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Johannes Van Biesebroeck

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KU Leuven and CEPR

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KU Leuven, Naamsestraat 69, 3000 Leuven, Belgium. E-mail: jo.vanbiesebroeck@kuleuven.be.

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Abstract

While many studies explain the correlation between firm-level productivity and export status entirely by better firms self-selecting into exporting, a few studies find evidence of reverse causation. Especially in developing or transition economies, exporters seem to improve performance after they start selling internationally. We provide evidence that the realization of scale economies is one possible explanation for such a learning-by-exporting effect. Exporting enables small firms to expand output and exploit all scale economies that the production technology allows. With access to finance problems and weak contract enforcement at home, domestic expansion of SMEs is constrained by the necessity of awarding trade credit to new clients. We show that small firms with a lot of outstanding trade credit expand sales the most following export market entry. This is especially true if they operate in industries with higher scale economies or if they are located in provinces with weaker institutions. The same type of firms also enjoy the largest productivity gains immediately following export market entry.

Keywords: Trade Credit, Finance, Learning-by-Exporting, Scale Economies

JEL codes: F10, F12, F14

* Comments by participants at the "Internationalization of SMEs" workshop in Washington DC, especially by the discussant Olga Timoshenko, as well as detailed remarks by two anonymous referees are greatly appreciated.

1. Introduction

While a few studies have found evidence for learning-by-exporting effects, most studies have not. No one doubts that more productive firms self-selecting into exporting is an important contributing factor to the positive correlation between export status and productivity. In contrast, evidence of firms improving their productivity level after entering the export market and linking this change explicitly to their export experience is rare. If such a channel exists, it is likely to operate only selectively and temporarily. Not all firms benefit and the positive effects are exhausted quickly.

Understanding the mechanism behind learning-by-exporting effects, if they exist, is a key to identifying them empirically. If we understand better where to look for an effect, we are more likely to be able to measure it. Given the strong association between trade openness and economic performance at the aggregate level, it is important for policy makers to know whether a causal effect from openness to higher productivity is part of the story. I propose one particular mechanism that could underlie such a causal effect and present some supporting evidence for Chinese manufacturing firms.

Exporting is associated with specific risks that a firm does not face when selling domestically, e.g. lack of information about clients, exchange rate volatility, additional transportation costs and delays. To deal with these obstacles, dedicated institutions have sprung up, often supported by governments, to facilitate international trade transactions. A bill of lading allows exporters to be paid as soon as goods leave the port, transferring the risk of non-payment by the buyer to the seller's bank. In many countries a governmental agency insures and guarantees export sales. Moreover, if a client defaults, a seller has recourse to the courts and other mediation institutions in the client's country to help enforce the contract. Importers also tend to be larger and more conscience of their reputation than domestic clients. Especially for developing countries, it is possible that these institutional arrangements make export sales a more secure type of transaction than domestic sales.

I propose the following chain of causality. In developing countries, many firms are forced to remain small because expanding is too risky. Given the difficulty for many firms of accessing formal credit, clients will always demand and receive trade credit. Domestic expansion implies extending risky trade credit to lesser-known or less-reliable counterparties. The bargaining power of large firms further tilts the balance against small firms. SMEs selling only domestically tend to grant much more trade credit to their clients than they receive themselves from their suppliers. As a result, many small firms operate at a low, sub-

optimal scale and they do not exhaust the scale economies the production technology allows. They operate below efficient scale, because marginal sales are more risky in terms of nonpayment.

Exporting provides a way out of this inefficient situation. Not only does world demand for any product exceed domestic demand, the institutional environment also differs. Foreign clients are less financially constrained and will be more likely to pay on delivery or even at the time of order, i.e. they require less trade credit. Moreover, in the case of default an exporter has access to additional institutions to try getting the contract enforced or to insure the default risk. In a way, exporting goods is a way for small, vulnerable firms in countries with deficient rule-of-law to import (access to) better institutions.

The remainder of the paper is organized as follows. In Section 2 I survey the literature on learning-by-exporting effects and the link between financial constraints and trade. The model of the production function that underlies the analysis is introduced in Section 3 and the data in Section 4. Section 5 contains four sets of results that illustrate the following findings. First, access to finance is a significant problem in China and large outstanding volumes of trade credit hamper firm expansion. Second, exporting provides a way out of this, namely it allows firms to expand sales without expanding trade credit. Third, the production technology in many sectors still has a lot of unexploited scale economies in the range of the data were firms are operating. Fourth, firm-level productivity increases after firms enter the export market and this effect is more pronounced for firms that faced increasing returns to scale prior to their export market entry. Section 6 concludes.

2. Literature

A large literature documents and seeks to explain the strong positive correlation between export status and firm-level productivity. Many studies have found evidence of self-selection: firms that choose to enter the export market are already more productive in the years prior to entry. Two well-known studies even find that this direction of causality explains all of the correlation. Clerides, Lach, and Tybout (1998) use a structural model of export market entry for firms in Colombia and Mexico; Bernard and Jensen (1999) compare performance prior and following export market entry for the United States. They both find that firm's productivity levels do not change significantly after they start exporting.

This finding has been confirmed for firms in several other countries. Early contributions that concluded in favor of self-selection focused on exporters in Germany (Bernard and Wagner, 1997), Spain (Delgado, Farinas, and Ruano, 2002), and the United Kingdom (Greenaway, Gullstrand and Kneller, 2005). Wagner (2007) surveys the evidence from 54 empirical studies covering 34 countries and finds overwhelming evidence for export market entry to be more likely for firms with an above average initial productivity level.

This evidence, however, does not preclude that causality in the opposite direction, i.e. from exporting to productivity, is also at work. It is intuitive that exporters would benefit from their international activities. A few studies have found evidence for these, so-called, learning-by-exporting effects. Kraay (1998) is an early contribution studying a small sample of Chinese firms. Van Biesebroeck (2005) provides the first evidence using an econometric approach that properly controls for input endogeneity when estimating firm-level productivity. He looks at manufacturing firms in eight sub-Saharan African countries and uses several approaches to deal with the endogeneity of export market entry. De Loecker (2007) confirms the existence of learning-by-exporting effects for Slovenia for the period when the country transitioned out of a planned economy. He uses a matching estimator to construct an appropriate benchmark for the performance of exporters.

One possibility why there is limited evidence for learning-by-exporting is identified in De Loecker (2013). When productivity is estimated using a control function to account for endogenous input choices, one should control for the difference in the dynamic problem that exporters face. Their investment function or material demand looks different from that of non-exporters and the productivity inversion in the econometric estimation should reflect this. He shows that a failure to properly account for this methodological complication biases one against finding learning-by-exporting effects.

A second possibility is that only firms in some countries learn from their exporting activities. Several of the countries where no learning-by-exporting effects could be detected are advanced economies. Firms from more mature markets are less likely to learn about more advanced technologies from their clients. A collaborative study by the International Study Group on Exports and Productivity, ISGEP (2008), performs a meta-analysis on learning-by-exporting effects and country characteristics. They find that the weak effects of exporting on productivity are increasing in the import tariff and distance to trading partners, suggesting firms in more isolated markets stand to benefit more from export activities. They also show that the effects are decreasing in GDP per capita and quality of regulation of the home

country. These factors are likely correlated with the institutional problem of insecure trade credit that we will focus on in the empirical work.

Many studies following this initial work have attempted to prove or disprove the existence of learning-by-exporting effects or measuring their size and incidence. This led to a lot of econometric and measurement innovation, but a lot less attention has been devoted to the question of what could be the underlying reason or mechanism for positive effects on productivity. A few hypothesis have been advanced and tested in the literature.

First, firms can learning from clients how to produce more efficiently. De Loecker (2007) shows that Slovenian firms only benefit from exports to more advanced economies, mostly EU member states, not when they export to neighboring countries. Fafchamps, El Hamine, and Zeufack (2008) show for Morocco that firms not only need to learn about production methods, but also about the type of products that will be in demand overseas.

Second, exporters sell their product in a greater market and will have much greater incentives to make productivity enhancing investments. If productivity is endogenous, i.e. can be influenced by firms by investing in process or product innovation, there will be two-way feedback effects been the export market and productivity. Initially more productive firms will still self-select into exporting. However, even less productive, but forward-looking firms will realize that investments in productivity improvements can be repaid much more easily if they sell on the larger export market. The mere existence of the export market will entice low productivity firms to start innovating, subsequently enter the export market if the innovations pan out, and boost innovation and productivity even further as they scale up. Aw, Roberts, and Xu (2012) estimate a structural model that incorporates this mechanism for Taiwanese firms. Lileeva and Trefler (2008) show that the reduction in US import tariffs exogenously increased the effectively available market for Canadian firms. Firms with intermediate productivity levels responded to this by investing more, increasing their productivity, and entering the export market.

Third, a lot of papers have investigating the relationship between product quality and export status. If part of the transportation and other trading costs or not *ad valorem*, but incurred per unit of output, higher quality products are more likely to be exported and will be exporter farther and to more destinations. As firms often start exporting to neighboring countries and gradually sell farther afield, we would expect their quality mix to improve and hence also the average product price rise with export market experience (Iacovone and

Javorcik, 2012). On a larger market, firms also do not need to lower their prices as much to lower sales. Investments in quality improvements can be spread over a larger volume and they become more valuable (Verhoogen, 2008; Bustos, 2011). Several recent papers study the price differences that exporters can charge. Given that productivity is almost always measured using sales, not quantity, as dependent variable these price effects will be included in the productivity numbers (De Loecker, 2011). Garcia and Voigtländer (2013) demonstrate that these pricing effects can mask learning-by-exporting effects. They find strong learning-by-exporting effects once they filter out price effects from the usual revenue-based productivity numbers .

Fourth, an older literature already hypothesized that exporters could realize scale economies by selling goods into a larger market which would lead to reduced (average) costs. Tybout (2003) surveys this literature and reviews the empirical evidence. Recent work by Baldwin and Gu (2009) shows that following the trade agreement with the United States, Canadian firms sharply reduced the average number of products produced in each plant, while increasing the size of production runs. Producing fewer products, but each at much higher scale generated large productivity benefits by realizing scale economies a the product level.

The mechanism I posit is related to this last literature, but it operates continuously in the cross-section of firms, not only following a trade liberalization. Rather than showing up only when firms re-optimize their product portfolio following an exogenous market opening, exporting could be a way for any small firms to relax a domestic constraint and expand their scale of operations. The type of constraint I focus on is financial, and the link between financial constraints and exporting is again a very broad literature.

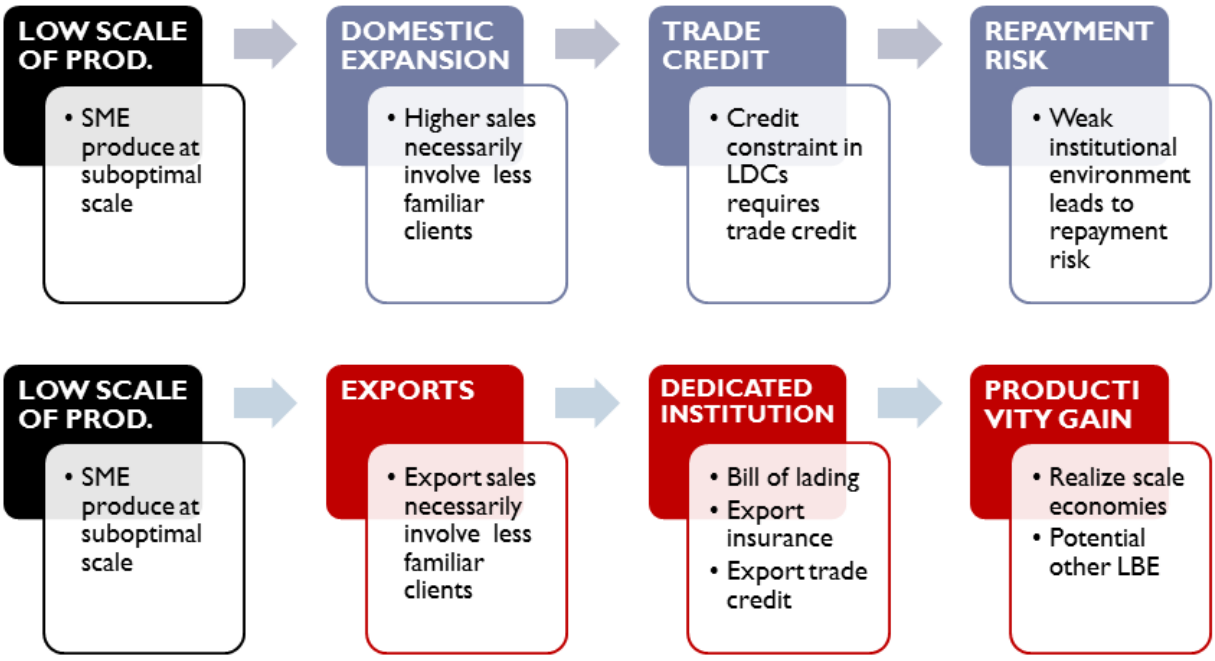
One example of a direct link between financing and exporting is Manova (2008) who shows that equity market liberalization, which provides a positive shock to credit availability, causes increased exports. Feenstra, Li and Yu (2011) further show that exporters are more credit constrained than other firms due to banks' difficulty of observing productivity. The financing constraint strengthen the productivity selection channel and provide an indirect link between financing, export-status, and productivity. However, the evidence does not always point in the same direction. For example, Berman and Héricourt (2010) find that access to finance leads to export market entry, but not to long term survival in exporting, nor to exporting of larger volumes. Their evidence suggests that financing constraints weaken the productivity selection channel and thus lowers the link between export status and productivity.

Two studies have also looked at the reverse effect, i.e. to what extent do export activities improve financial health? Both Do and Levchenko (2007) and Greenaway, Guariglia and Kneller (2007) provide some evidence that exporting improves firms finances. The first paper shows that an exogenous comparative advantage in finance-intensive goods at the country level, which they instrument using geography variables, leads to financial development. The second paper finds for UK firms that the correlation between financial health and exporting originates entirely from the export activities with no role for selection. Somewhat surprisingly, all of the identifying power in this paper comes from continuous exporters, not from starters.

It is important to highlight that most of the studies in the finance literature investigate to what extent financial health is a pre-condition for entering the export market or a consequence of it. The focus in this paper is quite different. The financing constraint that is relevant here is the one faced by clients. It is relevant for the export decision as domestic sales require firms, especially small firms, to extend more trade credit than they prefer. Export sales, on the other hand, do not require as much trade credit and thus relax a constrained faced only for domestic sales.

3. Model

The following figure illustrates the chain of causality we investigate. Small firms that only sell domestically will often be constrained by the amount of trade credit they need to extend to make additional sales. The weak institutional environment puts their capital and financial health at risk and limits their expansion. In contrast, once they turn to the export market, they can rely on dedicated institutions that are established to facilitate exporting and overcome similar repayment obstacles on international markets. On balance, it is possible that for small firms the domestic problems and risks outweigh the partially mitigated risks abroad.



To investigate whether there is a link between learning-by-exporting effects and the need to extend excessive trade credit, a constraint imposed by a general lack of financing in the local economy, we proceed in several steps.

First, we use survey information from the 2012 World Bank Enterprise Survey for China to illustrate the importance of access to financing. Firms rate this as the single most important obstacle to growth. Using the census of above-scale manufacturing firms from China's National Bureau of Statistics we confirm that a firm's growth, both in terms of output and inputs, is strongly negatively related to the amount of outstanding trade credit.

Second, we show that the sales growth for new exporters, and therefore also their subsequent increase in scale of operations, is systematically related to their prior amount of outstanding trade credit. Small firms extended most credit and are likely to be the most constrained by it. These same firms also expand most after they enter into the export market where they are less likely to extend trade credit with new sales. As a result, we find that for firms operating only domestically, the amount of outstanding trade credit is strongly decreasing in size, but not for exporters. In relative terms, small exporters are much less burdened by the need to extend trade credit than small non-exporters. In the Appendix, we confirm this pattern using the World Bank survey data and illustrate a few additional patterns.

Third, given that in the conjectured mechanism new exporters realize scale economies as they expand, we need to estimate a production function that allows for variable returns to scale. Therefore, we estimate the following translog production function:

$$\ln Q_{it} = \beta_l \ln L_{it} + \beta_{ll}(\ln L_{it})^2 + \beta_k \ln K_{it} + \beta_{kk}(\ln K_{it})^2 + \beta_{lk} \ln L_{it} \ln K_{it} + \omega_{it} + \epsilon_{it}.$$

The returns to scale are then given by

$$RTS = \left. \frac{\partial \ln Q(\lambda L, \lambda K)}{\partial \ln \lambda} \right|_{\lambda=1} = \beta_l + 2\beta_{ll} \ln L_{it} + \beta_k + 2\beta_{kk} \ln K_{it} + \beta_{lk}(\ln L_{it} + \ln K_{it}).$$

Depending on the parameter estimates, but also the input levels firms have chosen returns to scale can be increasing or decreasing for individual firms and this can even vary within sectors. We document that a significant fraction of firms are operating in a range where the production technology still has a lot of unexploited scale economies. We illustrate that there is again a systematic difference between exporters and non-exporters.

Fourth and finally, we will turn to the productivity effects. The productivity distribution by sector shows right away that in many sectors exporters have exhausted more of the scale economies and are less likely to operate in the range of technology where there are increasing returns to scale. Looking specifically at firm-level productivity changes immediately after firms enter the export market, we find a positive boost. This effect is more pronounced for firms that faced increasing returns to scale prior to their export market entry and for small firms in sectors where the marginal costs are of the usual U-shaped variety.

To estimate these effects we focus narrowly on new exporters and compare their productivity evolution one year before and one year after their export market entry. Firms that switch industry are excluded as their productivity levels are incomparable over time. We present results using productivity levels and including firm-fixed effects, as well as results using productivity growth with sector-fixed effects. Results are very similar in both specifications.

Note that if we use a productivity measure that is a residual from the translog production function above, the learning-by-exporting effects that we identify are in addition to the scale economies that firms realize simply by expanding sales following export market entry. To illustrate those additional effects, we also re-estimate the model assuming the Cobb-Douglas functional form. This amounts to imposing the assumption $\beta_{ll} = \beta_{kk} = \beta_{lk} = 0$, in which case returns to scale are constant and the same for all firms. To the extent that after they start exporting some firms reap scale economies and produce more output per input, this will be reflected in higher estimated effects using productivity as a residual from the Cobb-Douglas rather than the translog production function. This is indeed what we find.

An important dimension of the analysis is to verify according to what dimensions the productivity boost following export market entry varies. We estimate this by regressing $\widehat{\omega}_{it}$ or $\Delta\widehat{\omega}_{it}$ on a dummy for new exporters interacted with variables capturing firm size, outstanding trade credit prior to export market entry, and other firm characteristics.

4. Data

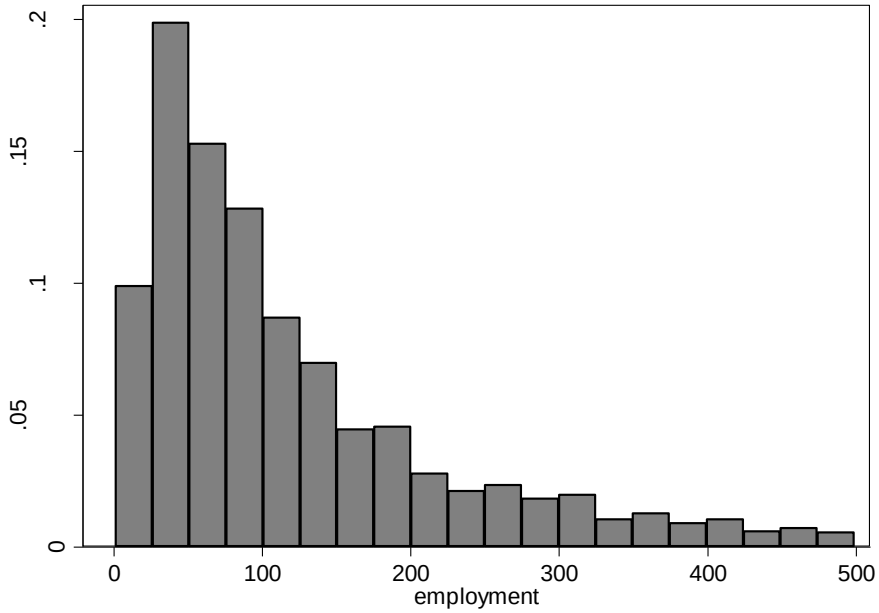
In the empirical analysis we use information from the annual survey of above-scale manufacturing establishments of the Chinese National Bureau of Statistics. This dataset covers a large unbalanced panel of industrial firms in China over the 1998-2007 period. The sample includes all state-owned enterprises and all other industrial firms with at least 5 million RMB of annual sales.[1] In total we observe 2.05 million observations for 536,245 firms. Brandt, Van Biesebroeck and Zhang (2012) provides detailed information on the sample composition and summary statistics.

Given our interest in the evolution of small firms, we illustrate the sample coverage in Figure 1. It shows the histogram of the employment distribution of all firms at age two. We use the second year of operation as some firms enter small and only operate for part of the year in their first active year. We have truncated the distribution at 500 employees, which represents the 90th percentile of the sample. Larger firms are included in the analysis, but not shown in Figure 1 as there is a long right-tail. Of those firms with fewer than 500 employees, almost one third even have fewer than 50 employees and 57.5% employ fewer than 100 workers. In total that amounts to 207,506 unique firms with fewer than 100 employees or 52% of all firms in the sample. On average, we observe the average firm for five to six years.

In most of the analysis we focus on the subset of privately owned firms as these tend to be smaller, more likely to enter the export market, and also extend a lot more trade credit as a fraction of their sales. In the group of private firms, fully 64.7% of firms have fewer than 100 employees and 32.1% have even fewer than 50 employees. Note that our definition of private firms includes a few hybrid categories, such as collectively owned enterprises and township and village enterprises. In Brandt et al. (2012) this group of mixed ownership firms was considered separately.

[1] Approximately $600,000 during the sample period.

Figure 1 Employment distribution across all firms (at age two)



Source: China's NBS "above-scale" manufacturing survey (1998-2007)

Almost 30% of firms are direct exporters at some point over the sample period and we observe 59,985 instances of export market entry. Limiting this to firms with non-missing information that permits us to estimate total factor productivity (TFP) and that do not stop exporting while remaining active leaves us with 19,476 observations of export market entry. In the estimation many more observations are included as we compare the sales growth and productivity evolution of export market entrants with the pattern for other firms.

One advantage of the Chinese situation is that export market entry was relatively exogenous for many firms. Initially, the Chinese government required a permit to export directly (Ahn *et al.* 2011) and only few firms, mostly state-owned firms, had such a permit at the beginning of the sample in 1998. This program was gradually relaxed and as part of China's accession agreement to the WTO, China agreed to give all firms direct access to the export market (Brandt *et al.* 2012). As a result, many firms probably wanted to start exporting earlier, but their entry was delayed because of administrative reasons.

5. Results

5.1 Access to finance as an obstacle to growth

When asked about the biggest obstacle faced, the problem most frequently mentioned by Chinese firms is access to finance. Statistics in Table 1 report survey results for a representative sample of firms organized by the World Bank. Details on the survey are in the

Appendix. The responses show that 21% of plants signal this as their most important concern, followed by lack of educated workers, competition from the informal sector and taxes. The importance of financing constraints is a common finding in developing countries, see for example Van Biesebroeck (2005) for comparable evidence in sub-Saharan Africa.

Table 1. What is the biggest obstacle faced by your business establishment? (self-reported)

	All establishments	Independent establishments
Access to finance	21.0%	21.7%
Inadequately educated workforce	16.1%	15.4%
Practices of competitors in the informal sector	15.8%	15.6%
Tax rates	15.6%	16.1%
Transport	7.5%	7.2%
Electricity	4.8%	5.0%
Access to land	4.7%	4.8%
Tax administration	4.0%	4.3%
Regulations: labor, customs, licenses	4.1%	3.7%
Corruption	1.1%	1.0%
Crime, theft and disorder; courts	0.8%	0.7%
Political instability	0.7%	0.8%
Does not apply, don't know	3.7%	3.6%

Source: World Bank, Enterprise Survey, China 2012.

Table 2. How much of a problem is "Access to finance" for your business?

	All establishments	Independent establishments
No obstacle	43.0%	42.3%
Minor obstacle	36.8%	37.2%
Moderate obstacle	15.2%	15.7%
Major or very severe obstacle	4.3%	4.2%

Source: World Bank, Enterprise Survey, China 2012.

Statistics in Table 2 further indicate that the problem is widespread. Many firms that do not flag it as their most important problem, still claim it as a problem. In total, almost 57% of enterprises report some type of financing constraints. Independent establishments are slightly more likely to suffer from it, both as the most important problem or as a problem at all.

The problem of access to finance is related to firm size as well as export status. Overall, exporters report more difficulty with financing. This is not unexpected as exporting is a capital intensive activity which leads to higher demand for financing, see for example Manova (2013) and Feenstra, Li and Yu (2013). Financing problems are increasing in firm size as well. This might be surprising as access to formal sources of finance, especially bank loans and overdrafts, is a lot easier for larger firms. Given that larger firms tend to operate more capital-intensively and ship their products over longer distances, their demand for finance is surely higher as well. On balance, the responses indicate that the firms' need for finance seems to grow more rapidly than their access.

Given the widespread problems of access to financing, especially formal financing such as bank loans or overdraft accounts, trade credit is a more informal financing channel to address the problem. Of course, as it helps some firms, it does so at the expense of other firms. In practice, firms cannot avoid extending some trade credit to their clients when making sales. The median outstanding balance as a fraction of annual turnover totals almost 10% of sales for firms in the Chinese manufacturing survey. The average is twice as high, at 15%, indicating that for some firms it has become a substantial sum. Approximately 8% of firms have an outstanding balance of more than half their annual sales.

Outstanding trade credit, in turn, can provide a drag on a firm's own expansion. Using the same data set, we illustrate in Table 3 that the growth rates of sales, value added, employment, and capital are all negatively related to high outstanding balances of trade credit in the preceding period. The negative effect is largest for capital at -0.085. Firms are more likely to hold off on making capital investments as they have higher balances of trade credit outstanding.

For the results in the first panel of Table 3 we have lagged the explanatory variable by two periods to avoid spurious correlation between firm sales in its denominator and the dependent variables. In the second panel, we present similar regressions of output and input growth on the balance of outstanding trade credit as fraction of annual turnover, but now we use the initial balance in the first year we observe the firm and the average growth rate in the entire subsequent period. All coefficients are still negative and highly significant and the effects are now stronger for both inputs than for both output measures.

Table 3. Outstanding trade credit constrains expansion

Annual growth:	**Sales**	**Value added**	**Employment**	**Capital**
Constant	0.132***	0.144***	0.017***	0.132***
	(0.001)	(0.001)	(0.001)	(0.001)
Outstanding trade credit (t-2)	-0.054***	-0.068***	-0.061***	-0.085***
	(0.004)	(0.005)	(0.004)	(0.003)
Industry (4-digit)-year FE	Yes	Yes	Yes	Yes
Number of observations	557,045	548,662	556,528	557,732
Average annual growth:	**Sales**	**Value added**	**Employment**	**Capital**
Constant	0.191***	0.212***	0.037***	0.203***
	(0.006)	(0.001)	(0.001)	(0.005)
Outstanding trade credit (initial year)	-0.0129**	-0.034***	-0.060***	-0.072***
	(0.005)	(0.006)	(0.004)	(0.005)
Industry (4-digit) FE	Yes	Yes	Yes	Yes
Number of observations	248,497	375,447	247,909	248,250

5.2 Expand through exports to circumvent trade credit

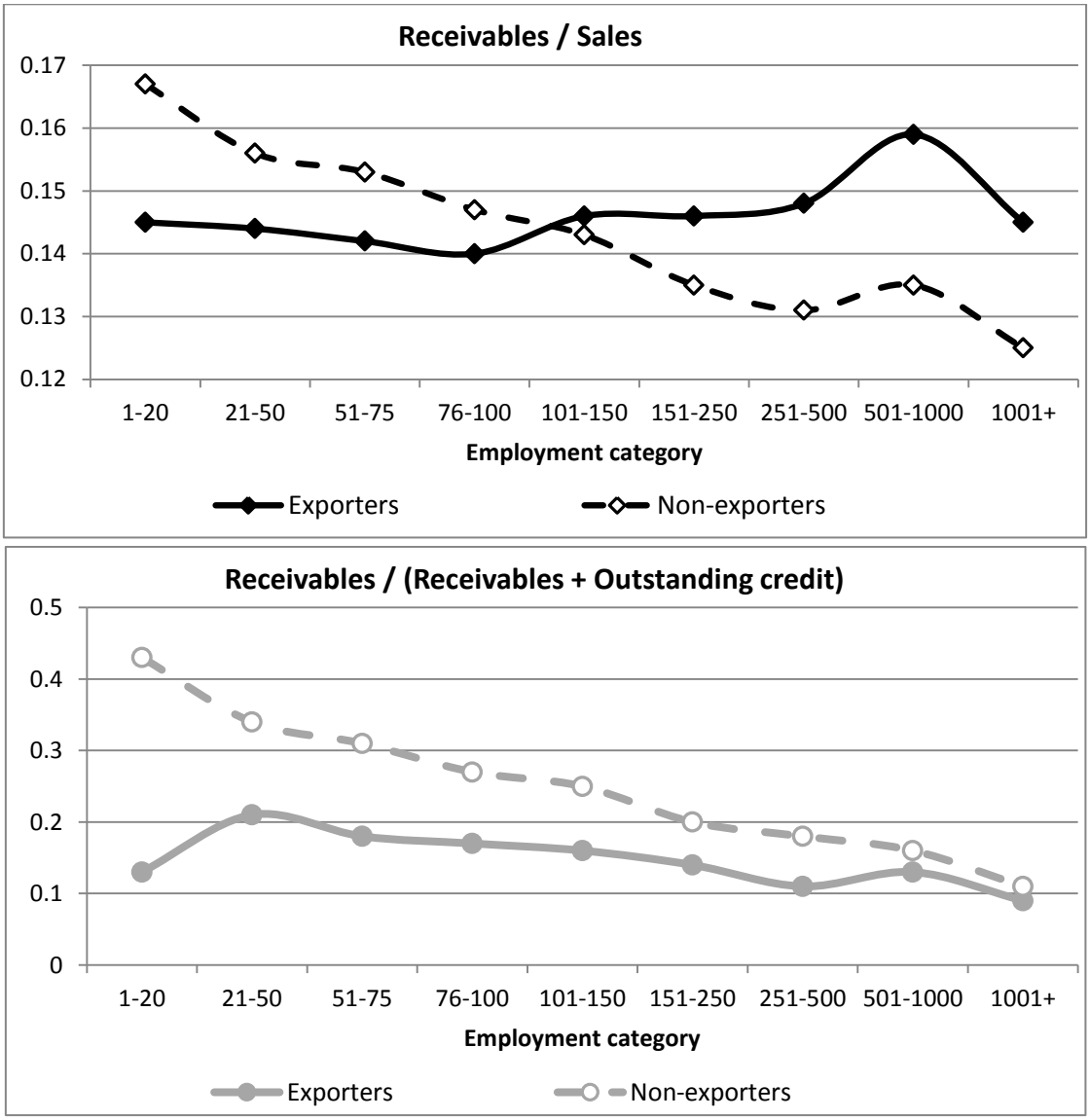
The above results suggest that extending trade credit can be a burden for firms and a limit to their expansion. We now verify how this practice varies by firm size and export status. In Figure 2, we rely on the sample of Chinese firms from NBS and in the Appendix we confirm the patterns and provide further supporting information using the smaller sample of firms from the World Bank survey.

The pattern in Figure 2 indicate that among smaller firms (as proxied by employment), non-exporters are a lot more financially extended than exporters. For medium-sized the difference between exporters and non-exporters vanishes and for larger firms it even reverses. Large exporters award more domestic trade credit than large non-exporters, but given that they also receive most of the formal financing they are more likely to afford it.

Another way to describe the same pattern is as follows. The amount of outstanding trade credit (receivables) as a percentage of sales is relatively invariant to firm size for exporters. The solid line in Figure 2 is only for a single size category outside the narrow 14.0% – 15% bracket. In contrast, for firms only selling domestically, the ratio is strongly declining with a firm's size. While outstanding trade credit for small firms is almost 17% of their annual sales, it is only just over 12% for the largest firms. Comparing the smallest to the largest category

of firms, small non-exporters have one third more trade credit outstanding, while small exporters are indistinguishable from large exporters on this metric.

Figure 2. Outstanding trade credit



The pattern is similar in the bottom panel of Figure 2. The amount of trade credit granted as a fraction of total trade credit—the sum of granted and awarded—does not vary with firm size for exporters. Again, this ratio is strongly declining with firm size for non-exporters. Small firms that only sell domestically grant almost as much credit as they receive, because their average ratio is close to one half. For large firms there is no difference between non-exporters are exporters and even small exporters receive vastly more trade credit than they award. The above statistics suggest that awarding trade credit to customers is an especially important burden for small firms that only sell domestically.

The above patterns refer to the cross-section of firms, but we can also look directly what happens when firms enter the export market. The results in Table 3 already indicted that firms that extend a lot of trade credit expand more slowly. Now we verify what difference a large volume of outstanding trade credit makes when firms enter the export market. To this end, we regress sales growth on dummies characterizing firms' export market changes and we interact those variables with the trade credit balance.

Table 4. Higher sales growth for new exporters that awarded more trade credit

Dependent variable:	**1/2 ln(Y_t/Y_{t-2})**	**1/3 ln(Y_t/Y_{t-3})**	**1/4 ln(Y_t/Y_{t-4})**
Constant (Never export)	0.160***	0.152***	0.142***
	(0.001)	(0.001)	(0.001)
Always export	-0.022***	-0.016***	-0.008***
	(0.001)	(0.001)	(0.001)
Start export	0.080***	0.062***	0.057***
	(0.002)	(0.002)	(0.002)
Credit ratio * Never	0.008***	0.001	0.005**
	(0.002)	(0.002)	(0.002)
Credit ratio * Always	0.022***	0.031***	0.036***
	(0.008)	(0.007)	(0.007)
Credit ratio * Start	0.076***	0.057***	0.059***
	(0.011)	(0.009)	(0.008)
Industry-year FE	Yes	Yes	Yes
Number of observations	548,654	375,447	249,457

The first set of results in Table 4 shows results from three regressions using average sales growth over two, three, or four year periods as dependent variable. The variable of interest is the `Start to export' dummy interacted with outstanding trade credit in the initial period. We include industry-year fixed effects as controls, as well as a dummy variables for firms that export throughout the entire sample period, also interacted with trade credit. The constant term will capture the effect of the omitted category, i.e. firms that never export and we also interact the identifier for that group with the trade credit variable. Note that we have normalized the credit variable by its sample mean, such that the interpretation of the uninteracted coefficients is the average sales growth.

The `Start to export' dummy is estimated positive and significantly different from zero in all three columns. This is entirely as expected as firms that enter the export market naturally expand their sales considerable, on average by six to eight percent per year. The results also suggest that firms serving only the Chinese market grow more rapidly than firms exporting

throughout. Given the very fast rate of domestic growth over this time period this is not entirely implausible.

The most interesting results are the interaction terms with trade credit. For each of the three categories of firms, sales growth is higher for firms that award more credit, although the point estimates are very small for non-exporters and not always significant. Coefficient are by far the largest for new export market entrants. A ten percent higher fraction of initial outstanding trade credit, is associated with 0.59 to 0.79 percent higher sales growth in subsequent years.[2] If outstanding trade credit is interpreted as a constraint on domestic expansion, these results are intuitive and the magnitudes plausible.

In the next set of results, in Table 5, we explore whether the key estimate—on the interaction between the `Start to export' dummy and the trade credit ratio—varies in plausible ways for different types of firms. We investigate the heterogeneity of the effect by further interacting the term with four more firm characteristics, one in each column of Table 5. To make sure the coefficient estimates of interest, indicated in the table with the shaded area, only measure the effect of the additional interaction on the sales growth of constrained export market entrants, we include all the dual-interaction terms involving the new variables. I.e. when interacting `Credit ratio * Start' with a new variable X, we also include X uninteracted, as well as X interacted with both variables (credit ratio and start to export) separately.

The signs on the coefficients of the triple-interaction terms all go in the expected direction. The sales growth for new exporters that had large outstanding trade credit, is especially pronounced for smaller firms (with fewer than one hundred workers). This is consistent with the higher relative reported incidence of finance problems for small non-exporters (see Appendix). The boost in sales growth is increasing in the average level of scale economies that we estimated for the industry. This captures directly one motivation for firms to expand. Firms in increasing returns to scale industries should be particularly eager to exploit export opportunities if domestic expansion is difficult.

Firms operating in provinces where there are more corruption cases per capita, results in the third column of Table 5, also show higher growth. This variable is picking up a weaker institutional environment and thus a greater relative advantage of export sales. Finally, we have omitted from our sample state-owned firms and firms with (some) foreign ownership

[2] To convert coefficients in log-points (x) to percentage growth, we use the following formula: exp(x)-1.

throughout as they are likely to face a different financing environment. This leaves fully private firms and a hybrid category that contains the older township and village enterprises and firms with mixed (domestic) ownership. Private firms grow most rapidly once they start exporting. This is consistent with evidence that the formal financing system in China still discriminates heavily against private enterprises.

Table 5. Sales growth for new exporters is also higher along other dimensions

	Dependent variable is $\frac{1}{2}\ln(Y_t/Y_{t-2})$			
Additional interaction:	X = "L < 100"	X = "High RTS"	X = "Weak institutions"	X = "Private firm"
Constant	0.176***	0.159***	0.161***	0.109***
(Never export)	(0.006)	(0.001)	(0.001)	(0.001)
Always export	-0.022***	-0.022***	-0.022***	-0.024***
	(0.001)	(0.001)	(0.001)	(0.001)
Start export	0.080***	0.081***	0.080***	0.076***
	(0.002)	(0.002)	(0.002)	(0.002)
Credit ratio * Never	0.113***	0.006**	0.008***	0.002
	(0.015)	(0.003)	(0.002)	(0.003)
Credit ratio * Always	0.129***	0.021***	0.022***	0.014*
	(0.017)	(0.008)	(0.008)	(0.008)
Credit ratio * Start	0.075***	0.068***	0.075***	0.089***
	(0.011)	(0.012)	(0.011)	(0.011)
X	-0.016***	0.008***		0.073***
	(0.006)	(0.002)		(0.001)
Start * X	0.011	-0.010*	0.011***	0.017***
	(0.036)	(0.006)	(0.004)	(0.006)
Credit ratio * X	-0.107***	0.008	-0.006	0.030***
	(0.016)	(0.005)	(0.005)	(0.004)
Credit ratio * Start * X	0.304**	0.030*	0.018*	0.094***
	(0.156)	(0.017)	(0.001)	(0.025)
Industry-year FE	Yes	Yes	Yes	Yes
No. of observations	548,654	548,654	548,654	548,654

5.3 Potential scale economies

Thus far, we have shown that small firms selling only domestically are constrained by the trade credit they (have to) extend. As they enter the export market, they disproportionately expand sales. The firms showing this pattern the strongest are small, private firms operating in provinces with weaker institutions. Also financially constrained firms in sectors with higher scale economies expand more strongly after they enter the export market. We now

evaluate to what extend there are unexploited scale economies in the different Chinese manufacturing sectors.

We estimate the translog specification by two-digit sector. Returns to scale are a function of the three higher order parameters, β_{ll}, β_{kk}, and β_{lk}, multiplied by the firms' choices of capital and labor inputs. As a result, they vary to some extent across firms. Assuming a standard U-shaped marginal cost curves, we expect returns to scale to be declining in firm size. For small firms that operate below minimum efficient scale, i.e. at a lower quantity than the low point of the marginal cost curve, returns to scale are increasing. Eventually, diminishing returns set in as firms become larger, because of congestion or diminishing returns to fixed inputs (e.g. managerial quality).

We implement the estimation algorithm described in De Loecker and Warzynski (2012) using the Stata code they made available through the journal's web site. Crucially, it incorporates a firm's export status in the inversion used to control for endogenous productivity. The results were similar to a standard fixed-effects specification in most sectors, but in some cases the results were entirely unreasonable, e.g. mean returns to scale larger than 100 or lower than 0.1. For the results reported below, we stick with the more stable fixed effects estimation results.

Table 6 lists a few summary statistics on the production function estimates. We report the fraction of firms in each sector to give a general idea of each sector's importance. The median returns in most sectors is not too far from unity, as one would expect. Individual firms, however, have estimates that cover a wide range of scale economies. The average 90% confidence interval for returns to scale estimates across the different sectors is [0.53, 1.23]. The higher order terms in the translog function are estimated significantly different from zero in most sectors which means that firms with different input choices do face different scale economies.

We indicate in particular what fraction of active firm-year observations imply increasing returns to scale. In some sectors there are virtually no such observations, while in other sectors almost all firms face increasing returns to scale. The fraction tends to be higher in light manufacturing sectors, higher up in the table.

In several sectors the square terms on both labor and capital are estimated to have coefficients with a positive sign, with usually a smaller coefficient in absolute magnitude on the interaction term. In these cases, returns to scale are increasing with firm size which is

somewhat counterintuitively. Small firms will experience little output growth if they expand inputs, while for large firms input growth translates into disproportionate output growth. Such estimates suggest that the marginal cost curve is inverse-U shaped in some sectors, at least over the range of the data. The large distortions in factor and product markets in China are perhaps an explanation for such puzzling findings, see for example Hsieh and Klenow (2009).

Table 6. Summary statistics on returns to scale estimates

Industry	CIC2	Fraction of firms	Median RTS	Fraction of obs. with RTS>1	Correlation of RTS with employment
Food processing	13	0.072	0.98	0.37	-0.19
Prepared foods	14	0.025	1.09	0.99	0.66
Beverages	15	0.019	1.15	0.95	0.48
Tobacco	16	0.001	0.93	0.20	-0.32
Textile	17	0.098	0.80	0.00	0.61
Apparel	18	0.054	1.03	0.99	0.05
Leather and fur	19	0.027	0.95	0.33	0.93
Wood products	20	0.027	0.86	0.00	-0.16
Furniture	21	0.014	1.10	0.84	-0.32
Paper	22	0.032	1.02	0.81	-1.00
Printing	23	0.022	1.02	0.55	-0.33
Culture, educ., sports products	24	0.014	1.02	0.58	-0.88
Petroleum products	25	0.004	0.92	0.01	-1.00
Chemical products	26	0.071	0.91	0.00	-0.01
Pharmaceutical products	27	0.020	1.09	1.00	-0.92
Fibers	28	0.004	0.91	0.17	0.76
Rubber	29	0.012	0.88	0.13	1.00
Plastics	30	0.050	0.92	0.02	0.92
Non-metal minerals	31	0.095	0.93	0.00	-0.12
Iron products	32	0.020	0.83	0.02	0.88
Basic metals	33	0.010	0.76	0.01	0.80
Metal products	34	0.045	0.93	0.02	-0.91
Tools and machinery	35	0.068	0.90	0.06	0.92
Equipment	36	0.040	0.97	0.26	0.60
Transport equipment	37	0.046	0.95	0.22	0.29
Arms	39	0.046	0.92	0.09	0.62
Electrical machinery	40	0.032	0.89	0.22	0.45
Electronic equipment	41	0.013	0.89	0.04	-0.38
Optical and measurement eq.	42	0.020	0.04	0.17	-0.96

In the last column of Table 6 we report the correlation of the firm-level scale economies and a measure of size, namely employment. The coefficients tend to be large in absolute

values as the estimated scale economies are a deterministic function of inputs. What matters is the sign. Only in sectors where the correlation is negative will we see the natural pattern of firms expanding to exploit available scale economies and eventually exhausting them. As firms increase their inputs, the estimated returns to scale they face will decline.

Figure 3. Returns to scale embodied in production technology (wooden furniture 2130)

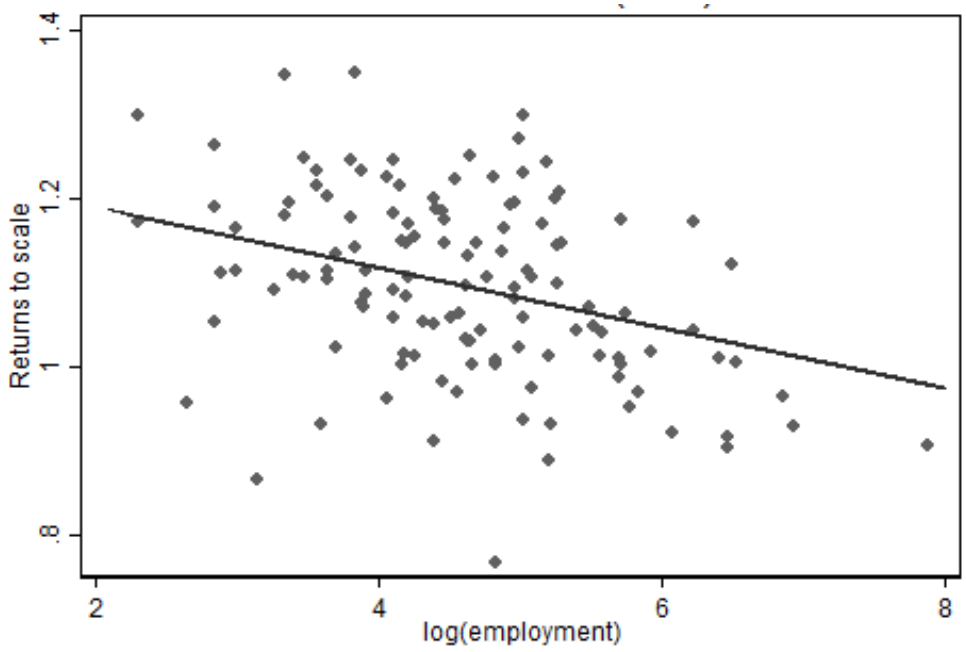


Figure 3 plots scale economies over the range of the data for one sector where the estimates are in line with expectations, namely wooden furniture (Chinese industry classification code 2130).[3] On the vertical axis we show the estimated firm-level scale economies and on the horizontal axis a proxy for firm size, log(employment). Scale economies tend to be lower for larger firms, which is natural as they have exploited most of the opportunities the technology allows. For many firms the estimated returns are even decreasing. This could be due to additional scale economies accruing with size that are unrelated to variable factor inputs and do not show up in the production function estimation. If fixed costs are important and they are not captured by the observed capital and labor input, e.g. they accrue to firm location, land, or managerial quality, firms would have an additional incentive to grow in size even after exhausting scale economies in their variable input use. It

[3] The production function is estimated at the two-digit level, but we only plot a subsample of firms from an even smaller 4-digit sector otherwise there would be too many markers on the graph.

is also possible, of course, that some firms have expanded too much and that they will shrink back in size.[4]

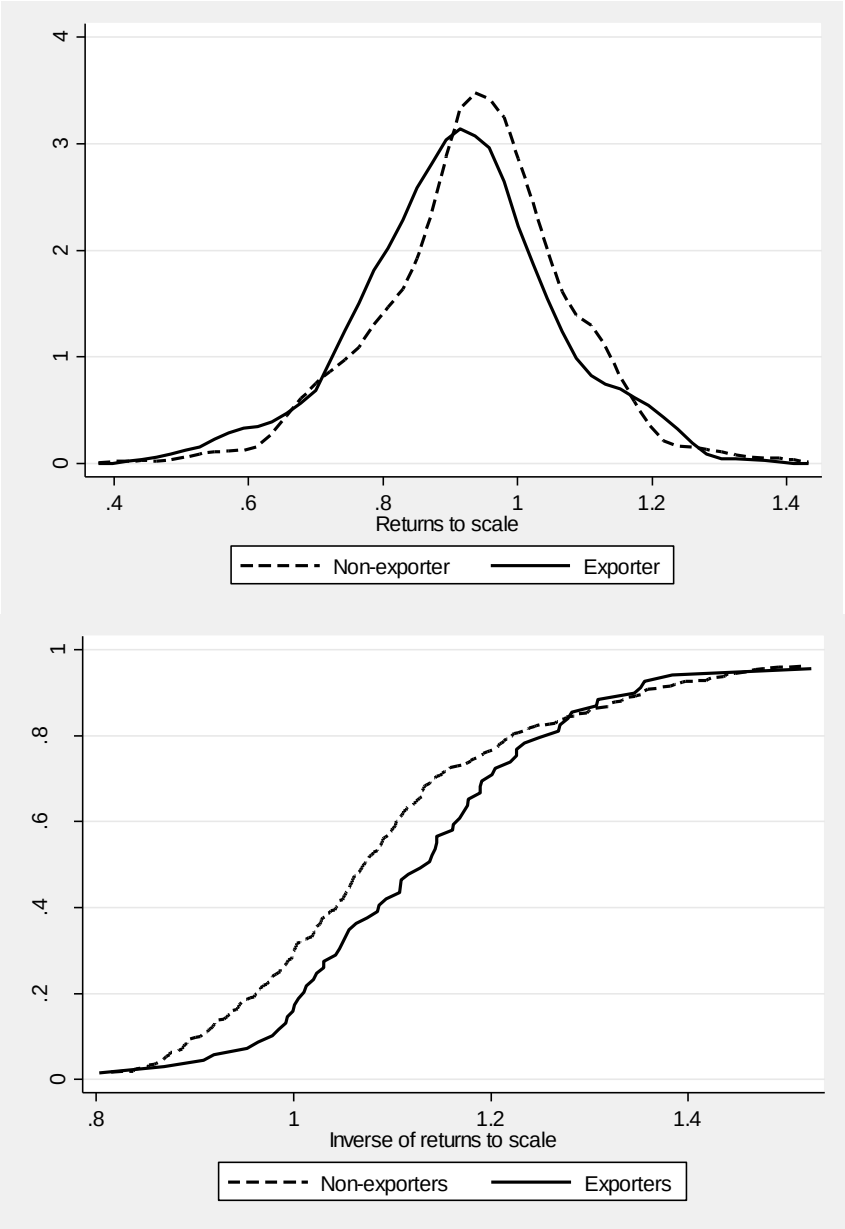
5.4 Productivity growth following export market entry

Now that we have seen that in most sectors many firms still face increasing returns to scale, we investigate whether exporters are noticeably different. In sectors where unexploited returns to scale are decreasing with firm size, those with negative correlations in the last column of Table 6, it are the small firms that still operate with scale economies. Given the higher average size of exporters, those sectors are most likely to confirm the expected pattern.

In Figure 4 we illustrate for the tobacco industry (CIC 1610) that exporters and non-exporters systematically operate at different points along the returns to scale spectrum. In the top panel we show the smoothed histogram for approximately 2000 firms, using for each firm the average scale economies over its active period. We plot the probability density functions separately for two groups. The solid line for exporters, is shifted slightly to the left of the dashed line for non-exporters. The right tail, where there are most unexploited scale economies, is also fatter for non-exporters.

[4] Yet an alternative explanation for the observed decreasing returns to scale observations is provided by De Loecker and Warzynski (2012). They argue that it can be caused by unobservable, but endogenous price variation. Firms can exploit a positive demand shock by raising prices rather than increasing output. Given that profit maximizing firms will always operate at a point where their residual demand curve is elastic, such a change will lead to larger quantity changes than sales changes and the coefficient estimates of the production function estimated using such variation will be below the true technological parameters. Firms still behave this way as they also save on costs as they reduce output. The estimated coefficients will be a function of both a mark-up term that is related to the demand elasticity and the marginal input productivities. As this bias affects the estimated returns to scale for all firms, it will not affect the comparison between firms.

Figure 4. Distribution of scale economies for exporters and non-exporters (tobacco 1610)



The difference in the distributions is much easier to see in the bottom graph which plots the cumulative density function for the same two group of firms. We now show the inverse of returns to scale on the horizontal axis, meaning that 0.8 represents increasing scale economies of 1.25. The distribution for non-exporters first-order stochastic dominates that of exporters. Given the larger average size of exporters and the declining scale economies with firm size, the pattern is not surprising. It does illustrate clearly that small non-exporters have a lot of room to exploit scale economies and raise output per input simply by growing larger.

As firms grow larger following export market entry, the technology allows them to produce more output per input aggregate. It does not represent technological change,

however, as it simply reflects a movements of the firm along the production function for the industry. If firms face similar factor prices, i.e. their inputs have the same opportunity costs, it does amount to a welfare benefit for society even in the absence of any firm-specific productivity improvement. Reassigning inputs from firms operating at decreasing returns to scale to firms operating with increasing returns to scale implies an improvement in allocative efficiency even without improved technical efficiency.

We have conjectured that export market entry relaxes an expansion constraint that firms face domestically, i.e. the need to extend additional trade credit with new firms. The estimates in Table 4 and Table 5, already indicated higher sales growth, especially for smaller firms. We now go one step further and see what happens with firm-level productivity following export market entry.

We use two different productivity measures as dependent variable in the regressions reported in Table 7. The columns labeled "CD" use productivity measured as a residual from a Cobb-Douglas production function. This functional form imposes the same technology and thus a constant level of scale economies on all firms in the same sector. To the extent that some firms face higher scale economies and exploit them as they expand, for example following export market entry, these effects will now also end up in the productivity measure.

The columns labeled "TL" use productivity measured as a residual from the more flexible translog production function. In this case, exploiting scale economies along the sectoral technology frontier will not show up in the productivity measures. The dependent variable now only captures firm-specific shifts in the frontier. If the mechanism we described above is operating, it should show up as higher effects of the `Start to export' dummy in the CD specification than in the TL specification.

In the top panel of Table 7 we use productivity levels and include firm-fixed effects. In the bottom panel we use productivity growth directly. We use a two-year change and define the `Start to export' dummy as one if a firm is not exporting in the initial year, but it is in the final year. Both specifications identify the effects from changes over time at the firm level and we expect the coefficients to be similar.

In the first two columns, we do find positive effects in both columns. They indicate that in addition to the output gain from simply growing larger, there is also a productivity boost associated with export market entry. The estimates show a more rapid productivity increase,

of 4.4% or 3.9%, for firms after they enter the export market. The estimates in the TL specifications are indeed lower, although the differences are not very large.

Table 7. Productivity growth following export market entry

(a) Dependent variable is productivity level (firm and year FE included in regression)

	CD	**TL**	**CD**	**TL**	**CD**	**TL**
Start to export	0.043***	0.039***	0.046***	0.017**	0.026***	0.025***
	(0.005)	(0.005)	(0.008)	(0.007)	(0.006)	(0.006)
Start to export * (RTS -1)			0.083*	-0.212***		
			(0.050)	(0.083)		
Start to export * (L < 50) * RTS'<0 sector					0.092***	0.078***
					(0.013)	(0.013)
No. observations	983,204	983,204	983,204	983,204	983,204	983,204

(b) Dependent variable is two-year productivity growth (sector-year FE)

Start to export	0.038***	0.031***	0.052***	0.019*	0.026***	0.013**
	(0.008)	(0.008)	(0.011)	(0.011)	(0.008)	(0.006)
Start to export * (RTS -1)			0.151**	-0.131		
			(0.075)	(0.086)		
Start to export * (L < 50) * RTS'<0 sector					0.075***	0.109***
					(0.021)	(0.021)
No. observations	476,570	476,570	476,570	476,570	476,570	476,570

Note: Sample excludes firms that switch sector or export throughout the entire period they are active

In the following columns we interact the `Start to export' dummy with two variables that specifically zoom in on the mechanism we proposed. First, we interact the dummy with the firm-specific level of scale economies, RTS – 1. This term is positive for firms facing increasing returns and negative for those facing decreasing returns to scale. In both the CD and TL columns we use the RTS estimate from the translog specification, otherwise there would be no difference across firms.

The results are supportive of the mechanism. Productivity growth is higher for new exporters that operated previously with increasing return to scale, but only when we leave those benefits in the productivity measure. Two two coefficients in the CD column are large, at 0.083 and 0.151, and estimated significantly different from zero. In contrast, if we

measure productivity relative to a technology that already allows for and incorporates the exploitation of scale economies, the interaction coefficient turns negative or insignificant.

In the last two column, we define an interaction term by multiplying the `Start to export' dummy with indicator variables for small firms (employment below 50) and a sector where returns to scale decline with firm size. These are exactly the firms where we expect to see rising sales following export market entry to exploit scale economies and lead to higher output per inputs. All coefficients on this triple-interaction term are estimated positive and statistically significant. Even the TL specifications now associate small firms that enter the export market with higher than average productivity growth, perhaps because the functional form restriction in the translog cannot entirely match their experience.

Finally, the results in Table 8 investigate what firm characteristics are systematically associated with higher or lower productivity effects for new exporters. We use the specification corresponding to the TL results in panel (a) in Table 7, i.e. translog productivity level as dependent variable with firm-fixed effects. To zoom in on the firms experience surrounding export market entry, we only keep a short window of two years prior and two years following the entry and limit the sample to new exporters.

In the top panel we study the impact of different firm characteristics by interacting them with the export dummy. These results are by and large intuitive and estimated highly significantly. The productivity boost for new exporters is higher for firms that are small, more capital-intensive, young, and located in provinces with weak institutions, i.e. more corruption cases. All of these firm types are also likely to be more constrained by the need to award trade credit and benefit from the scale increase associated with exporting. The current estimates measure the shift of the production function for them, which is an effect in addition to the scale effect.

Table 8. Variation in the productivity boost following export market entry

	Dependent variable is TFP level				
Export dummy	0.139***	0.138***	0.128***	0.135***	0.127***
	(0.008)	(0.008)	(0.007)	(0.008)	(0.008)
Exp. dummy * log(L)	-0.031***				
	(0.007)				
Exp. dummy * log(K/L)		0.019***			
		(0.006)			
Exp. dummy * log(age)			-0.028***		

			(0.011)		
Exp. dummy * "weak institutions"				0.123***	
				(0.013)	
Exp. dummy * log(EXP/Q)					-0.107***
					(0.004)
firm and year FE	Yes	Yes	Yes	Yes	Yes
No. of observations	29,348	29,348	29,340	29,348	29,348
Export dummy	0.142***	0.147***	0.131***	0.131***	0.131***
	(0.020)	(0.020)	(0.012)	(0.012)	(0.012)
Exp. dummy * log(No. products)	-0.009				
	(0.012)				
Exp. dummy * log(No. destinations)		-0.012			
		(0.011)			
Exp. dummy * log(% ordinary trade)			0.041		
			(0.032)		
Exp. dummy * log(relative UVR)				0.003	
				(0.015)	
Exp. dummy * log(% trade w/ OECD)					0.059**
					(0.029)
firm and year FE	Yes	Yes	Yes	Yes	Yes
No. of observations	11,511	11,511	11,511	11,511	11,511

Note: Sample only contains new exporters for two years before and two years following their initial export market entry; it excludes firms that switch sector. Sample in top panel is from annual manufacturing survey; in bottom panel it only contains new exporters that could be matched to custom's records.

In the bottom panel we follow a similar approach, but now we use variables that capture the nature of export market entry rather than the type of firm.[5] This panel explores whether the nature of export market entry also matters for the productivity gains, but the results are by and large negative. Four of the five interaction terms are estimated very small in size and highly imprecisely. The number of distinct products exported, nor the number of export destinations served seems to matter for the productivity gain. Firms selling more under the ordinary trade regime achieve slightly larger gains, but the difference is again insignificant. Even firms that are able to sell their products at relatively higher prices do not record higher productivity gains.

[5] Because we match firms to custom records on export transactions, we lose approximately one half of all observations in these regressions.

The estimate in the last column shows that the productivity increase is lower for firms that export a higher share of their total production. This captures a particular feature of the Chinese economy. Many export processing firms export all or most of their output, even though they are not particularly productive. They are able to export effectively because they have good foreign contacts and receive preferential policies, not necessarily because they are highly productive themselves.

Only firms that are able to export to high-income OECD markets achieve a stronger productivity boost. This findings is in line with the evidence for Slovenia in De Loecker (2007) and the evidence for firms entering in Science Parks in Schminke and Van Biesebroeck (2013). Together, the results in the bottom panel of Table 8 suggest that the nature of entry on the export market, i.e. the extent and type of of foreign contacts, is less important than the mere fact that a firm entered the export market. The only variable that could be considered a proxy for the institutional gap between China and its export partners—share of exports to OECD countries—did have a positive effect.

6. Conclusions

We have presented evidence for four facts that jointly map out a plausible chain of causality leading from financing constraints to export market entry and productivity growth.

First, firms in China report that access to finance is the largest obstacle they face. Especially small firms that only sell domestically tend to award a lot of trade credit to their clients as a fraction of sales. Having a large balance of outstanding trade credit is not costless, we show that it is associated with lower firm-level growth. It suggests that it constrains firms in their own expansion.

Second, firms that enter the export market record above average sales growth. This effect is particularly pronounced for firms that are small, privately-owned, or operate in sectors with high increasing returns to scale or in provinces with more corruption. These are the exact same firms that tend to face the highest financing constraints and the largest intensives to expand their scale of operations.

Third, flexible production function estimates indicate that in most sectors there are a lot of unexploited scale economies. If it are the small non-exporting firms that operate in the range of technology where scale economies are increasing, entering the export market and realizing higher sales could be an allocative benefit for the economy.

Fourth, when firms enter the export market for the first time, they receive a significant productivity boost. This reflects both a shift in their production function as well as a movement along the frontier to exploit scale economies. Both effects are net welfare gains to the economy. They are particularly large for firms that are small, young, capital-intensive, and located in provinces with more corruption. The nature of export market entry is far less important, except for a high share of exports going to OECD countries, which is associated with a higher productivity boost.

Taken together, these facts are consistent with the following explanation. With pervasive credit constraints in the local economy, firms, especially small firms, need to grant trade credit to increase sales. As they cannot take on too much client default risk, especially if enforcement of contracts is less than perfect, it constrains their expansion. Export market entry relaxes this constraint as exporters can take advantage of dedicated institutions set up to mitigate transaction costs and risks associated with international trade. As firms start exporting, they realize scale economies and are able to produce more output from their inputs. Moreover, new exporters realize further productivity gains, especially firms that export to richer and more institutionally secure OECD countries.

This provides one explanation for the learning-by-exporting effects that have been found in several poorer or transition economies. We can sum it up as follows. Exporting goods provides productivity benefits, as it implies importing better institutions or at least the services the institutions provide.

Appendix

In Section 5.1 we have shown the importance of access to financing problems in China's economy using the publicly available firm sample from the World Bank Enterprise Survey for China. This data source is a sample of 2,700 firms that were interviewed between December 2011 and February 2013. Firms are asked for quantitative information on their operations, but also on the type of problems they face. Comparable data exists for most countries around the world. The data itself with an overview of responses for each country are available online.[6] The online documentation also provides the full questionnaire and discusses the stratified-random sampling frame in detail.

In Figure A.1, we used the World Bank data to illustrate the different relationship between various financing and trade credit indicators and firm size for exporters and non-exporters. Each of these sets of lines should be interpreted as a difference-in-differences. We focus on the gap between exporters and non-exporters that are small (on the left) and the comparable gap for larger firms (on the right).

The first lines, on the left of Figure A.1, indicate that for small firms, non-exporters are a lot more financially constrained than exporters, while the differences for medium-sized or large firms are much smaller between exporters and non-exporters. As a result, the difference in reported financing problems between exporters and non-exporters, the difference-in-differences, is increasing in firm size.

One possible explanation for the greater difficulty of financing for non-exporters among small firms is that exporting relaxes the financing constraint. The lines in the middle of Figure A.1 show that small exporters have a much smaller share of their sales outstanding as trade credit. Again, for medium and large firms there is barely any difference between the two groups.

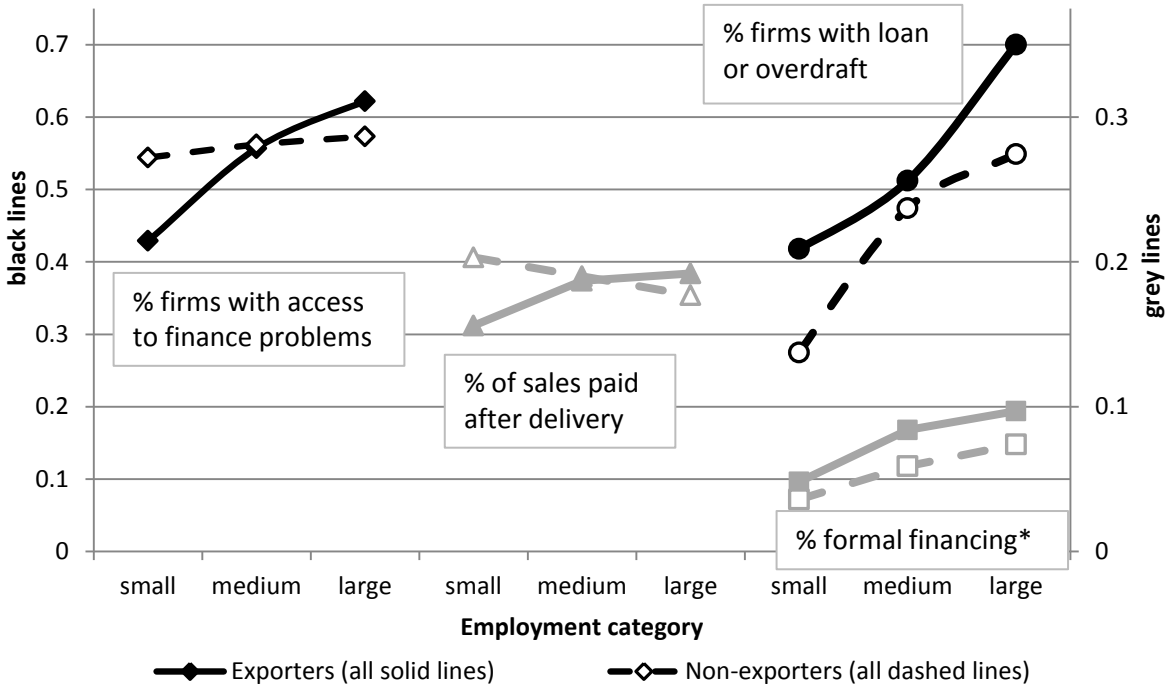
In terms of reported problems, the patterns in the first two comparisons line up. Large exporters award somewhat more trade credit than large non-exporters and are also somewhat more likely to report facing financing constraints. Small exporters award a lot less trade credit than small non-exporters and are much less likely to report financing constraints. These patterns are similar in nature as the one we documented already in Figure 2 on outstanding trade credit using firm-level information from the NBS survey. They are indirect evidence

[6] http://www.enterprisesurveys.org/.

that the amount of outstanding trade credit, the only piece of information we have available in the large NBS sample, is a good indicator of financing strain felt by firms.

Statistics at the right of Figure A.1 suggest that the correlation in these two patterns cannot be explained by the availability of formal finance. Exporters in all three size categories report better access to formal sources of finance—bank overdrafts or loans—than non-exporters. They also finance a greater share of their working capital or asset purchases using loans. As a result, while the relative extent of financing problems for exporters increases in firm size, this is not the case of formal sources of finance.

Figure A. 1 Financing problem and patterns



Source: 2012 World Bank Enterprise survey
Note: * Share of working capital or asset purchases financed by bank loan

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