=1}^{B_{jt}} \left( \frac{\text{#branch}_bt}{\sum_{b=1}^{B_{jt}} \text{#branch}_bt} \right)^2
\]  

(15)

where \(B_{jt}\) is the total number of banks in city \(j\) in year \(t\), and \(\text{#branch}_bt\) is the number

---

\(^4\)The prefectural-level city in China is an administrative unit comprising a main central urban area and the much larger surrounding rural area containing many smaller counties, county-level cities, towns and villages.
of branches of bank $b$ in city $j$ in year $t$.\footnote{One might argue that measuring HHI by the number of bank branches is less accurate. Ideally, the market shares are measured by a percentage of a bank’s assets to total assets of all banks in the city, however, such data is unavailable. The only data that available is the aggregate total asset and aggregate total number of employees for each type of bank in each province in each year, without distinguishing the new and the old banks. As a result, such data cannot measure the change of bank concentration induced by the new small banks in each city. To prove the accuracy of my baseline measure, I calculate the coefficients of correlation among the three measures of actual bank concentration. In particular, I first take an average of the city-level bank concentration measured by the number of branches within the same province (baseline measure). Then, I calculate the coefficient of correlation between this provincial-level bank concentration measured by total asset and the total number of employees, respectively. The coefficients of correlation between my baseline measure and both alternative measures are 0.736 and 0.810, respectively, both of which are statistically significant at 1\% level, indicating that the number of branches largely reflects a bank’s total asset in a city.}

As discussed in Section 2, the bank entry reform effective since 2007 leads to a substantial entries of small banks (including village banks, rural commercial banks, and rural credit cooperatives) in China. On that account, I construct a counterfactual scenario by dropping all small banks that established in or after 2007 and compute the second measure of bank concentration index $HHI_{jt}^{Counter}$ by Equation (15) for the remaining banks. This is a hypothetical bank concentration measure assuming that (i) small banks cannot enter the market in or after 2007 if the bank entry reform doesn’t exist and (ii) large banks do not change their entry and exit decisions after the entry of small banks.

Lastly, the change of bank concentration induced by the entry of small banks can be expressed as

\[
\Delta HHI_{jt} = HHI_{jt}^{Counter} - HHI_{jt}^{Actual}
\] (16)

where the larger $\Delta HHI_{jt}$ indicates larger impact of small bank entries on bank concentration, and $\Delta HHI_{jt}$ are equal to zero for all cities before 2007 by construction. Figure 2 plots a histogram of the average $\Delta HHI_{jt}$ across period 2007-2013 and indicates that around 40\% of local banking markets experience little or no change in concentration, while some others experience substantial decreases. Such changes can have large effects on loan competition and credit allocation in a city. Figure 3 shows the spatial distribution patterns of the average $\Delta HHI_{jt}$ during the 2007-2013 period, which generally indicates that the reduction of bank
concentration do not have clear pattern of location selection, as the high $\Delta HHI_{jt}$ cities are
distributed in both the highly-developed regions (e.g., the Pearl River Delta region) and the
under-developed regions (e.g., Qinghai province). Moreover, as the bank entry reform in
2007 was not designed to promote the international trade, the measure $\Delta HHI_{jt}$ allows me
to treat the exogenous bank entry shock as a random experiment to estimate causal effects
of the bank concentration on firm’s exports.

[Insert Figure 2]

[Insert Figure 3]

4.2 Econometric specification

Based on the measure of $\Delta HHI_{jt}$ and $HHI^\text{Counter}_{jt}$, I test Proposition 1 by the following
specifications:

\[
\text{FirmExport}_{ijkt} = \alpha + \beta s \Delta HHI_{jt-1} + \gamma X_{ijkt-1} + \delta X_{jt-1} + \mu_i + \theta_j + \varphi_k + \eta_t + \varepsilon_{ijkt} \tag{17}
\]

\[
\text{FirmExport}_{ijkt} = \alpha + \beta l HHI^\text{Counter}_{jt} + \gamma X_{ijkt-1} + \delta X_{jt-1} + \mu_i + \theta_j + \varphi_k + \eta_t + \varepsilon_{ijkt} \tag{18}
\]

where $\text{FirmExport}_{ijkt}$ represents the natural logarithm of total export revenue for firm $i$
in city $j$ and industry $k$ at time $t$; $X_{ijkt-1}$ is a set of firm-level control variables including the
natural logarithm of total asset, the leverage ratio, the share of liquid asset, and the dummy of
firm’s ownership; $X_{jt-1}$ is a set of city-level control variables including the GDP per capita
(in log), population density (in log), total deposits (in log), ratio of primary industry to
total GDP, ratio of secondary industry to total GDP, which controlling for a city’s economic
development. Additionally, I also control the time-invariant and firm-specific fixed effect $\mu_i$
and industry fixed effects $\varphi_k$, city fixed effects $\theta_j$, and year fixed effects $\eta_t$. Lastly, $\varepsilon_{ijkt}$ is an
i.i.d. error term.

Notably, I use a one-year lag for all independent variables based on two main reasons.
First, typically, there is a time lag for new banks to have effects on the performance of
enterprises. Second, the lagged measures could avoid simultaneity problems. However,
unobservable differences across cities and firms can also cause endogeneity problems that confound the real causal effect of bank concentration. Therefore, I provide more rigorous evidence to support the exogenous variations of $\Delta HHI_{jt}$ in the next section.

As indicated in Proposition 1, only the small-bank-induced reduction of bank concentration would have positive effect on firm exports, I expect that the estimated coefficient $\beta_s$ for $\Delta HHI_{jt-1}$ is significantly positive in Specification (17). In contrast, $\beta_l$ is expected to be insignificant and close to zero in Specification (18), as it indicates that in the counterfactual scenario where bank entry reform doesn’t exist, we shall not see any effects of the bank concentration index on firm exports.

Lastly, as Proposition 1 also indicates that exporting firms with less pledgeable assets are primarily affected by the small-bank-induced reduction of bank concentration, to show this evidence empirically, I conduct the following estimation:

$$FirmExport_{ijkt} = \alpha + \beta_1 \Delta HHI_{jt-1} \times Asset_{ijkPre} + \beta_2 \Delta HHI_{jt-1} + \varepsilon_{ijkt}$$ (19)

where $Asset_{ijkPre} = ln\left(\frac{1}{3} \sum_{t=2004}^{2006} Asset_{ijkt}\right)$ is the average amount of fixed assets (or total assets) for firm i in city j and industry k in 2004-2006 period, which proxy firm’s endowment of pledgeable assets before the bank entry reform. Also, I use one-year lag for firm’s fixed or total assets to substitute $Asset_{ijkPre}$ as a robustness check. Other controls in specification (19) are the same as specification (17). Based on Proposition 1, $\beta_1$ is expected to be negative and $\beta_2$ is positive in the sense that the small-bank-induced reduction of bank concentration has stronger positive impact on small-sized exporters.

4.3 Data

As indicated in the last section, the key variable of interest $\Delta HHI_{jt}$ only has cross-city variations after 2007, therefore, the main data I use in this paper is the panel data for the Chinese manufacturing firms from 2007 through 2013. It’s notable that this data
is also available before 2007, and I use the data from 2004 through 2006 to compute the pre-reform variables, such as $\text{Asset}_{ijk}^{\text{pre}}$, in later analysis. This firm-level panel data comes from the Annual Survey of Industrial Firms (ASIF), also known as the Chinese Industrial Enterprise Database, covering financial information for manufacturing firms with annual sales above 5 million Yuan until 2009 (about $750,000 at the 2009 exchange rate) and 20 million Yuan ($3,228,000 at the 2013 exchange rate) from 2010 to 2013. The dataset reports firms’ locations, industry, ownership and more than 100 financial variables listed in the main accounting statements. In this paper, I focus only on exporting firms that have non-zero export revenues.

The city-level bank concentration is computed by the bank branch information obtained from the Branch Database of Chinese Commercial Bank in the Chinese Research Data Service (CNRDS) Platform, which includes the establishment of all Chinese commercial bank branches from 1948 to 2019 in each city. However, this data set does not include the information of deposits and loans for each branch office in each city, therefore, I use the number of branches of each bank to compute the bank concentration index as indicated in Equation (15). Additionally, the data of city-level control variables are obtained from various issues of the China City Statistical Yearbook, such as city’s GDP per capita and population.

After matching the firm-level data with the city-level variables, the working sample is further cleaned based on the criteria used in Yu (2015). First, observations with missing key financial variables (such as total assets, fixed assets, and sales) are excluded. Second, firms with fewer than eight workers are also excluded. Third, observations with liquid assets greater than total assets or with fixed assets greater than total assets are removed. Moreover, I exclude the four province-level municipalities (Beijing, Shanghai, Tianjin, and Chongqing) in my baseline estimations. Additionally, due to lack of data, Tibet, Hong Kong, Macau, and Taiwan are also excluded. Finally, my baseline samples end up with 67,357 unique exporters and 240,867 observations in 266 prefectural-level cities from 2007 through 2013. Table 1 shows the summary statistics for all exporting firms in my dataset, and Table A1 in the
Appendix lists the detailed definitions for each variable.

5 Impacts of Bank Concentration on Exports

5.1 Baseline Estimations

Columns 1 and 2 in Table 2 present estimations for specification (3) without and with control variables, respectively. Column 2 shows that the larger decrease of the bank concentration induced by the entry of small banks is associated with significantly higher firm exports, i.e., one standard deviation increase in $\Delta HHI_{jt-1}$ contributes to 3.17% (SD is 0.018) growth in the firm’s exports. This is policy relevant as one standard deviation increase in $\Delta HHI_{jt-1}$ can be translated as an entry of around 5 small bank branches in a city within a year, which is quite applicable.\textsuperscript{6} In contrast, estimated results for specification (4) reported in columns 3 and 4 show that the competition of large banks proxied by $HHI_{jt-1}^{Counter}$ does not have significant influence on firm exports. These results support Proposition 1 that only the small-bank-induced reduction of bank concentration benefits firm exports. Intuitively, small banks enter the market and lower the bank concentration, which intensify the competition for business loans and result in a reallocation of bank credits towards the much-needed small exporting firms given their comparative advantage in small business lending, promoting firm exports significantly. In contrast, there’s no such credit allocation effect when we only have large banks in the market, regardless how fierce they compete with each other.

\textsuperscript{6}I regress $\Delta HHI_{jt}/\text{std.}$ on the number of yearly new small bank branches in the city-level, controlled for the city and year fixed effects. Obtain the estimated coefficient $\hat{\beta}$, then, $1/\hat{\beta}$ reveals the corresponding number of new small bank branches to one standard deviation increase in $\Delta HHI_{jt}$, which is equal to 5. In my data set, the number of yearly new small bank branches varies from 0 to 30 across cities in 2007-2013 period.
5.2 Validity of Bank Concentration Measure

I have argued that the specification (17) captures the effect of bank concentration that only induced by small banks, while the specification (18) examines the effect of large bank competitions on firm exports. Below, I provide further evidence on the validity of both bank concentration measures, i.e., $\Delta HHI_{jt}$ and $HHI_{jt-1}^{Counter}$, on three dimensions.

5.2.1 Is the Positive Effect of Bank Deconcentration Truly Driven by Small Banks?

As discuss in Section 5.1, $\Delta HHI_{jt}$ captures the reduction of bank concentration induced by the entry of new small banks, which has been shown to have significant positive effect on firm exports. However, the entry of any new banks, including large banks, can also lead to the same reduction of HHI, begging a question of whether the estimated effect reported in Columns 1-2 in Table 2 reflects the causal effect of small banks. To provide evidence against this possibility, a placebo test is conducted. In particular, given the number of branches for new small banks in each city in each year, I randomly drop the same number of branches for any new banks and compute $\Delta HHI_{jt}^{Placebo}$ by the same process discussed in Section 4.1. Using $\Delta HHI_{jt}^{Placebo}$, a placebo estimation is conducted by the specification in column 2 in Table 2. If the estimated coefficient of $\Delta HHI_{jt}^{Placebo}$ is statistically significant and close to the benchmark result in column 2 in Table 2, it would indicate that the entry of any new banks could lead to a positive effect on firm exports, which counteracts with the theoretical prediction in this paper.

Figure 4 shows the distribution of the estimates from the 500 simulations along with the benchmark estimate, 1.76, from column 2 in Table 2. The simulated estimates are normally distributed and well below the benchmark estimate 1.76, suggesting that the positive effect of bank deconcentration is only driven the entry of small banks.

[Insert Figure 4]
5.2.2 Do Small and Large Banks Make Entry Decisions Independently?

I construct the key variable $\Delta HHI_{jt}$ by subtracting $HHI_{jt-1}^{Actual}$ from $HHI_{jt-1}^{Counter}$, which relies on the assumption that the entry decisions of large banks are not affected by the entry of small banks. Otherwise, $HHI_{jt-1}^{Counter}$ cannot measure the counterfactual scenario accurately. To verify the validity of this assumption, I conduct the following estimation:

$$\Delta \# LargeBank_{jt} = \alpha + \beta \Delta \# SmallBank_{jt-1} + \delta X_{jt-1} + \theta_j + \eta_t + \varepsilon_{jt}$$  \hspace{1cm} (20)

where $\# LargeBank_{jt}$ and $\# SmallBank_{jt}$ are the total number of branches for large and small banks in city j at time t, respectively. $\Delta \# LargeBank_{jt} = \# LargeBank_{jt} - \# LargeBank_{jt-1}$. $\beta$ is expected to be close to zero and insignificant if the assumption holds.

Another concern is the exogeneity of the entry of small banks. In particular, if the entry decisions of small banks are affected by the number of existing or new large banks in a city, the measure of $\Delta HHI_{jt}$ cannot satisfy the exogeneity requirement. I conduct the following two estimations to show that small banks’ entry decision is not affected by large banks.

$$\Delta \# SmallBank_{jt} = \alpha + \beta \Delta \# LargeBank_{jt-1} + \delta X_{jt-1} + \theta_j + \eta_t + \varepsilon_{jt}$$  \hspace{1cm} (21)

$$\Delta \# SmallBank_{jt} = \alpha + \beta \# LargeBank_{jt-1} + \delta X_{jt-1} + \theta_j + \eta_t + \varepsilon_{jt}$$  \hspace{1cm} (22)

$\beta$s in specification (21) and (22) are also expected to be close to zero and insignificant if the entry decisions of small banks do not depend on the number of existing and new large banks. As shown in Table 3, estimated coefficients for these three specifications are all statistically insignificant and close to zero, supporting the argument that small and large banks enter the market independently.

[Insert Table 3]

5.2.3 Does Future Firm Exports Spur Present-Day Entry of Small Banks?

The results in columns 1-2 in Table 2 link the reduction of bank concentration to subsequent increases in firm exports. One interpretation of this link is a causal one, according to which entry of small banks intensify competition of business loans in the market and
re-allocate them to constrained exporting firms with less pledgeable assets, which in turn contributes to subsequent expansions of firm exports. However, the alternative explanation for this correlation is reverse causality. In particular, the reverse causality problem arises when unobservable variables that affect future firm exports drive present-day entry of small bank. For example, banks in a growing city may anticipate further increases of exports and try to enter the market today to make profits in the future. Followed Garmaise and Moskowitz (2006), I provide evidence against the reverse causality by the following test:

$$FirmExport_{ijkt} = \alpha + \beta \Delta HHI_{jt} + \gamma X_{ijkt-1} + \delta X_{jt-1} + \mu_i + \theta_j + \varphi_k + \eta_t + \varepsilon_{ijkt}$$  (23)

$\beta$ is expected to be statistically insignificant and close to zero, otherwise, it would indicate the presence of reverse causality. The rationale is that if trending firm exports spur entry of small banks, future firm exports would have to reflect the current export trend, therefore, current firm exports would promote contemporaneous bank entry. Hence, we should see a significant positive contemporaneous correlation between $\Delta HHI_{jt}$ and firm exports. However, I find no such relation in the data, i.e., $\beta$ is statistically insignificant and equal to 0.662.

Therefore, all tests prove that the key measure $\Delta HHI_{jt}$ is exogeneous and captures the causal effect of small bank driven bank deconcentration on firm exports.

5.3 Differential Effects on Small Exporting Firms

Next, to test the argument in Proposition 1 that exporting firms with less pledgeable assets are primarily affected by the small-bank-induced reduction of bank concentration, I estimate the specification (19) and report the estimation results in Table 4.

[Insert Table 4]

As shown in Table 4, results are consistent regardless how I proxy firm’s endowment of pledgeable assets. In particular, the reduction of bank concentration caused by small banks is associated with higher firm exports, and this effect is diminishing with firm’s endowment
of pledgeable assets given the significantly negative estimated coefficient for the interaction
term, supporting Proposition 1. While the results above are informative, they remain some-
what limited as they do not directly indicate the net partial impact of bank concentration
on firm’s export. Therefore, based on column 1 in Table 4, the marginal effect of $\Delta HHI_{jt-1}$
on firm exports across the observed range of the firm’s pledgeable assets is illustrated in
Figure 5. The solid sloping line indicates how the marginal effect changes as the firm’s fixed
asset endowment increases, while the two dashed lines, representing 95% confidence inter-
vals, allow us to determine the conditions under which bank concentration has a statistically
significant effect on the firm’s export. It is shown that the net effect of bank concentration
is significant whenever the upper and lower bounds of the confidence interval are both above
or below 0. As per Figure 5, the marginal effect of lower bank concentration on the firm’s
export is statistically significantly larger when firms endow with less fixed assets, i.e., it
facilitates exports for firms with fixed assets below 10 (22 million Yuan, which is equivalent
to around 3.6 million dollars at the 2013 exchange rate).

Therefore, the above results strongly support the argument in Proposition 1, that is,
small banks enter the market, compete for loans, and re-allocate the funds to exporters with
less pledgeable assets, which largely promotes their exports.

[Insert Figure 5]

Due to the lack of loan-level data, I cannot use the firm-bank lending relationship to
prove the increase of bank credits caused by the bank deconcentration directly. However,
the amount of liabilities, short-term liabilities, long-term liabilities, as well as the interest
payment are observed from the firm’s financial statement, which can be used as a proxy
for the amount of bank credits received. Therefore, I re-estimate the specification (19) by
substituting the dependent variable with the changes of the firm’s liabilities. As shown in
columns 1-3 in Table 5, the lower bank concentration contributes to a larger increase in firm’s
liabilities, especially the short-run liabilities, and this effect is also stronger for firms with
less pledgeable assets. In contrast, bank concentration only has marginal effects on firm’s
long-term liabilities. I also show that this effect holds regarding firm’s interest payment in column 4 in Table 5. The aforementioned evidence supports the argument that the lower bank concentration mainly promotes the intensive margin of exports by fulfilling the needs of working capital for exporters. Therefore, these results reinforce the story that regions with bank markets that are less concentrated with large banks tend to have greater levels of credit availability for small firms, which helps them acquire more external funding, alleviating their financial constraints, and promoting exporting activities.

[Insert Table 5]

5.4 Robustness Checks

To check the robustness of the baseline results, I exploit several alternative subsamples that are restricted to be more comparable. First, the initial sample is restricted to be a balanced one by ensuring the existence of data for all time periods between 2007 and 2013 (denoted the “balanced sample”), which makes the data directly comparable across periods.

Second, in my baseline estimates, I include all exporting firms with non-zero exports regardless of their domestic sales. However, domestic sales could provide large working capital for firm’s export orders, which alleviates firms liquidity constraints and makes them less reliance on bank credits (Chaney, 2016). To eliminate the impact of domestic sales, I only include the pure exporting firms with export-to-sale ratio equal to 100% (denoted the “pure exporters”), which ensures the exporting firms are comparable in terms of the liquidity constraints.

To further verify this argument, I also investigate the impact of bank concentration on firm’s entry or exit to the foreign market. In particular, I estimate the following specification: \[ \text{NumExporter}_{jt} = \alpha + \beta \Delta \text{HHI}_{jt-1} + \delta X_{jt-1} + \theta_j + \eta_t + \varepsilon_{jt}. \] \( \text{NumExporter}_{jt} \) represents the total number of exporters in city \( j \) in year \( t \). \( X_{jt-1} \) is the city-level control variables as the baseline estimation. The results show that \( \Delta \text{HHI}_{jt-1} \) doesn’t have significant impacts on the extensive margins of export.

I also regress the firm exports on total liability, current liability and long-term liability respectively to further prove the positive relationship between liabilities and exports. As shown in Table A2, larger growth of short-run liability is associated with a higher level of exports, while there are much smaller effects for long-run liability. These results are consistent with the conventional idea that working capital financing mainly facilitates the level of exports, while the fixed capital investment is more correlated with the decision of entering or exiting the market.
Third, as the capital city of each province is not comparable to other cities in the same province in terms of financial development and political resources, firms operated in these cities may be easier to obtain the external funds, I exclude the capital cities from my baseline samples (denoted the “non-capital sample”).

Fourth, as discussed in Section 2, the pilot program of China’s bank entry reform has been implemented in six provinces at the end of 2006, namely, Sichuan, Qinghai, Gansu, Inner Mongolia, Jilin, and Hubei, which makes these provinces less comparable to other provinces that adopted this policy in 2007. Therefore, I exclude samples in these six provinces (denoted the “non-pilot sample”).

Lastly, the 2008 financial crisis happened right after the nationwide implementation of the bank entry reform, which may dampen the positive effect of bank deconcentration by reducing the ability of small banks to make loans as well as reducing firms’ expected export revenues, which further lowered the probability for small exporting firms to get access to bank credits.\[9\] Even though my baseline specification (17) have largely controlled for the impact of financial crisis by including various of fixed effects and control variables, I exclude samples in 2007, 2008 and 2009 to make the financial market more comparable across periods.

Table 6 reports the new estimation results for all these alternative subsamples based on specifications (17) and (19). In all the subsample analyses, the key variable $\Delta HHI_{jt-1}$ has a consistent positive coefficient and the interaction term $\Delta HHI_{jt-1} \times Asset_{ijkPre}$ has a consistent negative coefficient, which are all statistically significant.

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\[9\] Another potential concern related to the fact that the Chinese government implemented a broad stimulus package to minimize the negative impact of 2008 financial crisis, which was also known as the 4 trillion yuan package. This stimulus, equivalent to 586 billion US dollar, was mainly used for public infrastructure development (38%), reconstruction in regions hit by the Wenchuan earthquake (25%), affordable housing (10%), rural development such as building public amenities (9%), technology upgrading such as supporting the high-end production (9%), sustainable development (5%), Education, health and culture (4%). Importantly, these programs did not target the manufacturing sector. In contrast, the 2007 bank entry reform—which was not designed to alleviate the impact of the financial crisis—could directly affect firm exports by increasing the credit availability for exporting firms with less pledgeable assets. For these reasons, I do not expect that the stimulus package would confound my baseline estimations.
6 Heterogeneous Effects

The main argument of this paper is that the exporting firms, especially for those endowed with less pledgeable assets, are easier to obtain bank credits and expand their exports after small banks enter the market and compete for loans with large banks, as small banks tend to offer lower collateral requirement and reallocate funds towards those constrained firms with collateral constraints. However, exporting firms with different credit tightness and different borrowing relationship might be affected disproportionately. This section shows the heterogeneous effects in both perspectives.

6.1 Credit Tightness

It has been documented that some firms may be inherently easier to access trade credit, which could become a substitute for formal financing (Fisman and Love, 2003). Therefore, the effect of bank deconcentration should matter disproportionately more for firms with less access to the trade credit financing. In other words, for exporting firms that routinely receive more trade credit, the lower collateral requirement offered by the new small banks should have less impact on them, as they do not have to borrow from banks. To test this argument, I re-estimate specifications (17) and (19) by the low and high trade credit group, respectively. In particular, I first compute the trade credit $\text{TradeCredit}_{ijkt}$ defined by the ratio of account payable to total assets for each firm and each year, which is the same measure used by Petersen and Rajan (1997). Second, calculate the mean value of trade credit for each firm from 2004 through 2006 (prior to the 2007 reform), i.e., $\text{TradeCredit}_{ijkt}^{\text{Pre}} = \frac{1}{3} \sum_{t=2004}^{2006} \text{TradeCredit}_{ijkt}$, which proxies firm’s routine trade credits. Then, I split the sample into two groups by the median value of $\text{TradeCredit}_{ijkt}^{\text{Pre}}$ and conduct estimations by groups. Estimates of specification (17) are reported in columns 1 and 3 in Table 7, while estimates of specification (19) are shown in columns 2 and 4. Columns 1-2 in Table 7 shows that exporting firms with lower level of trade credit experienced great
increase in their exports, especially for those with less pledgeable assets. However, for those routinely receive more trade credit, the bank deconcentration has smaller effects on promoting their exports (columns 3-4 in Table 7), which is consistent with the argument of trade credit financing discussed above.

Additionally, the effect of bank concentration may also vary across foreign and domestic controlled exporting firms, as the foreign controlled firms may be less financially constrained as they can access to the capital market abroad and receive funding from their parent company (Manova et al., 2015). To explore this potential heterogenous effect, I re-estimate specifications (17) and (19) by domestic and foreign group, respectively. Columns 5-8 in Table 7 display supporting evidence for this argument, that is, foreign controlled exporting firms are less affected by the bank deconcentration.

\[\text{Insert Table 7}\]

### 6.2 Borrowing Relationship

As discussed in Section 3 and 5, the effect of bank concentration roots in the entry of new small banks after 2007. However, the new entry small banks will only have real impact if the exporting firms are willing to build a new borrowing relationship with them. As the new small banks are the rural financial institutions that are typically not controlled by the government, the state-owned exporting firms are less likely to borrow from these new small banks given their inherent relationship with the state-owned banks. Moreover, the inherent relationship between the state-owned banks and state-owned enterprises also mitigates the difficulty of borrowing for SOEs, even they have less pledgeable assets. Therefore, I expect that the small-bank-induced bank deconcentration will not have positive effects on SOEs. To show this, I re-estimate specifications (17) and (19) by non-SOEs and SOEs, respectively, and demonstrate supporting evidence in Table 8. In particular, column 3-4 in Table 8 show that the bank deconcentration (induced by small banks) have negative impact on the exports of state-owned enterprises, and this effect is mitigated when the state-owned enterprises endow
with larger amount of fixed assets.

[Insert Table 8]

In sum, the heterogeneous effects further prove the lending channel through which bank deconcentration influences firm’s exports.

7 Conclusions

Bank concentration is important to exports in terms of credit allocation. This paper builds a theoretical model to demonstrate the mechanism through which bank concentration affects firm exports. In particular, the model implies that new entry banks compete with the existing banks for business loans and re-allocate those funds to the ideal exporting firms to maximize their profits. Small banks tend to allocate loans to firms with less pledgeable assets given their comparative advantage in collecting the soft information, whereas large banks have opposite tendency. Consequently, bank market that is concentrated with less large banks favors constrained exporting firms with less pledgeable assets, contributing to an expansion of firm exports. Using the panel data of Chinese manufacturing firms between 2007 and 2013, I find model-consistent evidences that the bank entry reform in 2007 leads to an exogenous entry of small banks, creating a less concentrated bank market in China and largely promoting the firm exports, especially for firms endowed with less pledgeable assets. In contrast, the counterfactual evidence suggests that the variations of bank concentration has no correlation with firm exports without the entry of small banks, supporting the argument that competition among large banks would not cause credit reallocation towards the much-needed small exporting firms. Further evidence shows that exporting firms with less pledgeable assets have greater increases in their liabilities, especially short-term liabilities, as well as their interest payment, when the credit market is less concentrated with large banks, providing supporting evidence for the role of small banks to alleviate the financial constraints of small business. Moreover, I show that the entry of small banks matter more for
exporting firms that cannot finance the working capital by trade credit and foreign capital routinely, or exporting firms without inherent relationship with large banks, further supporting the lending channel through which small-bank-induced bank deconcentration affects firm’s exports.

From a policy perspective, the positive finding of the impact of bank entry reform has important policy implication; that is, the intention of the central government in increasing credit availability and alleviating firms’ financial constraints may not be achieved by only promoting the competition of large banks. For the liquidity constrained firms, especially the exporting firms, one of the major reason that prevent them from accessing bank credit is the lack of quantitative information and pledgeable assets. However, large banks are less likely to lower the collateral requirement even they face fiercer competition in the market, given their relative higher costs in screening and monitoring. The competition among large banks only result in an allocation of funds across different large firms that endowed with plentiful pledgeable assets and can easily obtain external financing from any banks in the market. Nevertheless, the competition between small and large banks change the story in the credit market. That is, small banks could compete for loans and reallocate the funds towards the exporting firms with collateral constraints, promoting their foreign sales significantly. In all, introducing more small banks into the credit market could create strong credit allocation effects that favor the constrained exporting firms, which helps them alleviate the liquidity shortages and contributes to great expansion for their business.
References


Figure 1: Cost of screening and monitoring for small and large banks

Notes: \( \kappa^b(C) \) and \( \kappa^B(C) \) are the cost of screening and monitoring given the amount of collateral \( C \) for small and large bank, respectively.

Figure 2: Histogram of change in bank concentration induced by entry of small banks

Notes: The histogram shows the distribution of the average predicted change of bank concentration index \( \Delta HHJ_j \) for city \( j \) from 2007 through 2013, i.e., \( \Delta HHJ_j = \frac{1}{7} \sum_{t=2007}^{2013} \Delta HHJ_{jt} \), where \( \Delta HHJ_{jt} = HHJ_{jt}^{Counter} - HHJ_{jt}^{Actual} \).
Figure 3: Spatial Distribution of change in bank concentration induced by entry of small banks

Notes: The map shows the spatial distribution of the average predicted change of bank concentration index $\Delta HHI_j$ for city j from 2007 through 2013, i.e., $\Delta HHI_j = \frac{1}{7} \sum_{t=2007}^{2013} \Delta HHI_{jt}$, where $\Delta HHI_{jt} = HHI_{jt}^{Counter} - HHI_{jt}^{Actual}$. Darker purple represents cities with larger $\Delta HHI_j$. 
Notes: This figure shows the distribution of the estimates from the 500 placebo simulations along with the benchmark estimate, 1.76, from column 2 in Table 2. The placebo simulations are conducted by the following procedure. First, given the number of branches for new small banks (establish in or after 2007) in each city and each year, I randomly drop the same number of branches for any new banks (establish in or after 2007) and compute $HHI_{jt}^{CounterPlacebo}$. Second, subtracting $HHI_{jt}^{Actual}$ from $HHI_{jt}^{CounterPlacebo}$, I obtain the placebo change of bank concentration $\Delta HHI_{jt}^{Placebo}$. Third, regress firm exports on $\Delta HHI_{jt}^{Placebo}$, as well as other control variables in specification (17), I get the estimated coefficient for one simulation. Lastly, repeat the above steps 500 times and plot the distribution of the estimated coefficients for $\Delta HHI_{jt}^{Placebo}$.
Figure 5: Marginal effect of bank concentration on firm’s export

Notes: This figure shows the marginal effect of $\Delta HHI_{jt-1}$ on firm exports obtained from column 1 in Table 4 across the observed range of the firm’s pledgeable assets. The solid sloping line indicates how the marginal effect changes as the firm’s fixed asset endowment increases, while the two dashed lines, representing 95% confidence intervals.
Table 1: Summary Statistics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Obs</th>
<th>Mean</th>
<th>Std.Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>△HHI</td>
<td>242,577</td>
<td>0.008</td>
<td>0.018</td>
<td>-0.006</td>
<td>0.170</td>
</tr>
<tr>
<td>HHICounter</td>
<td>242,577</td>
<td>0.121</td>
<td>0.048</td>
<td>0.051</td>
<td>0.509</td>
</tr>
<tr>
<td>HHIActual</td>
<td>242,577</td>
<td>0.113</td>
<td>0.045</td>
<td>0.051</td>
<td>0.503</td>
</tr>
<tr>
<td>TotalAsset</td>
<td>242,577</td>
<td>10.649</td>
<td>1.436</td>
<td>5.649</td>
<td>15.606</td>
</tr>
<tr>
<td>TotalAsset_Pre</td>
<td>198,446</td>
<td>10.262</td>
<td>1.404</td>
<td>5.844</td>
<td>15.584</td>
</tr>
<tr>
<td>FixedAsset</td>
<td>242,023</td>
<td>9.150</td>
<td>1.689</td>
<td>0.000</td>
<td>15.445</td>
</tr>
<tr>
<td>FixedAsset_Pre</td>
<td>198,406</td>
<td>8.965</td>
<td>1.625</td>
<td>0.693</td>
<td>15.499</td>
</tr>
<tr>
<td>LiquidAsset</td>
<td>242,577</td>
<td>0.579</td>
<td>0.251</td>
<td>0.000</td>
<td>1.000</td>
</tr>
<tr>
<td>TotalDebt</td>
<td>232,615</td>
<td>9.932</td>
<td>1.442</td>
<td>5.303</td>
<td>13.022</td>
</tr>
<tr>
<td>ShortTermDebt</td>
<td>231,777</td>
<td>9.762</td>
<td>1.743</td>
<td>0.000</td>
<td>12.832</td>
</tr>
<tr>
<td>LongTermDebt</td>
<td>122,267</td>
<td>1.720</td>
<td>3.376</td>
<td>0.000</td>
<td>11.145</td>
</tr>
<tr>
<td>Interest</td>
<td>222,263</td>
<td>4.754</td>
<td>3.346</td>
<td>0.000</td>
<td>13.182</td>
</tr>
<tr>
<td>GDPPC</td>
<td>242,577</td>
<td>4.798</td>
<td>0.792</td>
<td>2.097</td>
<td>6.655</td>
</tr>
<tr>
<td>Primary/GDP</td>
<td>242,577</td>
<td>0.059</td>
<td>0.052</td>
<td>0.001</td>
<td>0.499</td>
</tr>
<tr>
<td>Second/GDP</td>
<td>242,577</td>
<td>0.534</td>
<td>0.063</td>
<td>0.170</td>
<td>0.851</td>
</tr>
<tr>
<td>PopDensity</td>
<td>242,577</td>
<td>6.435</td>
<td>0.480</td>
<td>2.319</td>
<td>8.837</td>
</tr>
<tr>
<td>TotalDeposits</td>
<td>242,577</td>
<td>17.344</td>
<td>1.139</td>
<td>12.768</td>
<td>19.486</td>
</tr>
</tbody>
</table>

Note: Authors’ calculations.

Table 2: Baseline Estimations

<table>
<thead>
<tr>
<th>Dep.Var.</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FirmExport_{ijkt}</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>△HHI_{jt-1}</td>
<td>3.402***</td>
<td>1.760**</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.710)</td>
<td>(0.717)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HHICounter_{jt-1}</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.998</td>
<td>0.694</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.768)</td>
<td>(0.828)</td>
</tr>
</tbody>
</table>

Other Controls     | No        | Yes       | No        | Yes       |
Observations        | 252,288   | 242,577   | 253,444   | 243,711   |
R-squared           | 0.862     | 0.863     | 0.861     | 0.863     |

Note: All regressions are controlled for firm, industry, city, and year fixed effects, total asset (in log), the leverage ratio, the share of liquid asset, the dummy of firm’s ownership, GDP per capita (in log), population density (in log), total deposits (in log), ratio of primary industry to total GDP, and ratio of secondary industry to total GDP. Standard errors are reported in parentheses, clustered at both city level and industry level. *, ** and *** denotes the significance at the 10%, 5% and 1% level, respectively.
Table 3: Responses of Large and Small Banks

<table>
<thead>
<tr>
<th>Dep. Var.</th>
<th>$\triangle # \text{LargeBank}_{jt-1}$</th>
<th>$\triangle # \text{SmallBank}_{jt-1}$</th>
<th>$\triangle # \text{SmallBank}_{jt-1}$</th>
<th>Other Controls</th>
<th>Observations</th>
<th>R-squared</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>No</td>
<td>2,380</td>
<td>0.315</td>
</tr>
<tr>
<td>$\triangle # \text{SmallBank}_{jt-1}$</td>
<td>-0.036</td>
<td>0.022</td>
<td>0.365</td>
<td>Yes</td>
<td>1,897</td>
<td>0.062</td>
</tr>
<tr>
<td>$\triangle # \text{LargeBank}_{jt-1}$</td>
<td></td>
<td></td>
<td>0.056</td>
<td>No</td>
<td>2,380</td>
<td>0.042</td>
</tr>
<tr>
<td>$\triangle # \text{LargeBank}_{jt-1}$</td>
<td></td>
<td></td>
<td>(0.259)</td>
<td>Yes</td>
<td>2,380</td>
<td>0.032</td>
</tr>
<tr>
<td>$# \text{LargeBank}_{jt-1}$</td>
<td></td>
<td></td>
<td>-0.126</td>
<td>No</td>
<td>1,897</td>
<td>0.099</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.099)</td>
<td>Yes</td>
<td>1,897</td>
<td>0.059</td>
</tr>
</tbody>
</table>

Note: All estimations are controlled for city and year fixed effects. GDP per capita (in log), population density (in log), total deposits (in log), ratio of primary industry to total GDP, and ratio of secondary industry to total GDP. Robust standard errors are reported in parentheses. *, ** and *** denotes the significance at the 10%, 5% and 1% level, respectively.

Table 4: Differential Effects on Small Exporting Firms

<table>
<thead>
<tr>
<th>Dep. Var.</th>
<th>$\triangle \text{HHI}_{jt-1}$</th>
<th>$\triangle \text{HHI}<em>{jt-1} \times \text{FixedAsset}</em>{ijkPre}$</th>
<th>$\triangle \text{HHI}<em>{jt-1} \times \text{TotalAsset}</em>{ijkPre}$</th>
<th>$\triangle \text{HHI}<em>{jt-1} \times \text{FixedAsset}</em>{ijkt-1}$</th>
<th>$\triangle \text{HHI}<em>{jt-1} \times \text{TotalAsset}</em>{ijkt-1}$</th>
<th>Other Controls</th>
<th>Observations</th>
<th>R-squared</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
<td>Yes</td>
<td>198,406</td>
<td>0.863</td>
</tr>
<tr>
<td>$\triangle \text{HHI}_{jt-1}$</td>
<td>17.463***</td>
<td>25.525***</td>
<td>10.348***</td>
<td>17.643***</td>
<td></td>
<td>Yes</td>
<td>198,446</td>
<td>0.863</td>
</tr>
<tr>
<td>$\triangle \text{HHI}<em>{jt-1} \times \text{FixedAsset}</em>{ijkPre}$</td>
<td>-1.736***</td>
<td>(0.247)</td>
<td></td>
<td>-0.922***</td>
<td>-1.483***</td>
<td>Yes</td>
<td>241,844</td>
<td>0.863</td>
</tr>
<tr>
<td>$\triangle \text{HHI}<em>{jt-1} \times \text{TotalAsset}</em>{ijkPre}$</td>
<td>-2.329***</td>
<td>(0.336)</td>
<td></td>
<td></td>
<td></td>
<td>Yes</td>
<td>242,577</td>
<td>0.863</td>
</tr>
<tr>
<td>$\triangle \text{HHI}<em>{jt-1} \times \text{FixedAsset}</em>{ijkt-1}$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\triangle \text{HHI}<em>{jt-1} \times \text{TotalAsset}</em>{ijkt-1}$</td>
<td></td>
<td></td>
<td>-1.483***</td>
<td>(0.271)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: All regressions are controlled for firm, industry, city, and year fixed effects, total asset (in log), the leverage ratio, the share of liquid asset, the dummy of firm’s ownership, GDP per capita (in log), population density (in log), total deposits (in log), ratio of primary industry to total GDP, and ratio of secondary industry to total GDP. Standard errors are reported in parentheses, clustered at both city level and industry level. *, ** and *** denotes the significance at the 10%, 5% and 1% level, respectively.
Table 5: Impact of Bank Concentration on Firm’s Debts

<table>
<thead>
<tr>
<th>Dep.Var.</th>
<th>TotalDebt$_{ijkt}$</th>
<th>ShortTermDebt$_{ijkt}$</th>
<th>LongTermDebt$_{ijkt}$</th>
<th>Interest$_{ijkt}$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
</tr>
<tr>
<td>$\Delta HHI_{jt-1}$</td>
<td>13.814***</td>
<td>11.743***</td>
<td>6.085</td>
<td>26.095***</td>
</tr>
<tr>
<td></td>
<td>(2.527)</td>
<td>(3.109)</td>
<td>(4.310)</td>
<td>(5.944)</td>
</tr>
<tr>
<td>$\Delta HHI_{jt-1}$</td>
<td>-1.460***</td>
<td>-1.270***</td>
<td>-0.726</td>
<td>-2.765***</td>
</tr>
<tr>
<td>$\times FixedAsset_{ijkPre}$</td>
<td>(0.247)</td>
<td>(0.291)</td>
<td>(0.467)</td>
<td>(0.593)</td>
</tr>
</tbody>
</table>

Other Controls
- Yes
- Yes
- Yes
- Yes

Observations
- 188,942
- 188,226
- 100,241
- 179,658

R-squared
- 0.905
- 0.770
- 0.816
- 0.812

Note: All regressions are controlled for firm, industry, city, and year fixed effects, total asset (in log), the leverage ratio, the share of liquid asset, the dummy of firm’s ownership, GDP per capita (in log), population density (in log), total deposits (in log), ratio of primary industry to total GDP, and ratio of secondary industry to total GDP. Standard errors are reported in parentheses, clustered at both city level and industry level. *, ** and *** denotes the significance at the 10%, 5% and 1% level, respectively.
Table 6: Robustness: Alternative Subsamples

<table>
<thead>
<tr>
<th>Dep.Var.</th>
<th>Balanced Sample</th>
<th>Pure Exporter</th>
<th>Non-capital</th>
<th>Non-pilot</th>
<th>Non-crisis</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\Delta HHI_{jt-1}$</td>
<td>$2.548^{***}$</td>
<td>$21.729^{***}$</td>
<td>$1.862^{***}$</td>
<td>$11.179^{***}$</td>
<td>$1.757^{**}$</td>
</tr>
<tr>
<td></td>
<td>$(0.920)$</td>
<td>$(3.151)$</td>
<td>$(0.517)$</td>
<td>$(1.188)$</td>
<td>$(0.714)$</td>
</tr>
<tr>
<td>$\Delta HHI_{jt-1} \times FixedAsset_{ijkPre}$</td>
<td>$-2.071^{***}$</td>
<td>$-1.140^{***}$</td>
<td>$-1.696^{***}$</td>
<td>$-1.692^{***}$</td>
<td>$-1.692^{***}$</td>
</tr>
<tr>
<td></td>
<td>$(0.307)$</td>
<td>$(0.148)$</td>
<td>$(0.245)$</td>
<td>$(0.243)$</td>
<td>$(0.243)$</td>
</tr>
<tr>
<td>Other Controls</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Observations</td>
<td>123,678</td>
<td>114,205</td>
<td>40,076</td>
<td>32,748</td>
<td>211,460</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.844</td>
<td>0.846</td>
<td>0.920</td>
<td>0.930</td>
<td>0.863</td>
</tr>
</tbody>
</table>

Note: All regressions are controlled for firm, industry, city, and year fixed effects, total asset (in log), the leverage ratio, the share of liquid asset, the dummy of firm’s ownership, GDP per capita (in log), population density (in log), total deposits (in log), ratio of primary industry to total GDP, and ratio of secondary industry to total GDP. Standard errors are reported in parentheses, clustered at both city level and industry level. *, ** and *** denotes the significance at the 10%, 5% and 1% level, respectively.
Table 7: Heterogeneous Effect - Credit Tightness

<table>
<thead>
<tr>
<th>Dep.Var.</th>
<th>FirmExport&lt;sub&gt;ijkt&lt;/sub&gt;</th>
<th>Low Trade Credit</th>
<th>High Trade Credit</th>
<th>Domestic Controlled</th>
<th>Foreign Controlled</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>△HHI&lt;sub&gt;jt−1&lt;/sub&gt;</td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.014***</td>
<td>19.566***</td>
<td>1.827**</td>
<td>16.820***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.721)</td>
<td>(2.417)</td>
<td>(0.858)</td>
<td>(2.870)</td>
</tr>
<tr>
<td></td>
<td>△HHI&lt;sub&gt;jt−1&lt;/sub&gt;</td>
<td>-1.942***</td>
<td>-1.703***</td>
<td>-1.711***</td>
<td>-1.390***</td>
</tr>
<tr>
<td></td>
<td>×FixedAsset&lt;sub&gt;ijkPre&lt;/sub&gt;</td>
<td>(0.237)</td>
<td>(0.303)</td>
<td>(0.273)</td>
<td>(0.500)</td>
</tr>
<tr>
<td>Other Controls</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.858</td>
<td>0.859</td>
<td>0.866</td>
<td>0.866</td>
<td>0.863</td>
</tr>
</tbody>
</table>

Note: The “Low Trade Credit” group represents firms with below-median trade credits before 2007, while the “High Trade Credit” group are firms with above-median trade credits before 2007. The “Domestic Controlled” group includes all domestic exporting firms, while “Foreign Controlled” group are exporting firms with foreign ownership. All regressions are controlled for firm, industry, city, and year fixed effects, total asset (in log), the leverage ratio, the share of liquid asset, the dummy of firm’s ownership, GDP per capita (in log), population density (in log), total deposits (in log), ratio of primary industry to total GDP, and ratio of secondary industry to total GDP. Standard errors are reported in parentheses, clustered at both city level and industry level. *, ** and *** denotes the significance at the 10%, 5% and 1% level, respectively.
<table>
<thead>
<tr>
<th></th>
<th>Dep.Var.</th>
<th>FirmExport$_{ijkt}$</th>
<th>Non State-owned Firms</th>
<th>State-owned Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>$\Delta HHI_{jt-1}$</td>
<td>1.787**</td>
<td>17.763***</td>
<td>-1.095</td>
<td>-19.479*</td>
</tr>
<tr>
<td></td>
<td>(0.733)</td>
<td>(2.369)</td>
<td>(1.469)</td>
<td>(10.508)</td>
</tr>
<tr>
<td>$\Delta HHI_{jt-1}$</td>
<td>-1.777***</td>
<td></td>
<td></td>
<td>1.577*</td>
</tr>
<tr>
<td>$\times FixedAsset_{ijkPre}$</td>
<td></td>
<td></td>
<td>(0.237)</td>
<td>(0.913)</td>
</tr>
<tr>
<td>Other Controls</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Observations</td>
<td>236,428</td>
<td>192,841</td>
<td>5,724</td>
<td>5,210</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.864</td>
<td>0.864</td>
<td>0.859</td>
<td>0.861</td>
</tr>
</tbody>
</table>

Note: All regressions are controlled for firm, industry, city, and year fixed effects, total asset (in log), the leverage ratio, the share of liquid asset, the dummy of firm’s ownership, GDP per capita (in log), population density (in log), total deposits (in log), ratio of primary industry to total GDP, and ratio of secondary industry to total GDP. Standard errors are reported in parentheses, clustered at both city level and industry level. *, ** and *** denotes the significance at the 10%, 5% and 1% level, respectively.
## Appendix

### Table A1: Variable Definitions

<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>FirmExport</td>
<td>Firm’s total export sales (log)</td>
</tr>
<tr>
<td>$HHI_{Actual}$</td>
<td>$\sum_{b=1}^{B} (#branch_b / \sum_{b=1}^{B} #branch_b)^2$, $B$ is the number of all banks in a city</td>
</tr>
<tr>
<td>$HHI_{Counter}$</td>
<td>$\sum_{b=1}^{B'} (#branch_b / \sum_{b=1}^{B'} #branch_b)^2$, $B'$ excludes small banks established after 2006</td>
</tr>
<tr>
<td>$\Delta HHI$</td>
<td>$HHI_{Counter} - HHI_{Actual}$</td>
</tr>
<tr>
<td>TotalAsset</td>
<td>Firm’s total asset (log)</td>
</tr>
<tr>
<td>$Total Asset_{Pre}$</td>
<td>Firm’s total asset averaged from 2004 though 2006 (log)</td>
</tr>
<tr>
<td>FixedAsset</td>
<td>Firm’s fixed asset (log)</td>
</tr>
<tr>
<td>$Fixed Asset_{Pre}$</td>
<td>Firm’s fixed asset averaged from 2004 though 2006 (log)</td>
</tr>
<tr>
<td>LiquidAsset</td>
<td>Ratio of firm’s current asset to total asset</td>
</tr>
<tr>
<td>TotalDebt</td>
<td>Firm’s total liabilities +1 (log)</td>
</tr>
<tr>
<td>ShortTermDebt</td>
<td>Firm’s short-term liabilities +1 (log)</td>
</tr>
<tr>
<td>LongTermDebt</td>
<td>Firm’s long-term liabilities +1 (log)</td>
</tr>
<tr>
<td>Interest</td>
<td>Firm’s interest payment +1 (log)</td>
</tr>
<tr>
<td>GDPPC</td>
<td>Real GDP per capita (log), 1978 fixed price</td>
</tr>
<tr>
<td>Primary/GDP</td>
<td>Ratio of Primary Industry to total GDP</td>
</tr>
<tr>
<td>Second/GDP</td>
<td>Ratio of Secondary Industry to total GDP</td>
</tr>
<tr>
<td>PopDensity</td>
<td>Ratio of population to area (log)</td>
</tr>
<tr>
<td>TotalDeposits</td>
<td>Total deposits in all financial institutions within a city</td>
</tr>
<tr>
<td>Dep.Var.</td>
<td>$FirmExport_{ijkt}$</td>
</tr>
<tr>
<td>------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>$TotalDebt_{ijkt-1}$</td>
<td>0.060***</td>
</tr>
<tr>
<td></td>
<td>(0.012)</td>
</tr>
<tr>
<td>$ShortTermDebt_{ijkt-1}$</td>
<td>0.014**</td>
</tr>
<tr>
<td></td>
<td>(0.006)</td>
</tr>
<tr>
<td>$LongTermDebt_{ijkt-1}$</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>$Interest_{ijkt-1}$</td>
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</tr>
<tr>
<td></td>
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</table>

Other Controls

<table>
<thead>
<tr>
<th>Observations</th>
<th>232,745</th>
<th>232,217</th>
<th>139,167</th>
<th>219,067</th>
</tr>
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<tbody>
<tr>
<td>R-squared</td>
<td>0.863</td>
<td>0.862</td>
<td>0.887</td>
<td>0.867</td>
</tr>
</tbody>
</table>

Note: All regressions are controlled for firm, industry, city, and year fixed effects, total asset (in log), the leverage ratio, the share of liquid asset, the dummy of firm’s ownership, GDP per capita (in log), population density (in log), total deposits (in log), ratio of primary industry to total GDP, and ratio of secondary industry to total GDP. Standard errors are reported in parentheses, clustered at both city level and industry level. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.
A.1 Proof of Lemma 2

Based on the Equation (4) and the Condition (8.2), we get
\[ q_{hfs} \leq (1 - \eta)q_{hfs}^* = (1 - \eta)^{1 - \varepsilon} \left( \frac{\tau_{hf} a_h w_h}{\alpha} \right)^{-\varepsilon} \frac{\theta_k Y_f}{P_{fs}^{1 - \varepsilon}}. \] Next, I transform this condition by simple algebra:

\[ \frac{\varepsilon - 1}{\varepsilon} q_{hfs} - \frac{1}{\varepsilon} P_{fs}^{1 - \varepsilon} (\theta_k Y_f)^{\varepsilon - 1} \geq (1 - \eta)^{1 - \varepsilon} \tau_{hf} a_h w_h \]

(24)

Differentiating equation (8) by \( q_{hfs} \) and substitute it by the demand function \( q_{hfs} = \frac{\gamma_{hfs} p_{hfs}^{1 - \varepsilon} \theta_k Y_f}{P_{fs}^{1 - \varepsilon}} \) and the Condition (16), we get

\[
\frac{\partial \pi_{hfs}}{\partial q_{hfs}} = \frac{\partial p_{hfs}}{\partial q_{hfs}} q_{hfs} + p_{hfs} - \tau_{hf} a_h w_h
\]

(25)

\[
= \left( -\frac{1}{\varepsilon} \right) \left( \frac{q_{hfs} P_{fk}^{1 - \varepsilon}}{\theta_k Y_f} \right)^{-\varepsilon} \frac{P_{fs}^{1 - \varepsilon} \theta_k Y_f}{\theta_k Y_f} q_{hfs} + p_{hfs} - \tau_{hf} a_h w_h
\]

\[
= \left( -\frac{1}{\varepsilon} \right) \left( \frac{P_{fk}^{1 - \varepsilon}}{\theta_k Y_f} \right)^{1 - \varepsilon} q_{hfs}^{1 - \varepsilon} + p_{hfs} - \tau_{hf} a_h w_h
\]

\[
= \left( -\frac{1}{\varepsilon} \right) \left( \frac{P_{fk}^{1 - \varepsilon}}{\theta_k Y_f} \right) q_{hfs}^{1 - \varepsilon} + \left( \frac{P_{fs}^{1 - \varepsilon}}{\theta_k Y_f} \right) q_{hfs}^{1 - \varepsilon} - \tau_{hf} a_h w_h
\]

\[
= \frac{\varepsilon - 1}{\varepsilon} q_{hfs} P_{fs}^{1 - \varepsilon} (\theta_k Y_f)^{\varepsilon - 1} - \tau_{hf} a_h w_h
\]

\[
\geq [(1 - \eta)^{-\frac{1}{\varepsilon}} - 1] \tau_{hf} a_h w_h
\]

\[
> 0
\]

given that \((1 - \eta)^{-\frac{1}{\varepsilon}} > 1\).

In the unconstraint case, the firm pays \( B \equiv (1 - \eta)q_{hfs}^* \tau_{hf} a_h w_h \) internally. Given the bank credits have higher cost than the internal funds, we know that the firm will also use the amount of \( B \) to cover its variable cost in the constraint case. As the firm cannot borrow external funds in the constraint case, we have \( B = q_{hfs}^{**} \tau_{hf} a_h w_h \) for the constrained quantity \( q_{hfs}^{**} \). Based on the demand function, we have
\[ q_{hfs}^* = (1 - \eta)q_{hfs} \quad (26) \]

\[ p_{hfs}^* = \left( \frac{q_{hfs}^* P_{fk}^{1-\varepsilon}}{\theta_k Y_f} \right)^{-\frac{1}{\varepsilon}} \quad (27) \]

\[
= \left( \frac{P_{fk}^{1-\varepsilon}}{\theta_k Y_f} \right)^{-\frac{1}{\varepsilon}} [(1 - \eta)q_{hfs}^*]^{-\frac{1}{\varepsilon}} \\
= (1 - \eta)^{-\frac{1}{\varepsilon}} \left( \frac{P_{fk}^{1-\varepsilon}}{\theta_k Y_f} \right)^{-\frac{1}{\varepsilon}} \left[ \left( \frac{(1 - \eta)\tau_{hfa_hw_h}}{\alpha} \right)^{-\varepsilon} \theta_k Y_f \frac{P_{fk}^{1-\varepsilon}}{P_{fs}^{1-\varepsilon}} \right]^{-\frac{1}{\varepsilon}} \\
= (1 - \eta)^{-\frac{1}{\varepsilon}} \frac{(1 - \eta)\tau_{hfa_hw_h}}{\alpha} \\
= (1 - \eta)^{-\frac{1}{\varepsilon}} p_{hfs}^* \\
\]

Therefore,

\[ R_{hfk}^{**}(s) = p_{hfk}^* q_{hfk}^* = (1 - \eta)^ap_{hfk}^* q_{hfk}^* < R_{hfs}^*(s) \quad (28) \]