Private Enterprises and China's Economic Development

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9 Trade, foreign direct investment, and productivity of China's private enterprises

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Introduction

Despite its murky classification in China's statistics, private enterprise has indubitably entered the center stage of the Chinese economy in the twenty-first century. According to a recent report by the Asian Development Bank (ADP) (2003: 2), "private activity already comprises the predominant share of the PRC economy, with that share lying somewhere between one-half and two-thirds (in total gross industrial output) depending on how narrowly one defines the term 'private'." The lower bound of one-half comes from a narrow definition of private sector as privately owned firms ("*siying qiye*") and individually owned businesses ("*getihu*"), while the upper bound of two-thirds comes from a broad definition of the private sector as non-state-owned firms. In an earlier study by the International Finance Corporation (IFC) (2000: 16), China's private sector ("*siying qiye*" and "*getihu*") was estimated to account for about 33 percent of gross domestic product (GDP) in 1998.

The rapid growth of private enterprises from next to nothing in 1985 to over half of China's gross industrial output or a third of China's GDP in the late twentieth century has had a profound impact on the Chinese economy, as documented by the ADB and IFC reports. It is well known that China's policy environment has been heavily biased in favor of state-owned enterprises (SOEs) and also provides favorable treatment to foreign enterprises. In contrast, China's private sector has been at a severe disadvantage, particularly in access to capital, skilled labor, infrastructure, and markets. According to the International Finance Corporation (2000), in the period from 1991 to 1997, the share of private sector investment in the national total was in the range of 15–27 percent, significantly lower than its share in national output. In a recently published book, Huang (2003) argued that China's becoming a leading recipient of foreign direct investment is largely a result of the weak policy environment for Chinese domestic private firms compared with that for foreign firms.

Because of the increasing role of private enterprise in the Chinese economy, it becomes important to assess its impact quantitatively. In particular, one would

like to know what has contributed to its fast growth, despite facing severe constraints in resource access and policy support. Moreover, private firms in China face restraints on direct access to foreign trade. For example, private firms were not allowed to export directly prior to 1998 when foreign firms and many state-owned firms had this right. It is interesting to investigate what role exporting plays in the fast growth of private firms in China. As China proceeds further in privatization and openness, a sound understanding of the above issues regarding private enterprise is useful for policy-makers to formulate future development strategies for the Chinese economy.

In this chapter, we examine the productivity growth of private firms in China based on a survey of 1,500 Chinese firms conducted by the World Bank in 2001. Using these data, we construct a sample of private firms. For comparison, we construct a sample of public firms (government owned and collectively owned) and a sample of foreign firms. We will discuss the samples in the following section. As a starting point for our statistical analysis, we estimate production functions for the three ownership groups and present the results in the next section. Our goal is to identify and estimate the key determinants of productivity growth in private firms. For this purpose, we will examine the characteristics of private firms and carry out a regression analysis in the following section. The regression results allow us to estimate total factor productivity (TFP); the TFP analysis is then presented followed by a summary of the main results and the conclusions drawn.

Sample

Our study uses data from a survey of 1,500 Chinese firms conducted by the World Bank in 2001.[1] The survey contains two sets of questions about each firm's ownership. First, a firm reports its legal status in ten categories and may report multiple categories. Second, a firm provides information on ownership shares by private ownership (domestic and foreign) and public ownership (state, local, and collective).

Our goal is to investigate the productivity of China's private firms. The difficulty in defining "private firm" in China's statistics is well known.[2] We adopt the following classification. If a firm reports its legal status as "subsidiary/division of a multinational firm" or "joint venture of a multinational firm," or if a firm reports foreign ownership exceeding 50 percent, we classify it as a *foreign firm*. If a firm reports its legal status as "state-owned company" or "cooperative/collective," or if a firm reports public ownership (including cooperative/collective) exceeding 50 percent, we classify it as a *public firm*. We classify any firm that is neither a foreign firm nor a public firm as a *private firm*. Thus, our group of private firms includes firms that have minority foreign ownership or minority public ownership but do not have a legal status as a foreign firm, state-owned firm, or cooperative/collective firm.

Table 9.1 reports the summary information in our sample. Based on the above classification, 450 firms in the survey are private firms, which account for 30 percent of the total. Some 562 firms are public firms, accounting for 37 percent, and

Table 9.1 Sample summary

	Full sample	*Private firms*	*Public firms*	*Foreign firms*
Number of observations	1,500	450	562	488
Sample distribution (%)	100	30	37	33
Growth in sales (%)	20.8 (95.8)	28.3 (85.0)	0.1 (82.1)	41.2 (113.7)
Growth in unskilled labor (%)	3.6 (50.6)	10.1 (46.4)	8.3 (52.1)	13.9 (48.8)
Growth in skilled labor (%)	5.2 (42.0)	14.4 (46.5)	8.8 (36.7)	15.5 (39.1)
Growth in physical capital (%)	22.8 (58.5)	34.9 (64.3)	10.6 (47.7)	28.3 (63.0)

Note
Mean of growth rate from 1998 to 2000 reported; standard deviation in parentheses.

488 firms are foreign firms, which constitute 33 percent of the whole sample. Without information on output, we use total sales value as a proxy. The current value of sales is converted to 1998 values using the GDP deflator from *The China Statistical Yearbook*, 2001.[3] Table 9.1 shows that sales grew by 20.8 percent on average in the full sample of 1,500 firms surveyed. Sales grew at 28.3 percent in private firms, 41.2 percent in foreign firms, and negatively in public firms.

Table 9.1 also reports growth rates of inputs of unskilled labor, skilled labor, and physical capital for the three ownership groups. The amount of skilled labor equals the number of engineering, technical, and managerial personnel. The amount of unskilled labor equals the number of basic production workers, auxiliary production workers, service personnel, and other employees. The amount of physical capital equals the book value of fixed assets including buildings, production machinery and equipment, office equipment, and vehicles; the value is converted to 1998 values using GDP deflators. As Table 9.1 shows, all three production factors increased significantly in private firms and foreign firms. In contrast, public firms saw an increase in physical capital input, but a decrease in both skilled and unskilled labor inputs.

Estimation of production function

We start by assuming a production function $Y_i = A_i F(K_i, N_i)$ for firm i, where Y denotes output, K stands for physical capital, N denotes total employment of labor, and A is a productivity parameter. Applying a second-order Taylor approximation in logarithms yields the following translog production function:

$$\log Y_i = \log A_i + a_0 + a_1 \log K_i + a_2 \log N_i + 0.5a_3(\log K_i)^2 + 0.5a_4(\log N_i)^2 + a_5 \log K_i \log N_i$$

Taking the time difference (denoted by Δ) and assuming that $\Delta \log A_i = \beta + \varepsilon_i$, we obtain the following regression equation:

$$\Delta \log Y_i = \beta + a_1 \Delta \log K_i + a_2 \Delta \log N_i + 0.5a_3 \Delta(\log K_i)^2 + 0.5a_4 \Delta(\log N_i)^2 + a_5 \Delta \log K_i \log N_i + \varepsilon_i.$$

The assumption $\Delta \log A_i = \beta + \varepsilon_i$ decomposes productivity growth into a general trend and a firm-specific component. Applying this regression equation to the full sample, we obtain the results displayed in regression (2.1) of Table 9.2.

Regression (2.1) indicates an estimated output elasticity of capital of 0.45, and an estimated output elasticity of labor of 0.68. All squared terms enter the regression with no statistical significance, suggesting that the production function takes the Cobb–Douglas form. In regression (2.2), we drop the squared terms and find that the estimated output elasticities become more statistically significant.

Table 9.2 Regression results, ordinary least squares

	2.1	*2.2*	*2.3*	*2.4*	*2.5*	*2.6*
Sample	Full	Full	Full	Private	Public	Foreign
Constant	7.67	7.58	9.19	10.50	2.86	14.39
	(2.51)***	(2.50)***	(2.64)***	(5.35)**	(3.86)	(5.97)**
$\Delta \log K$	0.45	0.35	0.37	0.31	0.38	0.37
	(0.24)*	(0.06)***	(0.08)***	(0.11)***	(0.11)***	(0.15)**
$\Delta \log N$	0.68	0.81				
	(0.38)*	(0.10)***				
$\Delta \log L$			0.33	0.51	0.09	0.73
			(0.11)***	(0.20)***	(0.11)	(0.24)***
$\Delta \log H$			0.54	0.12	0.60	0.53
			(0.12)***	(0.18)	(0.17)***	(0.20)***
$\Delta(\log K)^2$	0.01					
	(0.02					
$\Delta(\log N)^2$	0.02					
	(0.04					
$\Delta \log K \log N$	–0.02					
	(0.05)					
R-squared	0.23	0.23	0.23	0.21	0.23	0.28
Observations	1,261	1,261	1,103	291	467	345

Notes
K, physical capital; N, total labor; L, unskilled labor; H, skilled labor. The dependent variable is $\Delta \log Y = \ln Y(2000) - \ln Y(1998)$, where Y = sales. All values are in 1998 prices.
Numbers in parentheses are heteroskedasticity-adjusted standard errors.
Statistical significance at the *** 1% level, ** 5% level, and * 10% level.

It should be noted that the implementation of the regressions assumes that the ordinary least squares (OLS) assumptions hold, which may not be true. Nevertheless, regression (2.2) provides the starting point of our investigation and is appealing for its simplicity. In regression (2.3), we introduce unskilled labor (L) and skilled labor (H) as two input variables instead of combining them as one input variable. The results show an estimated output elasticity of 0.37 for capital, 0.33 for unskilled labor, and 0.54 for skilled labor. One may interpret the results as suggesting increasing returns to scale, but we would adopt caution over such an interpretation because the sample contains very different firms, and the assumption of an identical production function for the whole sample is clearly an oversimplification, so the results here serve only as a reference.

Recognizing that ownership structure may result in firms using different production functions, we run regressions for the three ownership groups separately. Regression (2.4) reports the results from the sample of private firms. Both capital and unskilled labor show statistically significant effects, but the change in skilled labor shows no statistically significant effect on the change in output. Given that skilled labor increased by 14.4 percent in the period (Table 9.1), one would expect to see its effect on output. One interpretation of this result is that human capital affects output growth mainly through its effect on productivity rather than factor accumulation. In a widely known study, Benhabib and Spiegel (1994) find from cross-country data that human capital does not affect output as an ordinary production factor such as physical capital or unskilled labor. Rather, it affects output by facilitating technology absorption. This view implies that the production function should be specified as $Y = A(H)G(K, L)$ rather than $Y = AF(K, L, H)$. While we find some support for this view in our data, we do not intend to push this view too far in our interpretation of regression (2.4), as it may well be a result of data noise or the assumptions failing to hold.

Turning to the sample of public firms, we find in regression (2.5) that variations in capital and skilled labor help to explain the variation in output, but variation in unskilled labor does not. Our interpretation is that public firms in China are severely constrained in their decisions regarding the employment of unskilled workers. Thus, one would not be surprised to see that the variation in output is not correlated with the variation in unskilled labor employment. Again, this is a suggestive interpretation, and it may well be a result of data quality or regression mis-specification. Finally, we have regression (2.6), which features the sample of foreign firms. All three input variables are found to be statistically significant in this regression.

Sample characteristics

Before exploring further with regression methods, it is useful to take a look at the characteristics of the firms in the sample. Table 9.3 reports capital intensity, skill intensity, research and development (R&D) intensity, and export intensity in 1998 and 2000 for the full sample and the three ownership groups. During this period, capital intensity, measured by the ratio of capital to sales, declined in all three

Table 9.3 Sample characteristics

	Full sample	*Private firms*	*Public firms*	*Foreign firms*
Capital intensity, 1998	3.81	1.08	3.15	7.01
Capital intensity, 2000	2.85	1.04	3.11	4.01
Skill intensity, 1998	0.97	1.12	0.91	0.92
Skill intensity, 2000	1.02	1.18	0.90	1.04
R&D intensity, 1998	0.07	0.04	0.06	0.13
R&D intensity, 2000	0.07	0.05	0.04	0.15
Export intensity, 1998	0.17	0.10	0.07	0.37
Export intensity, 2000	0.18	0.12	0.08	0.37

Notes
Capital intensity = K/Y; skill intensity = H/L; R&D intensity = R&D expenditure/total sales; export intensity = export sales/total sales.

groups, with the largest decline in foreign firms. This suggests an increase in capital efficiency. Skill intensity, measured by the ratio of skilled labor to unskilled labor, increased in private firms and foreign firms, but stayed about the same in public firms. This may be reflecting the difficulty of public firms in reducing the employment of unskilled workers. R&D intensity, measured by the ratio of R&D expenditure to sales, increased in private firms and foreign firms, but decreased in public firms. Notice that private firms had the highest skill intensity, while foreign firms had significantly higher R&D intensity and capital intensity than private firms and public firms.

Table 9.3 shows that both private firms and public firms saw an increase in export intensity, measured by the share of export sales in total sales. Export intensity remained very high and stable at 37 percent for foreign firms in this period.

R&D and exporting

So far we have used only changes in factor inputs to account for changes in output. Recall that the regression specification for Table 9.2 assumes that $\Delta \log A_i = \beta + \varepsilon_i$. To identify the variables that explain productivity changes, we assume that $\Delta \log A_i = \beta_0 + \beta_k X_k + \varepsilon_i$, where X_k is a set of variables that explains productivity change.

According to economic theory, an important driving force of productivity growth is technical progress. A firm can achieve technical progress from innovating new technology or imitating existing technology, with the extent of technical progress depending largely on the firm's efforts in R&D. To capture this R&D

Table 9.4 Regression results, ordinary least squares

	4.1	*4.2*	*4.3*	*4.4*	*4.5*	*4.6*
Sample	Private	Public	Foreign	Private	Public	Foreign
Constant	9.50	2.85	14.81	5.50	1.08	10.64
	(5.38)*	(3.92)	(6.24)**	(6.09)	(4.29)	(9.25)
$\Delta \log K$	0.30	0.36	0.33	0.30	0.37	0.33
	(0.11)***	(0.11)***	(0.16)**	(0.11)***	(0.11)***	(0.16)**
$\Delta \log L$	0.54	0.08	0.74	0.54	0.09	0.74
	(0.20)***	(0.11)	(0.25)***	(0.20)***	(0.11)	(0.25)***
$\Delta \log H$	0.08	0.60	0.53	0.09	0.60	0.53
	(0.17)	(0.17)***	(0.21)**	(0.17)	(0.17)***	(0.21)***
R&D	43.92	-2.27	18.71	41.56	-2.06	18.64
	(20.66)**	(0.93)**	(0.38)***	(23.42)*	(0.92)**	(0.39)***
Exporting				18.19	19.45	6.68
				(10.26)*	(8.49)**	(10.36)
R-squared	0.22	0.15	0.39	0.22	0.16	0.39
Observations	289	461	324	289	461	324

Notes
R&D, R&D intensity in 1998.
Exporting, a dummy variable that equals 1 if exporting in 1998 or 1999, and zero otherwise.
Statistical significance at the *** 1% level, ** 5% level, and * 10% level.

effect, we include an R&D variable in the regression and report the results in Table 9.4.[4]

As Table 9.4 shows, the R&D variable is statistically significant in all three ownership groups. In the sample of private firms and foreign firms, R&D intensity is positively correlated with output growth. The higher the R&D intensity, the faster is the output growth of a private firm or a foreign firm, which can be interpreted as R&D promoting productivity growth and, hence, output growth. Paradoxically, in the sample of public firms (regression 4.2), R&D intensity is *negatively* correlated with output growth. The higher the R&D intensity, the slower is the output growth of a public firm. What is the interpretation? We believe that this reflects the nature of public firms in China. State-owned firms in China have much better access to R&D funds than non-state-owned firms.[5] The firms with higher R&D intensity in our sample of public firms are mainly state-owned firms. The negative estimated coefficient on R&D suggests that those state-owned firms, while having a higher R&D-to-output ratio, are the ones with lower productivity growth. State ownership leads to both a higher R&D-to-output ratio and lower productivity growth; hence, the negative correlation between the two variables.

Next, we examine the role of export orientation. The economic literature is full of evidence that international trade is an important channel for technology diffusion.[6] Through exposure to the world market, exporters are able to absorb foreign technology better than non-exporters. Moreover, exposure to the world market adds competition and pushes exporters to improve production efficiency.

To see the role of exporting, we introduce a dummy variable that equals 1 if a firm exported in 1998 or 1999, and 0 otherwise. Table 9.4 reports the results. Regression (4.4) estimated that the sales of private exporting firms grew 18.7 percentage points faster than those of non-exporting firms. Recall that sales grew by 28.3 percent on average in the sample of private firms (Table 9.1), so this result is very significant. Export status is even more important for public firms. While sales grew negatively by 0.1 percent in the sample of public firms (Table 9.1), regression (4.5) estimated that sales of public exporting firms grew 19.5 percentage points faster than those of non-exporting firms. Regression (4.6) shows that export status does not matter for output growth of foreign firms. This is not surprising as foreign firms are already highly exposed to international competition, and their productivity growth is expected to be less sensitive to export status.

To gain more insight into the role of exporting, we display skill intensity and R&D intensity for exporting and non-exporting firms in Table 9.5. For all three ownership groups, exporting firms have lower skill intensity than non-exporting firms. This is consistent with the trade pattern of China in exporting unskilled labor-intensive goods. It is interesting to observe that R&D intensity is 0.20 for foreign exporting firms but only 0.03 for foreign non-exporting firms. R&D intensity is slightly higher for private exporting firms at 0.05 than for private non-exporting firms at 0.04. For public firms, R&D intensity is higher for non-exporting firms at 0.06 than for exporting firms at 0.02.

It should be noted that our results so far do not identify the causality between productivity growth and export status. The positive estimated coefficient on exporting may show that exposure to export markets enhances the productivity growth of firms, but may alternately show that firms with higher productivity growth choose to enter the export business.[7] The causality question is hard to answer with our limited data, but we will provide some evidence that exporting contributed to productivity growth in the following section.

Table 9.5 Sample characteristics by export status

Sample	*Export status*	*Observations*	*Skill intensity*	*R&D intensity*
Full	Exporting	359	0.47	0.13
	Non-exporting	715	1.24	0.05
Private	Exporting	63	0.37	0.05
	Non-exporting	226	1.34	0.04
Public	Exporting	93	0.37	0.02
	Non-exporting	368	1.05	0.06
Foreign	Exporting	203	0.56	0.20
	Non-exporting	121	1.62	0.03

Table 9.6 Regressions results, industry-specific effects

	6.1	*6.2*	*6.3*	*6.4*
Sample	Full	Private	Public	Foreign
Constant	0.65	−1.07	8.36	−12.45
Δlog *K*	0.35***	0.29***	0.39***	0.33**
Δlog *L*	0.31***	0.52***	0.10	0.73***
Δlog *H*	0.54***	0.11	0.59***	0.60***
R&D	15.32***	27.67	−1.90**	17.77***
Exporting	19.08***	17.65	12.79	19.59
Apparel and leather	Base	Base	Base	Base
Electronic components	2.82	6.62	−2.30	13.83
Electronic equipment	5.10	12.47	5.39	−2.35
Consumer products	−2.07	11.34	−14.86	1.69
Vehicles and parts	8.94	11.36	−12.23	40.67**
IT services	3.09	32.06*	−15.29	−3.15
Communication services	−33.07***	−46.20*	−33.35**	−13.62
Financial services	9.42	6.15	−22.16	67.83
Marketing services	5.40	34.55*	−47.02*	27.09
Logistics services	5.44	−21.21	−3.37	43.44**
R-squared	0.28	0.26	0.18	0.41
Observations	1,074	289	461	324

Note
Standard errors are not reported to save space.
Statistical significance at the *** 1% level, ** 5% level, and * 10% level.

Besides R&D and exporting, there are other factors that impact on the productivity growth of firms in China. It is not difficult to imagine that institutional factors must be playing an important role.[8] Unfortunately our data set does not contain information on institutional variables other than ownership. Still, we may obtain some indirect evidence on this. In Table 9.6, we report the results from regressions that include industry dummies. The survey provides a classification of ten industries. Using the apparel and leather industry as the base, we find that the majority of the industry dummies are statistically insignificant.[9] Presuming that the apparel and leather industry has a rather competitive market, we may detect from Table 9.6 some interesting evidence on institutional effects. First, the communication services industry has lower productivity growth than the base industry. This is an industry with significant government monopoly power, which may explain the lower productivity growth due to lack of competition. Second, the marketing services industry shows an interesting pattern. Private firms in this

industry had higher productivity growth than the base industry, while public firms in this industry had lower productivity growth. One possible explanation is that the state-owned firms in this industry remain highly regulated, which gives private firms an edge. Notice that private information technology (IT) firms had a higher productivity growth rate than the base industry, which is consistent with the observation of spectacular growth of IT firms in China during this period. Private firms in the IT services industry had the highest R&D intensity among all private firms, which may explain why the estimated coefficient on R&D turns from statistically significant in regression (4.4) without industry dummies to statistically insignificant in regression (6.2) with industry dummies. In regression (6.4) of foreign firms, the industry of vehicles and vehicle parts and the industry of logistics services saw higher productivity growth than the base industry, probably because of their high technology levels not captured by the R&D intensity variable.

Total factor productivity

Our investigation has been based on an assumed production function of the form $Y_i = A_i(X_k)F(K_i, L_i, H_i)$. We define $A_i(X_k) = Y_i/F(K_i, L_i, H_i)$ as total factor productivity (TFP). There are many issues regarding TFP construction. With the limited data we have, we can only compute TFP measures in a very rough way. Still, we hope that the rough estimates can shed some light on the productivity growth of Chinese firms.[10]

Specifically, we use estimated output elasticities of factor inputs from regressions (4.4), (4.5), and (4.6) to compute the TFP growth rate as the difference between output growth and the estimated contribution of input growth to output growth.[11] In so doing, we allow the three ownership groups to have different production functions, but assume that firms in each group share the same production function.

Table 9.7 displays the results from this computation. Notice first that TFP growth was 11.26 percent and contributed 41 percent to output growth in the sample of private firms; it was 17.26 percent and contributed 38 percent in the sample of foreign firms. In contrast, TFP growth was low at 2.72 percent in the sample of public firms, which saw a negative sales growth rate of –1.49 percent. The finding of strong TFP growth for China's private firms is encouraging.[12]

Exporting is very significant to TFP growth. Table 9.7 shows that TFP growth rates are 26.07 percent, 18.29 percent, and 20.91 percent for private firms, public firms, and foreign firms that exported. The fact that public exporting firms also enjoyed high TFP growth rates is worth noticing. The contribution of TFP growth to output growth is a high 67 percent for private exporting firms and 41 percent for foreign firms. Interestingly, while TFP growth is estimated to be 18.29 percent for public firms, the growth rate of sales from these firms is only 9.76 percent. One possible explanation is that the estimated output elasticities are based on the entire sample of public firms, which may be underestimates for the sample of public exporting firms and, hence, result in an overestimation of TFP contribution.

Table 9.7 Results on total factor productivity (TFP)

	TFP 1998	*TFP 2000*	*TFP growth*	*Sales growth*	*TFP contribution*	*Observations*
Private	1.19	1.34	11.26	27.65	41%	289
Public	0.53	0.53	2.72	–1.49	N/A	461
Foreign	0.16	0.21	17.26	45.13	38%	324
Exporting						
Private	0.79	1.30	26.07	39.06	67%	63
Public	0.43	0.49	18.29	9.76	N/A	93
Foreign	0.09	0.11	20.91	50.98	41%	203
Non-exporting						
Private	1.31	1.35	7.13	24.46	29%	226
Public	0.55	0.54	–1.22	–4.33	N/A	368
Foreign	0.28	0.37	11.14	35.32	32%	121
New exporting						
Private	2.02	2.98	46.32	84.49	55%	17
Public	0.31	0.41	37.24	42.11	88%	14
Foreign	0.09	0.09	17.29	45.23	38%	16

Notes
TFP computed based on regressions (4.4), (4.5), and (4.6).
TFP contribution is the ratio of TFP growth to sales growth; not applicable (N/A) if sales growth is negative.
New exporting firms are those that did not export in 1998, but exported in 1999 or 2000.

In sharp contrast, TFP growth rates are significantly lower for the sample of non-exporting firms compared with their exporting counterparts. TFP growth rates are negative for non-exporting public firms, largely because of the inefficient state-owned firms in the sample. This result is consistent with earlier studies that found the TFP growth of China's state-owned sector to be low. Notice that non-exporting firms had significantly higher TFP levels in 1998 than exporting firms in all three ownership groups, and the gap narrowed from 1998 to 2000. This supports the view that firms with higher TFP levels did not choose to be exporters; it is exporting that enhanced their TFP.

Finally, we examine a small sample of firms that were not exporting in 1998 but started to export in 1999 or 2000. This examination is intended to provide further evidence that exporting enhances productivity. Table 9.7 shows that the 17 private firms that did not export in 1998 had an average TFP level of 2.02, much higher than the average for all private firms (1.19). By becoming exporters, these firms experienced a TFP growth rate of 46.32 percent from 1998 to 2000, much higher than the average for all private firms (11.26 percent). Newly exporting public firms also had significantly higher TFP growth rate (37.24 percent) than the

sample average (2.72 percent). We view this as evidence that exporting enhances productivity growth.

Conclusion

In this chapter, we investigate the productivity growth of private firms in China. Based on a World Bank survey of 1,500 firms, we construct a sample of 450 private firms as well as a sample of 488 foreign firms and 562 public firms for comparison. The sample period is from 1998 to 2000. On average, private firms are less capital intensive, less R&D intensive, but slightly more skill intensive than other firms. While far less export intensive than foreign firms, private firms are more export intensive than public firms, and their export intensity increased over the sample period.

We estimate production functions for the three ownership groups separately. Using production function regressions, we identify R&D intensity and export status as two variables correlated with productivity growth. For private firms and foreign firms, higher R&D intensity is associated with higher productivity growth. We interpret this as reflecting the positive effect of R&D on technology absorption. For public firms, however, higher R&D intensity is associated with lower productivity growth. We interpret this as reflecting the inefficiency of state-owned firms, which implies higher R&D spending coexisting with lower productivity growth. Based on regressions with industry dummies, we obtain some indirect evidence on the impact of institutional constraints on market competition and productivity growth.

The main finding of the chapter is that exporting constitutes an important driver of productivity growth in both private firms and public firms in China. Exporting plays a much lesser role in the productivity growth of foreign firms in China. We estimate that exporting would raise a private firm's productivity growth rate by 18.19 percentage points over the sample period 1998–2000, and a public firm's productivity growth rate by 19.45 percentage points. While the regressions do not indicate the causality between exporting and productivity growth, we examine TFP estimates and find evidence that it is exporting that enhances productivity, rather than firms with higher productivity self-selecting to be exporters. Productivity levels of both private and public exporting firms were significantly lower than those of non-exporting firms in 1998, but the gap narrowed from 1998 to 2000. Firms that did not export in 1998 but became exporters in 1999 and 2000 had significantly higher TFP levels in 1998 than other firms; entering the export market makes them experience the highest productivity growth among all the firms in the sample.

Our results show optimism about China's economic growth in the coming years. As China's private sector continues to expand and become more involved in international trade, its productivity growth will become an important engine for the growth of the Chinese economy. While we do not have data to examine the link between the productivity growth of private firms and R&D spillovers from foreign firms, we suspect that the link exists and is strong. Despite low R&D intensity at about 0.05, as shown in Table 9.3, the productivity growth of private firms benefited greatly from R&D investment (regression 4.4). Private firms may be effectively absorbing R&D spillovers from foreign firms, whose R&D intensity, as shown in Table 9.3, is three times higher than that of private firms.

Notes

1 We thank the World Bank and the Davidson Data Center and Network (DDCN) for making the data available.
2 As pointed out in Asian Development Bank (2003: 1), "Exactly what comprises the 'private sector' in the PRC is murky, and a lack of clarity is evident in the data on economic performance provided by the State Statistical Office."
3 The GDP deflator is 0.978 for 1999 and 0.986 for 2000, with 1998 as the base year.
4 To avoid endogeneity, the R&D variable is R&D intensity in 1998.
5 See Brandt and Zhu (2004) for a study of the impact of financial constraint on technology absorption in a sample of Shanghai firms.
6 See the literature cited by Xu and Wang (2000).
7 Bernard and Jensen (1999) provide a discussion of the causality between exporting and productivity.
8 See Sachs and Woo (2000) for an excellent discussion of institutional factors in explaining China's economic performance.
9 We chose the apparel and leather industry as the base industry in the regression because it is arguably the industry with the most competitive market.
10 There is a large literature on measuring China's TFP. See Chow (1985, 1993), Chow and Li (2002), Gordon and Li (1995), and Li (1997), among many others.
11 Based on regressions (4.4) and (4.5), we use 0.09 as the estimated output elasticity of skilled labor for the sample of private firms and 0.09 as the estimated output elasticity of unskilled labor for the sample of public firms, despite their statistical insignificance. This practice has little impact on the results because the value of 0.09 is small.
12 These results regarding ownership impact on productivity are consistent with the findings of Zhang et al. (2001) who use a different data set.

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