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Productivity Evolution of Chinese Large and Small Firms in the Era of Globalisation

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Using a large firm-level dataset from the Chinese manufacturing industry, this paper studies the productivity gap and productivity convergence between large and small firms in China. We find that small firms are less productive relative to large firms, but the productivity gap became smaller over the sample period 1999–2007. Based on static and dynamic Blinder-Oaxaca decompositions, we distinguish the endowment effect from the return effect, and quantify the impacts of exports and FDI on the productivity gap and productivity convergence.

Key words: China, Small firms, Productivity, Globalisation

JEL Classification: F11, L22, O53

1. Introduction

The growth of small firms has been one of the main driving forces of the Chinese economy since economic reforms started in the late 1970s. The emergence of small private firms is a striking outcome of China's market-oriented reform. In addition to their contribution to gross domestic product (GDP) and employment, small firms have promoted entrepreneurship, provided broad-based growth, and served as incubators for developing Chinese domestic firms into large corporations.

We study the productivity of large and small firms against the background of globalisation. After more than 15 years of negotiations, China entered the World Trade Organization (WTO) in 2001. This event is a milestone in the history of China's economic reform and development. Since then, China has enjoyed one of the best decades in global economic history. Its GDP increased from RMB 11.0 trillion in 2001 to 51.9 trillion in 2012. During the same period, China's international trade increased more than seven-fold, making China the largest trading nation in the world.[1]

WTO entry has also profoundly and irreversibly changed China's economic reform as a whole. China had to reduce over 7,000 tariffs, quotas and other trade barriers. The average tariff declined from 15.3 percent in 2001 to 9.8 percent in 2010 (Brandt, *et al*., 2012b). As a condition for WTO entry, China had to improve governance and the rule of law in accordance with WTO regulations. For example, in the first year after its WTO entry, China abolished 2,300 central government regulations.[2]

Did China's WTO entry in 2001 affect large firms and small firms differently? To answer this question, we chose two years, 1999 and 2007, to compare the pre-WTO era with the post-WTO era. In particular, this study focuses on the following three questions:

- How did small firms perform as compared to large firms in 1999 and 2007?
- Had the performance of small firms been converging or diverging between 1999 and 2007?
- How did exports and foreign direct investment (FDI) contribute to the convergence or divergence of small firms' performance?

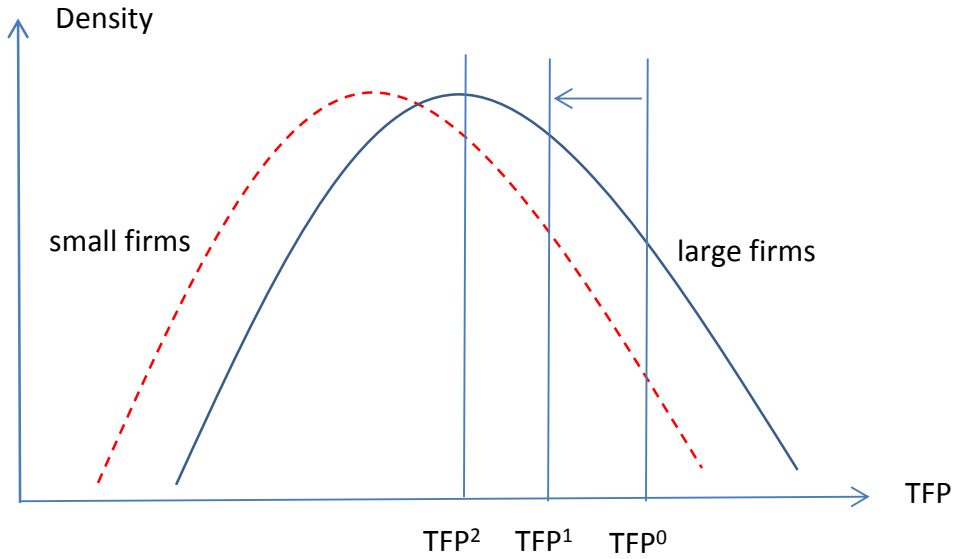
Firm size matters for firm productivity and productivity growth. In a classic paper, Jovanovich (1982) purported that firms will grow if they are sufficiently efficient. In

industrial organization theories, there is a clear positive relation between firm size and productivity. In a review paper, Geroski (1998) distinguished the direct effects of firm size from the indirect effects: firm size affects performance directly (which is what the usual regression coefficients measure), and it also affects performance indirectly because it conditions the size of the effects that other things have on performance i.e. all of the coefficients in equations vary by size of firm).

What are the mechanisms of the relationship between firm size and productivity? First, large firms may benefit from scale economies or scope economies. Second, Schumpeter (1942) believed that large firms tend to have an advantage because their financial situation allows them to be the most capable innovators. Based on Spanish firms, Huergo and Jaumandreu (2004) found evidence of a positive relationship between firm size and innovation, supporting Schumpeter's hypothesis. Third, large firms may attract people with superior human capital and provide better training. They may be able to afford the kind of specialist advice that can sometimes make a big difference to performance. It could also be true that large firms generate higher returns on human capital, as shown by Oosterbeek and Van Praag (1995).

In our paper, beyond these three channels, we try to explore the role of exports and FDI in affecting the productivity of firms of different sizes. It is well documented that exporters are more productive than non-exporters and foreign invested firms are more productive than local firms. According to the heterogeneous firm trade model, firms will incur a fixed cost to start exporting (e.g., researching foreign markets, establishing trade networks with foreign buyers, etc.). As a result, only firms with sufficient funds can afford the fixed cost. If this is true, it will certainly give a big advantage to large firms.

Figure 1: The Effect of Trade Liberalisation on Large and Small Firms



How does trade liberalisation such as China's WTO entry affect large and small firms? In Figure 1, the two curves depict the density distribution of large and small firms. The horizontal axis is total factor productivity (TFP). Before trade liberalisation, the cut-off productivity is TFP^0. In other words, according to Melitz's (2003) model, only firms with productivity higher than TFP^0 can export. Trade liberalisation reduces trade cost, allowing lower-productivity firms to export. Consequently, the productivity cutoff point shifts from TFP^0 to TFP^1. Trade liberalisation will benefit large firms more than small firms. This is because a higher percentage of large firms turn from non-exporters into exporters. We can see that by comparing the area of the two density curves between TFP^0 and TFP^1.

One key assumption in the above analysis is that the size of the productivity cut-off shift is the same for large and small firms. If the cut-off shifts to TFP^1 for large firms and to TFP^2 for small firms, it is possible that small firms may benefit more from trade liberalisation. As long as the reduction of trade cost is the same for large and small firms, it will matter more for small firms, because the reduction accounts for a larger proportion of their cost.

We can have a similar argument for FDI liberalisation. The Chinese government's FDI liberalisation policies reduce the cost for foreign investors, allowing more foreign firms to invest in China. Small foreign firms benefit more than large firms if the size of cutoff shifts is larger for smaller firms.

We use the 2003 Law of Small and Medium Enterprise's classification to define small industrial firms.[3] A firm is considered a small firm if it meets one of the following criteria:

- employment below 300;
- sales revenue below RMB 30 million;
- total assets below RMB 40 million.

The 2003 law classifies all firms into three categories: large, medium and small firms. For the convenience of comparison, we only define two groups: small firms and large firms. We put medium firms in the category of large firms. This is mainly because the Chinese definition of small firms is close to the international standard of small and medium enterprises (SME). For example, the European Union (EU) considers an SME a firm with up to 250 employees. The employment threshold of Japanese manufacturing SME is 300.

In this study, we use a comprehensive firm-level dataset from China National Bureau of Statistics. We find that small firms are less productive than large firms, even after controlling for a set of firm characteristics. However, we also find that the TFP gap has been significantly reduced. The productivity gap was about 40 percent in 1999 and only about 25 percent in 2007. In other words, we observe a quick productivity convergence of about 15 percentage points between large and small firms in our sample period.

Based on the Blinder-Oaxaca decomposition framework from labour economics, we analyze the impact of exports and FDI on the productivity gap and productivity convergence. In these analyses, we distinguish the endowment effect from the return effect (or the coefficient effect in labour economics). The endowment effect is the share of firms that are exporters or foreign-invested enterprises (FIEs). The return effect is the size of the coefficients of exports and FDI in the productivity regressions. We can interpret the return effect as the export premium and FDI premium, or the return to exports and FDI. The source of the export return effect can be self-selection, but it can also be the learning effect (De Loecker, 2007; Lileeva and Trefler, 2010). In fact, the return effect is related to the firm's ability to take advantage of export and FDI opportunities. Our estimation shows that exports and FDI explain about 13.8 percent of the TFP gap in 1999 and 8.1 percent in 2007. We also find that the endowment effect is the main

contributor to the export impact on the firm productivity gap between large and small firms. For FDI, the return effect is more important than the endowment effect.

We further decompose the difference in TFP growth using the dynamic Blinder-Oaxaca method. According to our calculation, exports and FDI can explain about 23.9 percent of the productivity convergence. For exports and FDI, the endowment change effect and the return change effect are both important channels for the convergence.

The rest of the paper is organized as follows. Section 2 describes the development of Chinese small private firms in the reform era. Section 3 discusses the data. Section 4 presents the basic productivity evolution patterns. Section 5 reports panel data regression results. We conduct static and dynamic decompositions in Sections 6 and 7. Section 8 concludes.

2. Background: Development of Small Private Firms in China

Chinese government policy toward small firms is sometimes self-conflicting. On the one hand, it continued to discriminate against private firms. On the other hand, the government made policies aimed at promoting SMEs development. In China, small firms and the private sector are closely related.

Most private firms are small firms. At the same time, as shown in Table 3, the share of private firms among small firms increased dramatically, from 13 percent in 1999 to 67 percent in 2007.

Private firms emerged in the early 1980s as a consequence of the rapid expansion of the economy. The new private firms were intended to play a role that is "supplementary" to the state sector. They were not allowed to officially register until 1988, when the first law governing private firms was implemented. In 1989, China's private sector suffered a major setback as a result of the 1989 Tiananmen Square event. However, a new wave of reforms that started in 1992, following Deng Xiaoping's Southern Tour, created a favorable environment for rapid growth of the private sector. In addition, China's WTO entry in 2001 brought both opportunities and challenges to private entrepreneurs.

Chinese private firms flourished as ideological barriers gradually fell. In the 1980s, China's private firms operated in an openly hostile political atmosphere. Recognising the

contribution of the private sector, in 1997, the 15th Party National Congress lifted the status of the private sector from "complementary" to "an important component" of the economy. A revision of the party constitution in 1999 further equated the private sector and the state sector. A 2004 constitutional amendment helped better safeguard private property rights.

Despite the improvement of the environment, China's private firms still face severe discrimination from the government and the banks. Such discrimination includes legal discrimination, entry barriers, and financial discrimination. Because of government interference in Chinese banks—especially the requirement that banks must fund enterprises (SOEs)—the domestic financial sector accords privileges to the least efficient SOEs and deprives the emerging private enterprises of access to bank funding.

Realising the important contribution of small firms, in 2003 the Chinese government passed the "Law of the People's Republic of China on Promotion of Small and Medium-sized Enterprises". The law specifies several measures to protect and promote small firm development. The Chinese government vowed to protect the legal rights of SMEs, including their rights of property and their rights of fair competition. The government launched the SME Growth Project in 2006, aiming at better targeting priority areas for SME development. In 2011, the government revised the SME law and further strengthened its support of SMEs.

Economics literature on the development of small private firms in transition countries mainly focuses on government policy and access to external finance. Johnson, *et al.* (2002) found in a survey of private manufacturing firms in Romania, Slovakia, Ukraine, and Russia that it was the lack of property rights protection that discouraged firms from investing. International Finance Corporation (2000) found that Chinese local government and officials tend to over-expand their duties and focus on rent-seeking opportunities. They find the roles of government bureaus often overlap and are ill-defined. Chinese local government policy on private enterprises could be a key determinant of private firm development. For example, Chinese local governments have an incentive to use their power over private small firms to protect their large SOEs (McMillan, 1995). External finance itself is important for the small private firms (Song, *et al.*, 2011). If bank credits are not available, private entrepreneurs may not be able to take advantage of investment opportunities. It was found that in transition economies smaller firms have lower rates of

investment, because their investment depends on the availability of internal funds (Lizal and Svejnar, 2002). The problem of external finance is more serious in China than in other transition economies. Chinese small private firms still face numerous financial obstacles such as discrimination when seeking bank credits (Brandt and Li, 2002). Chinese entrepreneurs started their businesses relying almost exclusively (90.5 percent) on self-financing. In comparison, this ratio is 66 percent in Russia and 79 percent in Viet Nam (International Finance Corporation, 2000). Manova, *et al.* (2012) documented that the financial constraints of Chinese private firms hamper their export growth, and this operating disadvantage is systematically greater in sectors with higher levels of financial vulnerability.

We study the development of small private firms from a different angle. Instead of government policy and external finance, we focus on exports and FDI and how these factors affect firms with different sizes.

3. The Data

In this study, we use 1999–2007 firm-level data for all state-owned industrial firms and non-state owned firms with sales over RMB 5 million.[4] Unfortunately, the non-state smaller firms (sales below RMB 5 million) are not included in our data. The information is collected through annual surveys by the National Bureau of Statistics (NBS) and discussed in detail in Brandt, *et al.* (2012a). The sample size ranges from 160,000 firms in 1999 to 330,000 firms in 2007. The firms in the sample account for 61 percent of total industrial value-added in 1999 and 94 percent in 2007. We exclude observations with missing values for key variables and those that fail to satisfy some basic error checks. The dataset contains detailed information of firm ID, address, ownership, output, value-added, four-digit industry code, six-digit geographic code, exports, employment, and capital stock.

Following Jefferson, *et al.* (2008), we drop all firms with fewer than eight employees as they fall under a different legal regime. As a result, 13 percent of firms in the original

data set are dropped from the sample in 1999. The percentage excluded drops to 6 percent in 2007.

For the analysis in the paper, we only use manufacturing firms. As a result, we drop all observations from mining and utilities industries. To create a panel dataset, we use firm ID to link the firms over time. However, as firm ID may have changed if a firm went through restructuring or merger and acquisition (M&A) activity, we have supplemented the firm IDs with information on the firm's name, sector, and address to establish links across different years.

To measure firm performance, we estimate firm TFP using the Olley and Pakes (1996) procedure.

4. Descriptive Analyses

Table 1 shows large and small firms' shares in some key variables. Small firms accounted for 89 percent of all firms in 1999, but their share dropped slightly, to 88 percent, in 2007. Although large firms were small in number, they dominated the economy in almost all other aspects. In both 1999 and 2007, large firms contributed more than half of value-added, employment, revenue, assets and capital. Note that large firms' share of profit dropped sharply, from 91 percent in 1999 to 68 percent in 2007. In contrast, large firms' advantage in exports was further strengthened as their share in total export value increased from 62 percent in 1999 to 69 percent in 2007.

Table 1: Share of Large and Small Firms

	Large	Small	Large	Small
	1999		2007	
share in total number of firms	0.11	0.89	0.12	0.88
share in total value-added	0.64	0.36	0.62	0.38
share in total employment	0.52	0.48	0.53	0.47
share in total revenue	0.64	0.36	0.57	0.43
share in total asset	0.69	0.31	0.70	0.30
share in total capital	0.70	0.30	0.71	0.29
share in total exports	0.62	0.38	0.69	0.31
share in total profit	0.91	0.09	0.68	0.32

Source: NBS manufacturing firm database.

Table 2: Comparing Large and Small Firms (Mean Values)

	Large	Small	Large	Small
	1999		2007	
ln(TFP)	-1.31	-1.71	-0.25	-0.50
ln(employment)	6.85	4.67	6.59	4.36
ln(revenue)	11.61	9.02	12.37	10.01
ln(total asset)	12.02	9.22	12.22	9.47
age	20.30	13.20	25.10	4.36
capital_intensity	113.15	97.63	140.19	104.10
profitability	0.05	0.03	0.07	0.05
exporter dummy	0.38	0.19	0.36	0.22
FDI dummy	0.23	0.17	0.22	0.21

Source: NBS manufacturing firm database.

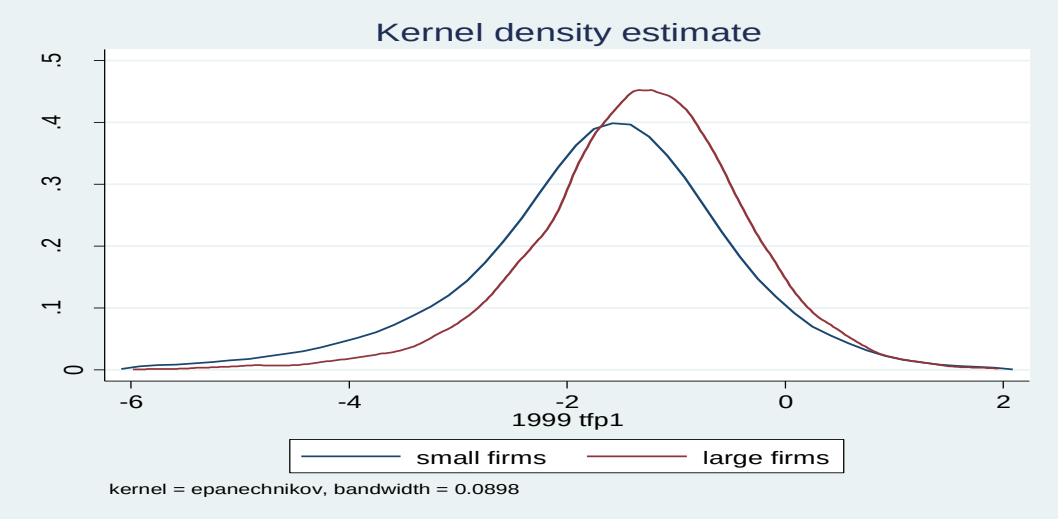
Table 2 compares key indicators between large firms and small firms. Here capital intensity is defined as capital labour ratio. Profitability is the profit to value-added ratio.

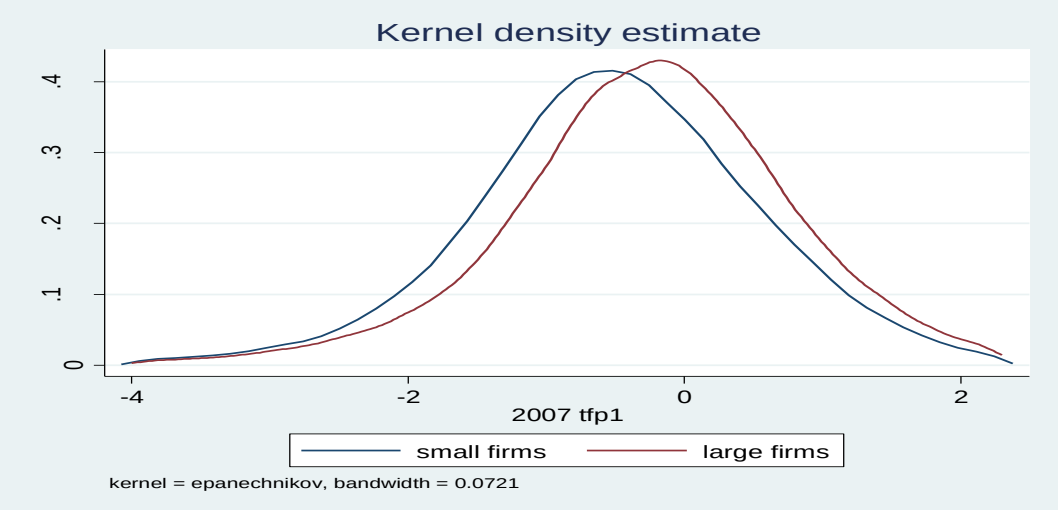
In 1999 and 2007, large firms were more productive, older, more capital intensive and more profitable. The productivity gap between large and small firms was about 40 percent in 1999 and 25 percent in 2007. While the productivity of both large and small firms improved substantially, small firms' productivity increased even faster, cutting the productivity gap by 15 percentage points. This is a remarkable productivity convergence in a short span of eight years.

Table 2 also shows that the average age of small firms fell significantly, from 13.2 years in 1999 to 4.4 years in 2007, while the age of large firms actually increased in this period. This is mainly due to the government liberalisation measures that allowed large scale entry of small firms following WTO entry.

In Table 2, the exporter dummy is equal to 1 if the firm's exports are positive and 0 otherwise. The definition of FDI dummy is based on ownership information reported by firms, including foreign firms and firms of Hong Kong, Macau and Taiwan investors. As we can see from the last two rows of Table 2, the shares of exporters and foreign invested firms decreased for large firms, but increased for small firms. Large firms' share in total export value increased (Table 1), but their share in total number of exporters decreased (Table 2). This is because exporters from large firms exported much higher value per firm in 2007.

Figure 2: ln (TFP) Distribution in 1999 and 2007





Source: NBS manufacturing firm database.

The result of the productivity comparison in Table 2 is limited to the mean values. To further study the comparison of productivity distribution, we create kernel density plots for 1999 and 2007. Figure 2 shows the kernel density of the ln(TFP) from large firms and small firms in 1999 and 2007. The curves of both large and small firms shift to the right, but it appears that the large–small TFP gap became narrower in 2007.

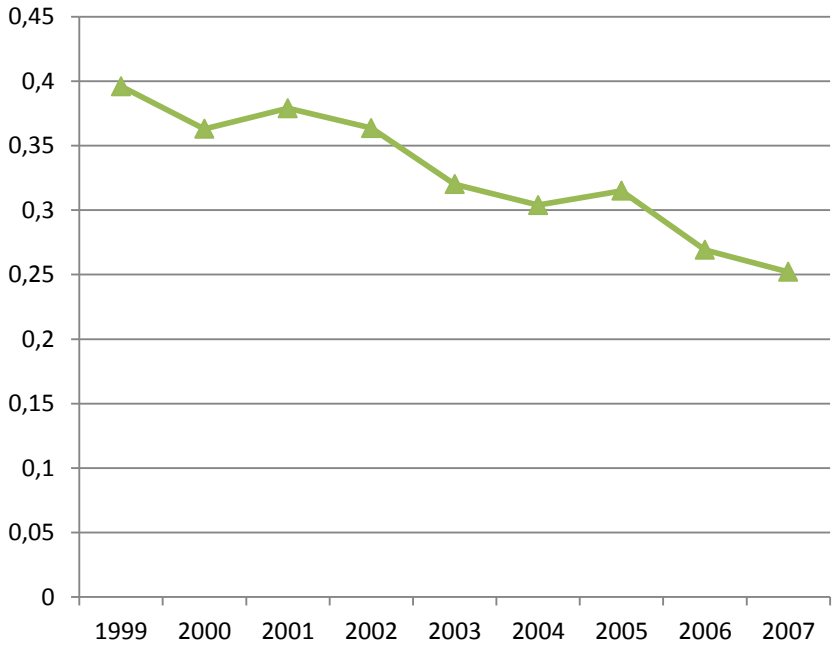
Table 3: Ownership Distribution of Large and Small Firms

	Number of Firms	Share	Number of Firms	Share
	Large		Small	
Panel A: 1999				
State	7,840	0.48	41,980	0.32
Collective	3,569	0.22	48,788	0.37
Private	1,022	0.06	16,980	0.13
Foreign	3,770	0.23	22,636	0.17
Panel B: 2007				
State	6,969	0.22	15,753	0.06
Collective	3,485	0.11	13,127	0.05
Private	14,256	0.45	175,907	0.67
Foreign	7,096	0.22	56,185	0.21

Source: NBS manufacturing firm database.

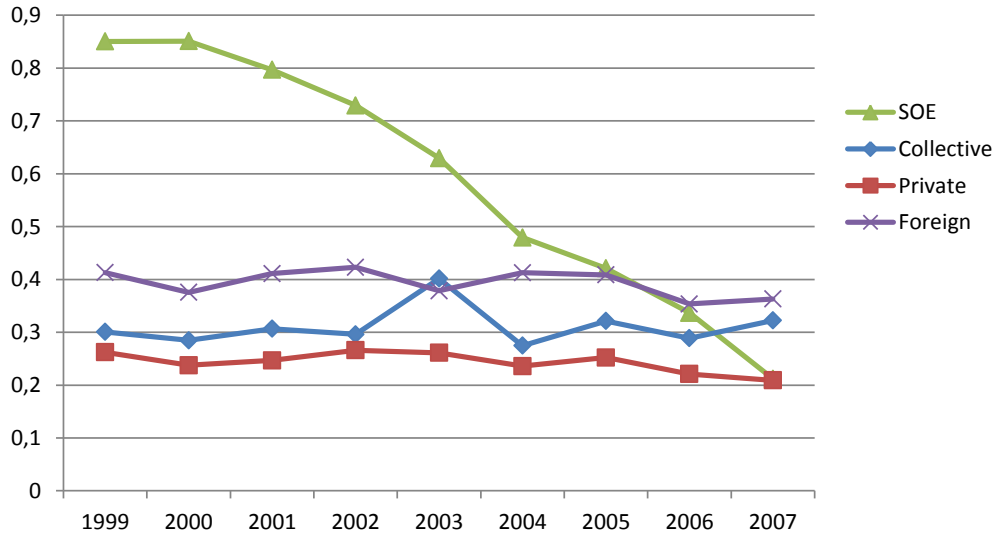
We report ownership distribution of large and small firms in Table 3. Between 1999 and 2007, the share of SOEs decreased dramatically, whereas the share of private firms increased more than five-fold for both large and small firms. We also observe that in 1999 and 2007, on average more large firms were SOEs and fewer were private firms, compared to small firms.

Figure 3a: ln (TFP) Difference Between Large and Small Firms (All Firms)



Source: NBS manufacturing firm database.

Figure 3b: ln (TFP) Difference Between Large and Small Firms (by Ownership)



Source: NBS manufacturing firm database.

To give a full picture of the evolution of the productivity gap between large and small firms, we regress ln (TFP) on the dummy of large firms. We run the regression for each year over the period 1999–2007. Figure 3a shows the estimated coefficients of large firm dummy that illustrate the gap between large firms and small firms and how this gap evolved over time. We can see that the productivity gap gradually declined after 1999. It decreased every year except in 2001 and 2005, when there were small rebounds. Figure 3b illustrates the productivity gap evolution for the subsamples of SOEs, collective firms, private firms and foreign firms. We observe a dramatic decrease of the productivity gap between large firms and small firms for the SOEs. One reason is that most of the inefficient small SOEs were privatised before 2007 and therefore they are no longer in the sample of SOEs.

Table 4: Share of Small Firms by Industry

	1999		2007	
	# of firms	output	# of firms	output
Average of all industries	0.84	0.40	0.86	0.44
Processing of Food from Agricultural Products	0.93	0.62	0.93	0.60
Foods	0.92	0.49	0.88	0.43
Beverages	0.83	0.27	0.85	0.34
Tobacco	0.47	0.04	0.41	0.01
Textile	0.84	0.41	0.89	0.50
Textile Wearing Apparel, Footware and Caps	0.92	0.61	0.90	0.54
Leather, Fur, Feather and Related Products	0.90	0.51	0.88	0.49
Timber, Wood, Bamboo, Rattan, Palm and Straw Products	0.94	0.60	0.96	0.73
Furniture	0.93	0.67	0.89	0.54
Paper and Paper Products	0.90	0.53	0.91	0.47
Printing, Reproduction of Recording Media	0.95	0.60	0.92	0.60
Articles For Culture, Education and Sport Activities	0.90	0.55	0.89	0.53
Petroleum, Coking, Processing of Nuclear Fuel	0.81	0.08	0.78	0.11
Raw Chemical Materials and Chemical Products	0.86	0.39	0.91	0.46
Medicines	0.85	0.37	0.85	0.39
Chemical Fibers	0.72	0.16	0.86	0.22
Rubber	0.86	0.33	0.88	0.35
Plastics	0.93	0.64	0.93	0.65
Non-metallic Mineral Products	0.90	0.55	0.91	0.60
Smelting and Pressing of Ferrous Metals	0.82	0.15	0.85	0.18
Smelting and Pressing of Non-ferrous Metals	0.83	0.30	0.88	0.39
Metal Products	0.93	0.63	0.93	0.60
General Purpose Machinery	0.90	0.46	0.92	0.50
Special Purpose Machinery	0.89	0.41	0.90	0.44
Transport Equipment	0.84	0.20	0.84	0.20
Electrical Machinery and Equipment	0.87	0.26	0.87	0.36
Communication Equipment, Computers and Electronic Equipment	0.86	0.35	0.74	0.10
Measuring Instruments and Machinery for Cultural Activity	0.81	0.20	0.87	0.33
Artwork and Other Manufacturing	0.89	0.39	0.93	0.61
Recycling and Disposal of Waste	n.a.	n.a.	0.97	0.85

Source: NBS manufacturing firm database.

Table 4 reports large and small firms' industry distribution in 1999 and 2007. It shows the average share of small firms in total number of firms and in total output by two-digit industry. Small firms made up the majority of the firms in all industries except tobacco,

which is highly regulated by the government and dominated by a few giant SOEs. Regarding the share of output, small firms had disadvantages in capital-intensive industries such as petroleum processing, communication equipment and transport equipment.

5. Panel Data Analyses

To analyze the relationship between firm size and globalisation variables (exporter dummy and FDI dummy), we take advantage of the panel nature of our data and estimate the following firm fixed effect model:

$$\ln(TFP)_{it} = \alpha_i + \beta_1 exporter\_dummy_{it} + \beta_2 FDI\_dummy_{it} + \beta_3 exporter * \ln(output)_{it} + \beta_4 FDI * \ln(output)_{it} + other\_controls + \varepsilon_{it} \quad (1)$$

where other controls include ln(output), ln(wage), and ln(capital intensity).

Table 5: Firm Fixed Effects Regressions Dependent Variable: ln(TFP)

	(1)	(2)	(3)
exporter dummy	0.192***	0.141***	0.167***
	(18.51)	(17.91)	(4.81)
FDI dummy	0.202***	0.136***	0.154***
	(16.07)	(13.64)	(7.04)
exporter*ln(output)			-0.038***
			(-3.37)
FDI*ln(output)			0.074***
			(8.29)
ln(output)		0.324***	0.148***
		(20.38)	(21.62)
ln(wage)		0.124***	0.170***
		(7.40)	(7.26)
ln(capital intensity)		-0.087***	-0.106***
		(-14.21)	(-13.01)
firm fixed effects	Yes	Yes	Yes
N	1.773.836	1.769.080	1.769.080

Notes: The sample includes all firms from 1999–2007. Numbers reported in parentheses are t-statistics. *** indicate significance at the 1 percent level.

Since firm fixed effect captures all time-invariant firm-level variables, the identification of exporter dummy and FDI dummy comes from those observations that switched their export status and FDI status during the sample period. Table 5 reports the regression results. In the first column, exporters are on average 19 percent more productive than non-exporters and FIEs are about 20 percent more productive than Chinese local firms. These coefficients are statistically significant at the 1 percent level. Both of them decrease in column (2) where we include more firm-level control variables. We add interaction terms in column (3). Given the negative sign of the interaction term

between export dummy and firm output, it seems that the exporters' premium is higher for smaller firms. In contrast, the FDI premium is lower for smaller firms.

6. Static Blinder-Oaxaca Decomposition

To quantify the globalisation effects on the performance difference between large and small firms, we conduct decomposition analyses. Our methods come from Blinder-Oaxaca decomposition in the literature on racial and gender wage discrimination in labour economics. Blinder-Oaxaca decomposition (Blinder, 1973; Oaxaca, 1973) separates the difference in average wages of the comparing groups into two components:

(1) The component that exists because of the differences in average observable characteristics of the individuals;

(2) The component that is the result of the differences in the rewards for those characteristics.

In particular, our decomposition uses the following equation:

$$y^S - y^L = (x^S - x^L)\beta^S + x^L(\beta^S - \beta^L) \qquad (2)$$

In the racial discrimination literature, the left-hand side is the mean difference in earnings between black and white workers. x is a vector of average values of the independent variables such as education and experience and β^j is a vector of coefficient estimates for race j. The first term is the "explained part", while the second term is often regarded as "discrimination".

In our case, the left-hand side variable is the average ln(TFP) difference between large firms and small firms. x is a vector of variables that determine firm TFP, including exporter dummy, FDI dummy, firm wage rate, firm age, capital intensity, and a full set of industry and provincial dummies. β is a vector of the coefficients of these variables.

Our interpretation of equation (2) is different from labour economists. Let us use exporter dummy as an example. The first term shows "the endowment effect", or the effect brought about by the difference in mean value of exporter dummy. The second term is the "return to export effect". It comes from the difference in the coefficients of exporter dummy. Intuitively, even when large firms and small firms have the same

endowment (same percentage of exporters), exporting may still benefit large firms and small firms differently, leading to different estimates of the coefficients. FDI dummy can be explained in a similar way.

To implement the decomposition,

(1) we run separate regressions for the large firm sample and the small firm sample, and obtain the coefficients; then

(2) we calculate the means of the independent variables; and

(3) we use equation (2) to calculate the two terms.

Table 6: Regressions of Large and Small Firms 1999 and 2007 Dependent Variable: ln(TFP)

	(1) 1999 Small firms	(2) 1999 large firms	(3) 2007 Small firms	(4) 2007 large firms
exporter dummy	0.148***	0.132***	0.219***	0.152***
	(3.78)	(2.69)	(4.81)	(3.84)
FDI dummy	0.098***	0.214***	0.166***	0.223***
	(5.81)	(4.67)	(7.04)	(6.64)
ln(wage rate)	0.034***	0.039***	0.067***	0.074***
	(13.28)	(6.40)	(14.39)	(8.32)
ln(firm age)	-0.314***	-0.278***	-0.165***	-0.146***
	(-7.32)	(-6.13)	(-6.18)	(-5.36)
ln(capital intensity)	-0.098***	-0.053***	-0.075***	-0.063***
	(-8.01)	(-7.21)	(-13.01)	(-11.56)
four-digit industry dummies	Yes	Yes	Yes	Yes
provincial dummies	Yes	Yes	Yes	Yes
adj R-sq	0,4431	0,3017	0,5149	0,4791
N	117.494	15.814	262.549	30.986

Notes: Numbers in parentheses are t-statistcs corrected for four-digit industry clustering. *** indicates statistical significance at the 1 percent level.

Table 6 reports the results of TFP regressions with large firm and small firm subsamples in 1999 and 2007. In all columns, wage rate has a positive effect on firm productivity, while firm age and capital intensity appear to have negative effects. For the exporter dummy, in both 1999 and 2007, the coefficients of small firms are larger than those of large firms. The opposite is true for the FDI dummy. The FDI coefficients of large firms are always larger. It is interesting to see that the coefficients of exports and FDI are all larger in the 2007 regressions than their counterparts in the 1999 regressions. But the size of the increase is bigger for small firms. To facilitate the decomposition analyses, we list the main parameters in Table 7.

Table 7: Summary of the Decomposition Parameters

	exporter dummy		FDI dummy	
	small firms	large firms	small firms	large firms
1999				
x (endowment)	0.187	0.376	0.174	0.233
β (coefficient)	0.148	0.132	0.098	0.214
2007				
x (endowment)	0.220	0.356	0.214	0.224
β (coefficient)	0.219	0.152	0.166	0.223

Note: This table summarizes the decomposition parameters that will be used in Table 8 and Table 9. The parameters come from Table 2 and Table 6.

Table 8: Static Blinder–Oaxaca Decomposition of Productivity

	1999		2007	
		share in TFP difference		share in TFP difference
Small firms ln(TFP)	-1.713		-0.503	
Large firm ln(TFP)	-1.317		-0.251	
Difference (small–large)	-0.396		-0.252	
Exporter dummy				
endowment effect	-0.028	0.071	-0.030	0.118
return effect	0.006	-0.015	0.024	-0.095
export total effect	-0.022	0.055	-0.006	0.024
FDI dummy				
endowment effect	-0.006	0.015	-0.002	0.007
return effect	-0.027	0.068	-0.013	0.051
FDI total effect	-0.033	0.083	-0.014	0.057
Other variables	-0.341	0.862	-0.232	0.919

Table 8 reports the results of the static Blinder-Oaxaca decomposition using the 1999 sample and the 2007 sample. In 1999, the ln(TFP) difference between small and large firms is 0.396. Let us look at the export dummy of 1999 decomposition first. The export endowment effect, or the first term in equation (2), contributes 0.028 log points, or about 7.1 percent (=0.028/0.396) of the observed difference in productivity. Since the coefficient of exporter dummy is even higher for small firms, the export return effect, or the second term in equation (2), is actually negative. These two effects combined can explain about 5.5 percent of the productivity gap. The FDI endowment effect is small, contributing only 1.5 percent of the productivity gap. But the FDI return effect is relatively large, due to the large difference of the two coefficients in the regressions. The total effect of FDI is about 14 percent of the productivity gap. Now we can interpret the 2007 decomposition results in a similar way. Again, the export return effect is negative, and the FDI total effect is stronger than the export total effect.

7. Dynamic Blinder-Oaxaca Decomposition

In the static analysis, we can disentangle the effect of major variables on the TFP gap between large firms and small firms. As we observed in Figure 2, there is a fast and strong convergence of TFP between these two groups. How do exports and FDI affect this convergence? To answer this question, we adopt a dynamic version of Oaxaca–Blinder decomposition (*i.e.*, Baker and Drolet, 2010). If we want to explain the change of ln (TFP) gap between large and small firms during 1999–2007, we can decompose it in the following way:

$$(y_1^S - y_0^S) - (y_1^L - y_0^L) = [(x_1^S - x_0^S)\beta_1^S - (x_1^L - x_0^L)\beta_1^L] + [x_0^S(\beta_1^S - \beta_0^S) - x_0^L(\beta_1^L - \beta_0^L)] \quad (3)$$

It can be easily shown that equation (2) implies equation (3). Note that there are four terms on the right-hand side of equation (3). The two terms in the first bracket can be regarded as the effect of change in endowment. The third and fourth terms in the second bracket show the effect of change in return.

Table 9: Dynamic Blinder–Oaxaca Decomposition of Productivity Growth

		share in total difference in TFP change
Small firms ln(TFP) change between 1999 and 2007	1.210	
Large firm ln(TFP) change between 1999 and 2007	1.066	
Difference in ln(TFP) change (small–large)	0.144	
Exporter dummy		
change in endowment effect (first and second terms)	0.010	0.071
change in return effect (third and fourth terms)	0.006	0.040
exporter total effect	0.016	0.111
FDI dummy		
change in endowment effect (first and second terms)	0.009	0.060
change in return effect (third and fourth terms)	0.010	0.068
FDI total effect	0.018	0.128
Other variables	0.110	0.761

The left-hand side of equation (3) is the change in ln(TFP) gap, which is equal to 0.144. From Table 9, we can see that for the exporter dummy, the effect from the change in endowment is stronger than the effect from the change in return. In total, exports can contribute 11.1 percent of the productivity catch-up. For the FDI dummy, the endowment change effect and return change effect are more equal, accounting for 6.0 percent and 6.8 percent of the convergence, respectively. And the FDI total effect is 12.8 percent.

The trade liberalisation and domestic market liberalisation brought about by WTO entry can offer some explanations of the convergence. For example, after WTO entry, it became easier for entrepreneurs to start up new businesses. Simplified exporting procedures may benefit small exporters more than large exporters. After the Chinese government removed many FDI entry barriers, small foreign firms could enter the Chinese market that had been almost exclusively reserved for large multinationals before WTO entry.

8. Concluding Remarks

This paper studies the productivity gap and productivity convergence between large and small firms in China. We find that firm size matters for productivity. On average, small firms are less productive than large firms. We also find that the productivity gap became narrower during 1999–2007. Using static and dynamic Blinder-Oaxaca decompositions, we quantify the effects of exports and FDI on the productivity gap and productivity convergence. By examining the endowment effect and the return effect, we find that globalisation factors have impacts on large and small firms through different channels.

Our study has important policy implications. Promoting the development of small firms has been one of the priorities of national economic policies for many countries. In China, those government programmes that targeted external finance, innovation, and taxation only had limited success. This paper explores new channels—globalisation channels—that can benefit small firm growth. We find that exports and FDI accounted for nearly 24 percent of the productivity convergence between 1999 and 2007. In order to encourage the productivity growth of small firms, the government could focus on helping small firms to become exporters and strengthening their ability to benefit from exporting. Foreign participation is also important for small firms. As multinationals are a critical source of technology and knowledge, the government should guide more FDI into the small firm sector.

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ENDNOTES

[1] Source: Author's calculation based on *China Statistical Yearbook*, 2013.

[2] Source: China Daily, *WTO Entry Boosts China's Economy*, November 18, 2002.

[3] The Chinese government revised the law and the classification in 2011. Since our sample period is 1999–2007, we decided to use the 2003 classification.

[4] We also have 1998 data. Since 1998 is the year of the Asian financial crisis, we decided not to use 1998 data.

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