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Factor Intensity, product switching, and productivity: Evidence from Chinese exporters☆

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ABSTRACT

This paper analyzes how a firm's specialization in its core products after exporting affects its factor intensity and productivity. Using Chinese manufacturing firm data for the 1998–2007 period, we find that firms become less capital-intensive but more productive after exporting, compared to non-exporters that share similar ex ante characteristics. To rationalize these findings that contrast with existing studies, we develop a variant of the model by Bernard, Redding, and Schott (2010, 2011) to consider firms producing multiple products with varying capital intensity. The model predicts that when a firm in a labor-abundant country starts exporting, it specializes in its core competencies by allocating more resources to produce more labor-intensive products. Firm ex ante productivity is associated with a smaller decline in capital intensity after exporting. A sharper post-export decline in capital intensity is associated with a larger increase in measured total factor productivity. We find firm-level evidence supporting these predictions. Using transaction-level data for the 2000–2006 period, we show that Chinese new exporters add products that are less capital-intensive than their existing products and drop those that are more capital-intensive in subsequent years.

1. Introduction

A rich body of research documents the superior performance of exporters compared to non-exporters. Exporters are larger, more productive, more capital-intensive, and more skill-intensive (e.g., Bernard and Jensen, 1999). Existing explanations for exporters' superior performance can be categorized into three broad themes: self-selection (e.g., Clerides et al., 1998; Bernard et al., 2003; Melitz, 2003), learning by exporting (e.g., Aw et al., 2000; Van Biesebroeck, 2005; De Loecker, 2007), and firms' investment in preparation for export (e.g., Bernard and Jensen, 1997; Yeaple, 2005; Lileeva and Trefler, 2010; Bustos, 2011; Aw et al., 2011; Iacovone and Javorcik, 2012).

This paper studies a lesser known effect of exporting on firm performance: how a firm's specialization in its core products after exporting affects its factor intensity and thus productivity. Using a large panel data set of China's manufacturing firms for the 1998–2007 period, we find that firms' measured productivity increases but capital intensity declines after exporting. Figs. 1 (unbalanced panel) and 2 (balanced panel) show that, although the average firm capital intensity increased for both exporters and non-exporters from 1998 to 2007 in China, exporters were persistently less capital-intensive than non-exporters and there was no sign of convergence before 2007. We confirm that exporters have a relatively lower capital intensity than non-exporters, both within firms and within a narrowly defined industry, and for both domestic and foreign firms. To tackle the potential estimation bias due to firms' selection into exporting, we use various matching methods to compare exporters and non-exporters with similar ex ante characteristics (i.e., Heckman et al., 1997 and subsequent studies).[1] Within the same bins of ex ante productivity, capital intensity and sales, we find that new exporters experienced a significant decline in capital intensity relative to non-exporters. Moreover, we show that the *relative* decline in capital intensity after exporting is smaller for the ex ante more productive exporters, but is larger for the ex ante more capital-intensive ones.

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[1] In this paper, we address endogeneity issues by using the matching estimation techniques only. We do not have well-defined instrumental variables, such as tariff cuts as in Lileeva and Trefler (2010).

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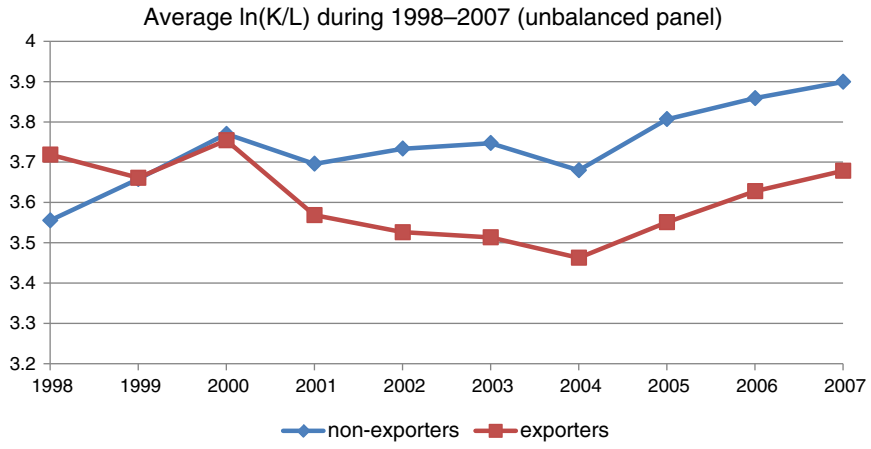

Fig. 1. Note: the unbalanced panel includes all firms in our sample.
Source: China's NBS above-scale manufacturing firm data.

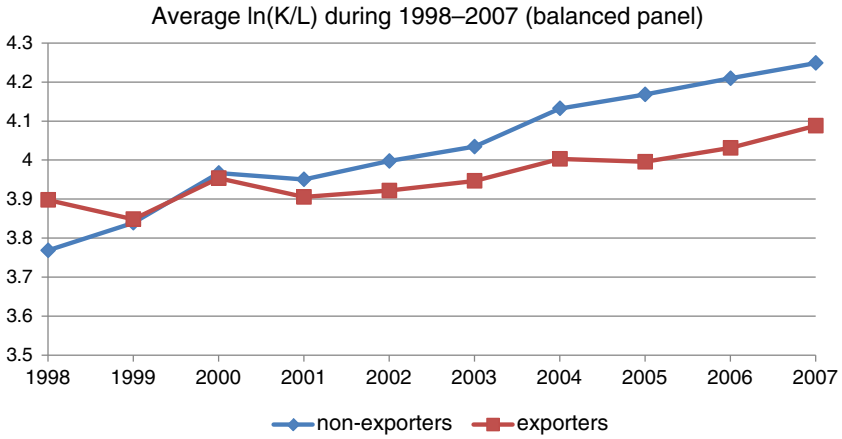

Fig. 2. Note: the balanced panel includes only those firms that appear every year in our sample. The balanced sample covers 7.6% of all firms in our sample.
Source: China's NBS above-scale manufacturing firm data.

Our findings regarding the relatively lower capital intensity among exporters contrast sharply with the existing evidence from both developed and developing countries (e.g., Bernard and Wagner, 1997; Bernard and Jensen, 2004; Van Biesebroeck, 2005; De Loecker, 2007). However, our results provide "mirror image" evidence supporting Bernard et al. (2006), who find that U.S. manufacturing firms in sectors facing more import competition from low-wage countries are more likely to switch industries and become more skill and capital-intensive over time. During our sample period, we find that Chinese firms exploited the country's comparative advantage and used less capital in production when they became exporters. These findings show that the classic Heckscher–Ohlin forces are operating at the firm level, serving as another channel through which trade can affect the factor markets in both developing countries and their trade partners.[2]

What accounts for the decline in firms' capital intensity after exporting and the heterogeneous outcomes across firms? To answer this question, we develop a variant of the multi-product model by Bernard et al. (2010, 2011) to consider both capital and labor as factors of production. In the model, heterogeneous firms can produce a continuum of products with different capital intensities of production. Besides firm heterogeneity in productivity ("ability") as in Melitz (2003), a firm's profitability from selling a product in a foreign market depends on a set of exogenous firm-product "consumer taste" attributes. In addition to the country-specific fixed export cost, exporting an additional product entails extra fixed costs (e.g., R&D expenditure to produce a blue print or overhead cost to manage a product-specific sales team). Thus, a firm will export a product only if its product attributes guarantee sufficiently high revenue to cover these extra fixed costs. Given China's labor abundance, labor-intensive products are on average associated with lower zero-profit thresholds than capital-intensive products for all firms. When a firm receives a favorable cost shock and starts exporting to a capital-abundant country, it will specialize in its core competencies — its labor-intensive products. Thus, a firm becomes more labor-intensive after exporting either by expanding sales of existing labor-intensive products (the intensive margin) or by adding more labor-intensive products (the extensive margin).

Although our model focuses on product churning as a driver of the observed change in firm factor intensity, this is not the only channel through which exporting has an effect. Firms may still invest in new capital or capital-intensive activities, as shown by some existing studies (e.g., Aw et al., 2011; Bustos, 2011). It should be noted that our empirical results show the net effect of exporting on capital intensity, implying that in China the standard investment effects proposed in the literature

[2] Although Bernard et al. (2007b) also embed a Heckscher–Ohlin framework within the Melitz (2003) model, firms in their model only differ in terms of productivity but not factor intensity within an industry.