China Economic Review 41 (2016) 234–252

Contents lists available at ScienceDirect

China Economic Review

Product differentiation, export participation and productivity growth: Evidence from Chinese manufacturing firms☆

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ARTICLE INFO

Article history:
Received 25 September 2015
Received in revised form 21 October 2016
Accepted 22 October 2016
Available online 26 October 2016

JEL classification:
L1
F1
D24

Keywords:
Export participation
Product differentiation
TFP
Learning-by-exporting

ABSTRACT

In this paper, we investigate how the degree of export participation and product differentiation affect firms' productivity growth through learning-by-exporting. We extend the model of Melitz and Ottaviano (2008) to endogenize the effort firms allocate to learning. This effort choice depends on both the degree to which firms enter export markets and the extent to which products are differentiated across producers. Using a firm-level dataset from China's manufacturing industries, we implement propensity score matching methods to test the model's predictions. Our results indicate that the degree of export participation is positively correlated with TFP improvements. Simultaneously, we empirically verify that firms exporting less differentiated products experience faster TFP growth than those exporting more differentiated products.

1. Introduction

Exporting is treated as a driving force behind economic growth, and is also believed to be a source of productivity growth. Not surprisingly, a large number of export promotion programs have been implemented to stimulate export growth, especially in developing countries. However, whether exporting leads to firm-level productivity gains is controversial. While some papers find a significant exporting impact on firm-level productivity growth (e.g. De Loecker, 2007; Van Biesebroeck, 2005; Girma, Greenaway, & Kneller, 2004; Dai & Yu, 2013; Lin, 2015), others provide little supporting evidence for the learning-by-exporting hypotheses. (e.g. Clerides, Lach, & Tybout, 1998; Bernard & Jensen, 1999; Aw, Chung, & Roberts, 2000; Kim, Gopinath, & Kim, 2009; Haidar, 2012; Foster-Mcgregor, Isaksson, & Kaulich, 2014). The diverse evidence could be attributed to the analysis design. In particular, the impact of exporting on productivity growth might be different across firms. For example, Du, Lu, Tao, and Yu (2012) find learning by exporting effect for domestic firms, but not for foreign affiliates. Understanding this difference is important, in order to encourage export programs to work more effectively despite limited resources. Therefore, it is crucial to identify which firms stand to gain more from trade in terms of productivity growth.

☆ Contact information: pkucuihu@gmail.com (C. Hu), and yongtan_econ@163.com (Y. Tan). Yong Tan is the corresponding author. We would like to thank Joel Rodrigue for his helpful suggestions as they have enhanced the quality of this paper. Cui Hu acknowledges the financial support from the National Natural Science Foundation of China (71403302). Yong Tan acknowledges the financial support from the Major Project Program of the National Social Science Fund of China (15ZDA060).

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http://dx.doi.org/10.1016/j.chieco.2016.10.006
1043-951X/

In this paper, we theoretically and empirically investigate how the impact of trade on firms' productivity varies with firm-specific export intensity and product — specific differences in product differentiation. In the theory, we extend the model of Melitz and Ottaviano (2008) to endogenize the effort exporting firms allocate to learning. This effort choice depends on the degree of their product differentiation and firm-specific export sales. Our model predicts first that firms exporting less differentiated products acquire faster productivity growth than those exporting more differentiated products; second, firms with high export sales experience larger productivity improvements than those with low export sales.

Empirically, we test the model's predictions by using Chinese firm-level data. China provides an ideal setting to analyze the impact of exporting on firm-level productivity growth. In China, export flows demonstrate substantial variation across firms and product classes. For instance, in electronic heater industry, the largest exporters export more than 20,000 times of the smallest exporters in 2006. In the same year, China exports more than 7000 types of products, which vary widely in their degree of product differentiation. In particular, we use export sales to measure the degree to which firms enter export markets, and classify products into homogeneous and heterogeneous categories according to Rauch (1999) to proxy for product differentiation. Using propensity score matching methods, we find that exporting increases new exporters' productivity by 4%–8%. Furthermore, firms exporting homogeneous products gain 5%–11% faster productivity growth than those exporting heterogeneous products. Meanwhile, large exporters have, on average, 17.2% faster productivity growth than that of small exporters.

Our work is closely related to the work of Du et al. (2012), who investigate the different impact exporting has on domestic firms and foreign affiliates located in China. Relative to their work, this paper attempts to clarify the mechanisms through which the impact of exporting varies across firms. Intuitively speaking, firms are differentiated in their learning efficiency and productivity gains, which determine their optimal learning effort choice. As such, they obtain different productivity growth.

Specifically, we pay attention to the role of product differentiation and export sales in the determinant of learning efficiency. On the one hand, homogeneous product exporters might pay more efforts to learn to escape from the competition, but on the other hand the heterogeneous product exporters might learn more from their competitors given the longer product quality ladder. In either case, product differentiation influences firms' learning effort choice. Meanwhile, the export scale could also affect firms' learning effort choice. Usually, the larger scale exporters have more incentives to learn as they might benefit more from total cost reduction.

Some recent studies document that product differentiation and export scale can potentially influence firm's decision in R&D, which is closely related with learning efficiency. Das, Roberts, and Tybout (2007) point out that the small exporting firms are reluctant to invest in R&D since the profit gains cannot cover their fixed investment cost, therefore it can be expected that learning efficiency is low for small firms. Aw, Roberts, and Xu (2011) claim that the return of R&D is higher for exporting firms with higher initial productivity and larger exporting volume. So firms with higher initial productivity and large exports generally enjoy higher learning efficiency. There are some researchers find that, in a "neck and neck" industry,[1] firms have a relatively larger incentive for innovation (e.g. Aghion, Bloom, Blundell, Griffith, & Howitt, 2005; Aghion, Bechtold, Cassar, & Herz, 2014), which indicates that the feature of product a firm produced is an important determinant of learning efficiency. All these studies provided the basis for our paper.

Some recent papers also attempt to investigate the firm-level learning-by-exporting effect. Lileeva and Trefler (2010) claim that low productivity exporters invest more and gain larger productivity than more productive exporters. Andersson and Loof (2009) find that for Swedish firms, the learning takes place for persistently high exporters only. Ma, Tang, and Zhang (2014) document that, in China, more capital intensive firms gain faster TFP growth from exporting. Girma et al. (2004) and Dai and Yu (2013) report a negative correlation between the learning–by-exporting effect and the number of years firms participate in international trade. However, to best of our knowledge, there is no paper which investigates how firms benefit from exporting varies across product differentiation. Our paper fills this gap.

The paper proceeds as follows. The next section introduces the model and the model's predictions. Section 3 describes the data used in the empirical estimation. Sections 4 and 5 present the estimation method and the empirical results. Section 6 reports the results of robustness checks. We conclude in Section 7.

2. Model

In this section, we develop a model to describe learning decision in export markets. In particular, we are first interested in these conditions under which export firms decide to learn in export markets; second, we are interested in the firms' characteristics which affect their learning efforts, and hence their TFP growth.

2.1. Demand

Following Melitz and Ottaviano (2008), we assume that the representative consumer's utility function is of a linear form as follows:

$$U = q_0 + \alpha \int_{q_i \in \Omega} q_i di - \frac{1}{2}\gamma \int_{q_i \in \Omega} (q_i)^2 di - \frac{1}{2}\eta \left(\int_{q_i \in \Omega} q_i di \right)^2 \quad (1)$$

[1] A "neck and neck" industry is an industry in which firms face more similar production cost due to lacking of product differentiation.