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Government Efficiency and Exports in China

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Abstract

This paper investigates the role of local governments' efficiency on exports in China. We argue that firms located in provinces characterized by high governmental efficiency export more due to a positive productivity effect that lowers transaction costs. The analysis builds on NBS firm-level data that covers a representative sample of Chinese establishments. We find a positive correlation between provincial governments efficiency and Chinese firm's exports. Moreover, we are able to show that the positive link between firm size and exports is magnified by governmental efficiency. Larger firms export more and this relationship is much stronger in provinces with more efficient provincial governments.

I. Introduction

Do firms benefit from the presence of a good institutional environment? Instability and inefficiency are potential distortions that can hinder entrepreneurial activity. Both foreign and domestic firms are expected to prefer investments in low-risk locations with governments that interact more efficiently with firms' decision makers.

Governmental efficiency is one important aspect of institutional quality by means of providing legal systems, public services and infrastructure as well as reasonable policy making decisions. Furthermore, it comprises credibility of the government as well as quality of formulation and implementation of local policies. Hence, government effectiveness indirectly affects regulatory quality or contract enforcement just to name some channels through which it can determine institutional quality.

A recent strand of literature shows that institutional quality has an impact on international integration, in particular on imports and exports. Weak institutions can be linked to higher risk and more intensive transaction cost of international trade (e. g. Anderson and Marcouiller (2002), De Groot et al. (2004), Ranjan and Young Lee (2007)). Besides higher transaction costs, firms' market entry can be affected by institutions through firm selection as described in Melitz (2003). Only the most productive firms are able to bear additional exporter fixed costs. Productivity in the Melitz (2003) model is static but empirical evidence on institutions and its impact on productivity exist. Hall and Jones (1999) for instance argue that institutional quality has a positive effect on physical as well as human capital accumulation, both being important determinants of productivity. Similarly, Tanzi and Davoodi (2000) find a diminishing effect of weak institutions on FDI and firm productivity. In line with their study,

Rodrik et al. (2004) identify a positive impact of high quality institutions on capital accumulation and productivity, and a positive and significant effect on international integration.[1]

Thus, one may conclude that a better quality of institutions, including governmental efficiency, fosters the volume of trade (e. g. Anderson and Marcouiller (2002), Anderson and Young (2006), Francois and Manchin (2006), Musila and Sigué (2009), Ranjan and Young Lee (2007)), as more firms are able to cover the exporting fixed costs. Francois and Manchin (2006) detect a positive relationship between institutional quality and both the probability to export and the volume of trade. Ranjan and Young Lee (2007) propose a model that allows to analyze the effect of contract enforcement on trade volumes. Contract enforcement is indirectly affected by government efficiency due to the fact that efficient governements are able to provide a political enviroment that promotes economic activity. According to their model, the quality of contract enforcement is more important for trade in differentiated goods.[2] Ranjan and Young Lee (2007) provide supporting evidence of their theoretical findings: the effect of contract enforcement on trade volumes is positive and highly significant. Additionally, they identify a stronger effect of contract enforcement on export-intensive countries. In line with that, Méon and Sekkat (2008) find that exports of manufactured goods are positively affected by high institutional quality.

China went through a period of rapid institutional changes after 1978 but

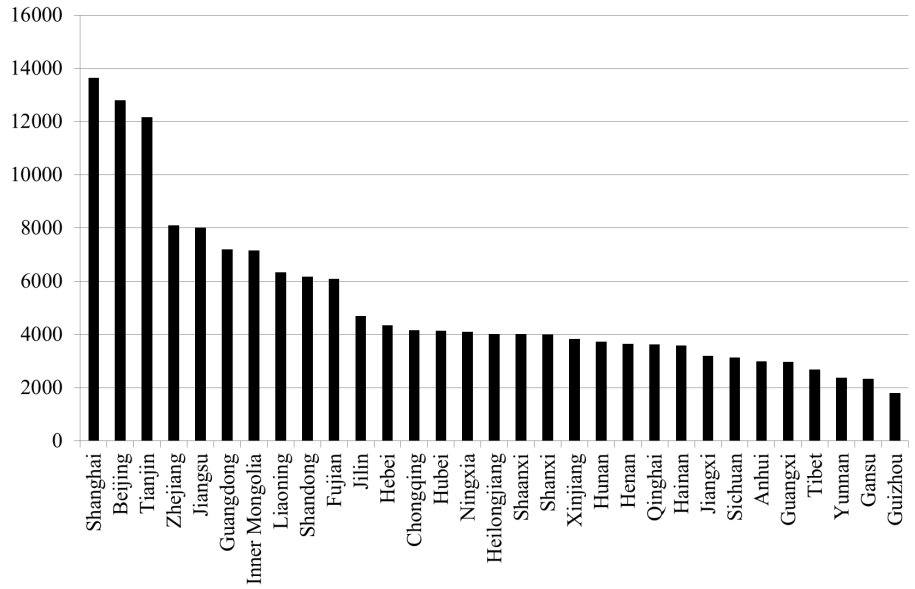
[1] Rodrik et al. (2004) note that the causality of the relation between institutional quality and integration is not unique. They also find a positive correlation between integration and institutional quality.

[2] Imperfect contract enforcement increases the price of warranty payments. Buyers are assumed to be risk avers, while sellers are risk neutral. If warranty payments become less effective due to a lower level of contract enforcement, buyers face a higher risk. Sellers are forced to lower the product price. Suppliers of low quality goods give up the business and the volume of trade declines. Due to the fact that quality is more important regarding differentiated goods, the effect of contract enforcement is elevated.

the reforms were not equally implemented over the different provinces in China. State owned enterprises were decentralized, prices were partly liberalized and the permission to establish private owned firms was granted in special economic zones mainly located at the coastal regions of China. Furthermore, some markets were liberalized in order to attract foreign capital and to intensify global trade links. The Chinese economy experienced great efficiency gains and two digit GDP growth rates up to the financial crisis. By the same token, international trade in China was growing by around 4.4% on average.

The summarized stylized facts connote a positive economic development but the more disaggregated data show that economic growth was not equally distributed across space and time. In particular the eastern provinces of China benefited from the economic reforms, whereas the western regions are still lagging far behind. Figure 1 illustrates the high inequality of GDP per capita across different regions.

Figure 1: *GDP per capita by province 2010 (in USD)*



The three coastal municipalities Shanghai, Beijing and Tiannjin report the

highest GDP per capita across all Chinese provinces.[3] This contrasts with Yunnan, Gansu and Guizhou, whose GDP per capita lags far behind.[4]

The pattern of an economic strong East and a less developed West is mirrored in other economic outcomes as well. For instance the documented rise in exports was also mainly driven by the extraordinary export performance of firms located in the eastern regions. Guangdong (362.4 bn USD), Jiangsu (207.5 bn USD) and Zhejiang (147.6 bn USD) are the three regions with the highest export volumes in China. All these regions are located at China's east cost. In contrary, the western provinces Gansu (0.8 bn USD), Tibet (0.3 bn USD) and Qinghai (0.2 bn USD) bring up the rear. There are several obvious advantages that the East has over the West: the proximity to the sea facilitates international trade by providing short ways to ship goods to the rest of the world. A further major advantage of the coastal areas are the so-called 'special economic zones', which granted spatially delimited legal and administrative benefits for investors. The special economic zones were opened sequentially over time, which led to regional disparities in both economic outcomes and provincial governments' efficiency. We argue that this development had a huge impact on the formation of regional export markets through its impact on firm behavior. Governmental efficiency can affect firm productivity, and transaction cost of trade.

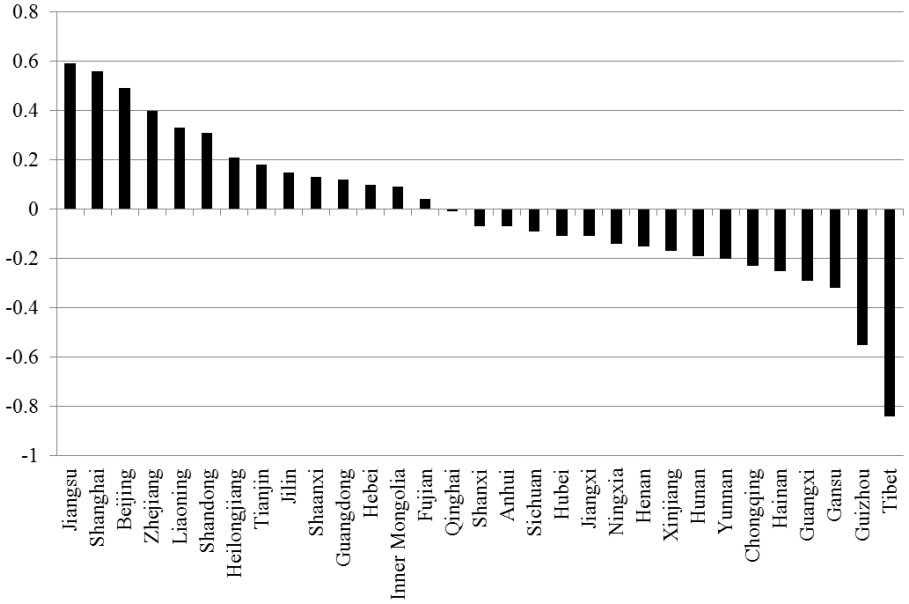
Figure 2 provides a first glimpse at the data. The comparison of governmental efficiency depicted in this graph builds on the *Chinese provincial government efficiency index* developed by Tang et al. (2014). The index is calculated on the basis of four main indicators, namely government public service, public infrastructure, governmental size and residents' economic welfare, which are subdivided into further categories.[5] It can be seen that governmental efficiency

[3]GDP per capita - Shanghai: 13,633 USD, Beijing: 12,790 USD and Tianjin: 12,166 USD.

[4]GDP per capita - Yunnan: 2,366 USD, Gansu: 2,323 USD and Guizhou: 1,808 USD.

[5]The *Chinese provincial government efficiency index* is a very broad measurement of institutional quality and includes government public service (24 indexes), government public infrastructure

Figure 2: *Institutional quality by province (2009)*



differs across the 31 Chinese provinces. Provinces characterized by a high per capita GDP are also associated with high efficiency of provincial governments. Jiangsu, Shanghai, and Beijing are the provinces with the highest governmental efficiency and they belong to the top five provinces regarding GDP per capita. In contrast, Tibet, Guizhou and Gansu are the provinces with least efficient governments and concurrently belong to the most indigent provinces in China.

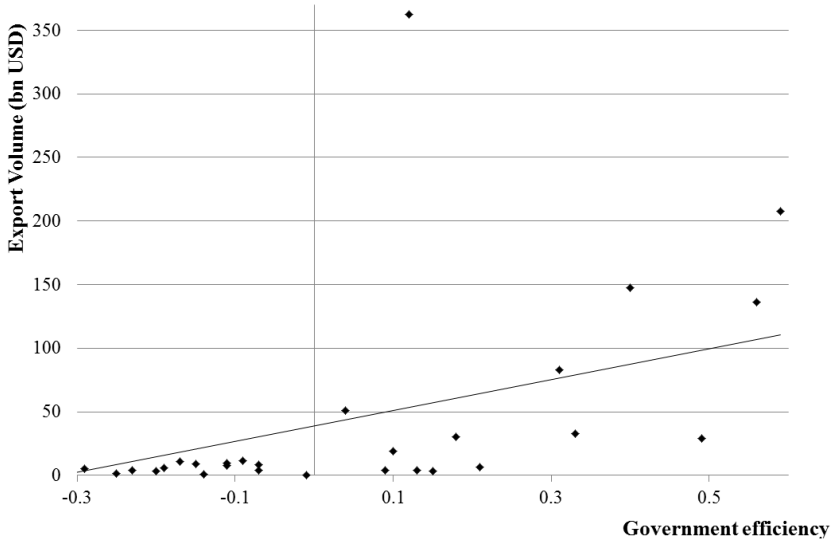
We state that the governmental efficiency affects firm productivity, and thereby firm size. We know, that more productive firms tend to be larger, and that firm size and the propensity to export are positively related.[6] Moreover, at the intensive margin of trade, firm-size and export volume are also positively correlated. We expect that a low level of governmental efficiency distorts the positive effect of firm size on export volume by generating hidden transaction cost. This link is illustrated in Figure 3, which confronts the *Chinese provincial*

(11 indexes), government size (5 indexes) and economic welfare of residents (7 indexes). More detailed information regarding the index composition can be found in Appendix I.

[6]Productivity plays an important role for this relationship. Firms that are more productive tend to generate higher profits and export more (e. g. Melitz (2003), Bernard et al. (2007)).

government efficiency index with the average export volume of the respective province.

Figure 3: *Institutional quality and export volume by province (2009)*



The stylized facts substantiate the hypothesized link: Provinces characterized by a higher level of institutional quality, by means of government efficiency, are associated with higher export volumes. In the remainder of the paper we analyze the relationship between governmental efficiency and exports in Chinese provinces in more detail based on a regression analysis that allows to account for additional firm and region level controls, as well as potential interactions between governmental efficiency and firm size.

II. Empirical Analysis

The analysis is elaborated on basis of panel data that contains information on Chinese firms covering the years 2001 to 2006. Stimulated by China's entry into WTO and numerous trade promoting policies, more and more firms started to export accompanied by rising productivity (Brandt et al. (2015)). For this reason, the data used in our analysis provide the ideal time span to study firms'

exporting behavior. Firm's rapid development gives us enough variation of the data for identification using panel fixed effects estimators. Moreover, the data allows us to distinguish between state owned enterprises (SOE), private enterprises and foreign owned firms. Smaller firms are not included but all firms with sales above five million RMB are repeatedly surveyed over the years. We are interested in the total effect of governmental efficiency on exports, including intensive and extensive margin, and we are interested in the effect on the intensive margin, separately. The preferred regression models read

$$\begin{aligned} ln(export)_{it} = \alpha + \beta_1(GE_{jt}) + \beta_2(FS_{it}) + \beta_3(GE_{jt} \times FS_{it}) + \beta_n(C_{it}) + \\ + \gamma_i + \mu_t + u_{ijt} \end{aligned} \tag{1}$$

and

$$\begin{aligned} (export/output)_{it} = \alpha + \beta_1(GE_{jt}) + \beta_2(FS_{it}) + \beta_3(GE_{jt} \times FS_{it}) + \beta_n(C_{it}) + \\ + \gamma_i + \mu_t + u_{ijt} \end{aligned} \tag{2}$$

The first model allows identification of the marginal effect of size and government efficiency at the intensive margin, whereas the second model identifies the marginal effects at both the intensive and the extensive margin together.

Indices i, j and t identify a firm i in province j at time t. The dependent variable $ln(export)_{it}$ represents the log linearized export volume at the firm level (intensive margin), while $(export/output)_{it}$ represents the export share (total effect). The variable GE is our measure of government efficiency, which varies over time and provinces. We expect that a higher efficiency is positively

related to the export share/volume through lower transaction cost. The variable FS takes on the values associated with firm size, which is either measured by the log level of employment or the log level of sales. Following the relevant trade literature, we expect a positive relationship between size and exports in manufacturing firms. A positive coefficient of the interaction term would indicate that government efficiency GE magnifies the positive correlation between firm size and export volume. C covers a set of control variables including firm's year of establishment, the capital stock and ownership. Collectively owned enterprises are lumped together with state owned enterprises and we do not distinguish between foreign owned firms and firms from Hong Kong and Taiwan. All regressions are purged from time fixed effects μ_t and in some of the regressions we also include firm fixed-effects. Standard errors are clustered at province level and u_{ijt} denotes the error term.

As further robustness check, we substitute the number of employees and the capital stock using a proxy of total factor productivity.

I. Data

The data on government efficiency is provided by Tang et al. (2014). Their index is based on four main indicators and six sub-indicators that are subdivided into 47 indexes. The *Chinese provincial government efficiency index* covers 31 Chinese provinces[7] and a time span that ranges from 2001 to 2010. Tang et al. (2014) adopt the calculation method of the International Institution for Management Development (IMD). Averaged indexes and standard deviations are calculated based on the raw data of the Chinese statistical yearbooks. The resulting index is weighted and standardized so that the value -1 is associated with the lowest

[7] Anhui, Beijing, Chongqing, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Heilongjiang, Henan, Hubei, Hunan, Inner Mongolia, Jiangsu, Jiangxi, Jilin, Liaoning, Ningxia, Qinghai, Shaanxi, Shandong, Shanghai, Shanxi, Sichuan, Tianjin, Tibet, Xinjiang, Yunnan, Zhejiang

level and +1 with the highest level of efficiency.

To identify export volumes at the firm level, we build on the Chinese NBS firm level data that covers the observations for firms surveyed in the years 1998 and 2006. The included number of firms varies between 146,101 in 1999 and 278,739 in 2006. Overall, we have 1,728,740 observations during the whole period. All firm-level controls as sales, size, firm age, ownership and productivity stem from the Chinese NBS firm level data set. Export shares are constructed as the ratio between export volumes and total sales at the firm level.

We lose some observations merging the provincial and the firm level data due to the fact that both employed data sets do not cover the same time period. Additionally, we drop firms with date of establishment earlier than 1850 and later than 2006 as well as duplicates in order to purge some inconsistent observations from the data. Following these adjustments, we conduct our regression analysis based upon 1,258,115 observations. Performing the analysis with nominal trade volume at the intensive margin we get a reduction to 344,644 observations due to the loss of all pure domestic firms with zero exports. A summary statistic can be found in Appendix II.

II. Empirical Results

Total effect. The benchmark specification includes the export share as dependent variable, which is regressed upon the direct and indirect measures of size and governments efficiency. The latter is captured by an interaction term between employment, *Labor*, and government efficiency. The estimation results are reported in Table 1.

Table 1: *Benchmark regression results*

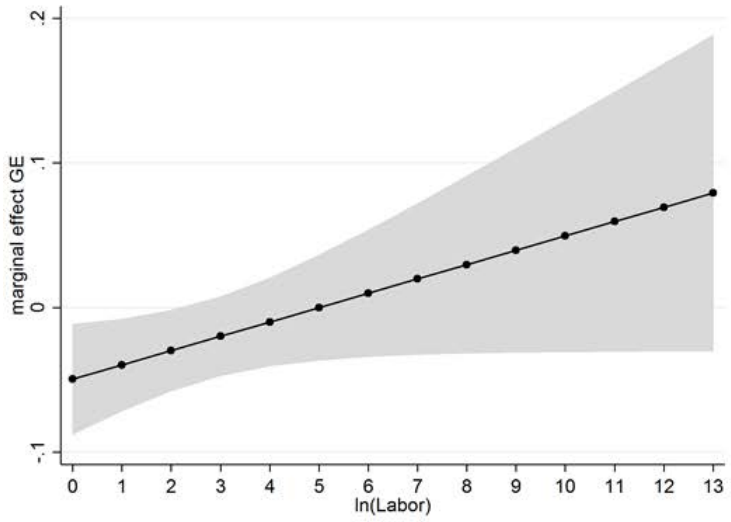
Dependent Variable: Export Share

	(1)	(2)	(3)	(4)	(5)	(6)
	b/se	b/se	b/se	b/se	b/se	b/se
Labor	0.108***	0.101***	0.012***	0.100***	0.096***	0.012***
	(0.02)	(0.02)	(0.00)	(0.02)	(0.02)	(0.00)
GE	-0.189***	-0.312***	-0.050**	-0.146***	-0.236***	-0.050**
	(0.04)	(0.10)	(0.02)	(0.04)	(0.08)	(0.02)
GE × Labor	0.080***	0.067***	0.010*	0.056***	0.048***	0.010*
	(0.02)	(0.02)	(0.01)	(0.01)	(0.02)	(0.01)
Firm Age	0.003***	0.002***	-0.000	0.001***	0.001***	-0.000
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Capital	-0.037***	-0.030***	0.004***	-0.046***	-0.041***	0.004***
	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.00)
Sales	-0.011*	-0.014**	-0.001	-0.015***	-0.016***	-0.001
	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.00)
Private				0.041***	0.022***	-0.002*
				(0.01)	(0.01)	(0.00)
Foreign				0.348***	0.311***	0.022***
				(0.04)	(0.03)	(0.00)
Constant	-6.944***	-4.913***	0.258**	-1.916***	-1.087***	0.263**
	(1.28)	(0.79)	(0.11)	(0.51)	(0.24)	(0.11)
Time FE	x	x	x	x	x	x
Province FE		x			x	
Firm FE			x			x
Number of obs.	1,258,115	1,258,115	1,258,115	1,258,115	1,258,115	1,258,115
R-sq. within	0.098	0.170	0.867	0.237	0.275	0.867
adj. R-sq.	0.098	0.170	0.800	0.237	0.275	0.800

Standard errors are clustered at province level and reported in parentheses. Coefficients are significant at the 10 percent (* p<0.10), 5 percent (** p<0.05) or 1 percent (*** p<0.01) level. The dependent variable is the export share on total output. *GE* is our measure of governments efficiency. *Firm Age* specifies year of establishment. *Sales* defines sales in logarithmic scale. *SOE*, *Private* and *Foreign* identify firm ownership and stand for state owned enterprises (including collectively owned enterprises), private owned firms as well as foreign owned firms (including firms of Hong Kong and Taiwan). *Labor* and *Capital* are controls for employment and capital stock. Column (2) and (5) report estimations including province fixed effects, while column (3) and (6) represent results with firm fixed effects. All regressions include year dummies.

Columns (2) and (5) include province fixed effects, whereas columns (3) and (6) control for firm fixed effects. Time dummies are included in all specifications. Standard errors are clustered at province level. In Figure 4 we plot the estimated marginal effects of government efficiency, GE, under consideration of the interaction term.[8] The marginal effect is negative at low levels of firm size but it becomes positive for firms with a size above $\ln(5)$. Interestingly, the marginal effect of firm size on exports is positive for all regions including the ones with lowest level of government efficiency. In line with our story, the effect is stronger in regions with higher government efficiency.

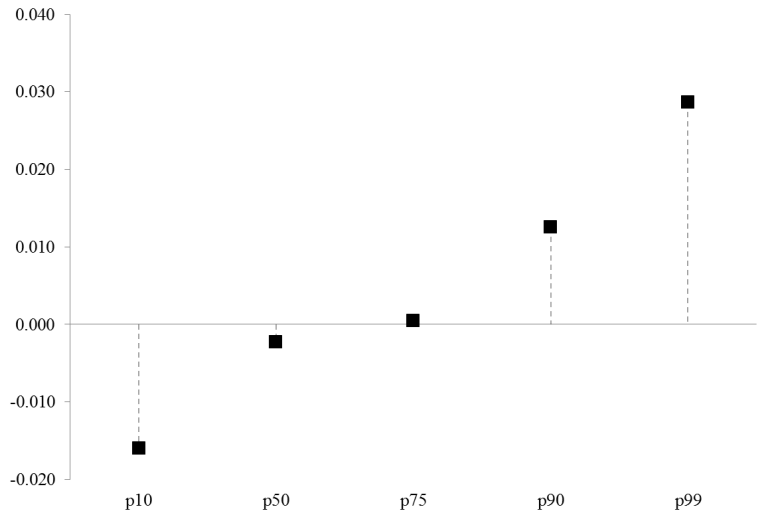
Figure 4: *Marginal effect of government efficiency at different firm size*



[8]We plot the results of column (6), including controls for firm ownership and firm fixed effects.

To analyse the marginal effect of government efficiency by firm size distribution in more detail, Figure 5 visualies the marginal effect of *GE* at different firm size percentiles.

Figure 5: *Marginal effect of GE by firm size*



The marginal effect of government efficiency conditional on firm size is negative at the bottom of the firm size distribution ranging from percentiles $p10$ to $p50$. However, it becomes positive at around the 75th percentile and increases further with firm size. This treshold at around 148 employees is reasonably high as in the year 2006 around 42,100 exporting firms employed 148 or more workers. This number corresponds to 53.86% of all exporting and 15.12% of all the firms that were surveyed in the year 2006.

The year of establishment is positively related to the export share: younger firms tend to export more. This result is robust against including ownership dummies in columns (4) to (6), where the *SOE*-dummy is our base category. Relative to *SOE*s, *Private* as well as *Foreign* owned enterprises tend to export more and this result survives the inclusion of time and province fixed effects. The number of non-state owned enterprises was increasing after the reforms

were initiated in 1978 and a further sharp increase in establishments of private and foreign firms can be observed shortly before and after China's entry into WTO. Appendix IV illustrates the development of the number of firms between 1950 and 2006. Notice that the graph does not cover the universe of firms because only the firms that are surveyd in the years 2000 to 2006 can be traced back to the year of establishment.

The estimated coefficient associated with *Capital* is highly significant and positive when firm fixed effects are controlled for but negative in the remaining regression setups where only the time trend and province-level fixed effects are included. This result appears to be counterintuitive but can be explained by frictions in the financial market. State owned enterprises had less difficulties in raising loans. Consequently, those enterprises have better access to credit markets compared to private firms and were therefore able to invest more into physical capital. At the same time, SOEs are less productive and (relative to private and foreign owned firms) export less frequently. Moreover, it is likely that foreign owned firms had an incentive to produce at low labor cost without investing too much into their affiliated firms in China. China is labor abundant, which should be mirrored in its production process.[9]

We elaborate the benchmark regression by firm ownership as a further robustness check. The results reported in the regression table confirm the benchmark regression results. Only the inclusion of firm fixed effects yields insignificant coefficients of the interaction term. Results can be found in Table 2. Column (1) to (3) represents estimates solely including SOEs, column (4) to (6) show the results for private firms and column (7) to (9) are based upon observations for foreign owned enterprises. The time trend is controlled for in

[9]Most empirical research on the Heckscher Ohlin model was unable to support this result. More recent research from Ito et al. (2016) highlights the role of trade in value added as potential explanation for the Leontief paradox.

all specifications. Column (2), (5) and (8) include province fixed effects, while the specifications in column (3), (6) and (9) include firm fixed effects.

Firm size, approximated by the number of employees, is highly significant and positive. This positive effect is magnified by high government efficiency: the coefficient of the interaction term, $GE \times Labor$, is highly significant in regressions that exclude firm fixed effects. The coefficient of governments efficiency is negative and significant. Under consideration of the positive and highly significant interaction term, this result suggests that the intensifying positive effect of institutional quality does not occur until a certain firm size is achieved. Estimating the specification exclusively with foreign owned enterprises, we find that the interaction term becomes insignificant.

Firm Age, is positively related with export shares estimating our specification exclusively with state owned enterprises, *SOE*. Not controlling for unobserved heterogeneity, *Capital* and *Sales* are estimated to be negatively associated with export share. Including firm fixed effects, the sign of *Capital* turns again from negative to positive and is highly significant, and thereby is consistent with our benchmark results.

Intensive margin. Table 3 provides regression results based upon log linearized export volumes as dependent variable. Column (1) and (4) control exclusively for the time trend, while column (2) and (5) include province fixed effects. In column (3) and (6) unobserved heterogeneity is controlled for by including firm fixed effects. Standard errors are clustered at province level.

Our results support the standard result reported in the related literature: bigger firms tend to export more illustrated by the highly significant and positive estimates of *Sales* and *Labor*. Similarly, the estimated coefficient of the interaction term $GE \times Labor$ exhibit the expected positive sign. The result is highly significant controlling for unobserved heterogeneity in column (3) and

Table 2: *Regression results including interaction with labor by ownership*

Dependent Variable: Export Share

	SOE			Private firms			Foreign firms		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	b/se	b/se	b/se	b/se	b/se	b/se	b/se	b/se	b/se
Labor	0.054***	0.056***	0.007***	0.088***	0.086***	0.009***	0.168***	0.152***	0.023***
	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.00)	(0.02)	(0.02)	(0.00)
GE	-0.121***	-0.196***	-0.046*	-0.192***	-0.300**	-0.064*	-0.208**	-0.161	-0.020
	(0.03)	(0.06)	(0.03)	(0.06)	(0.14)	(0.04)	(0.09)	(0.13)	(0.03)
GE × Labor	0.047***	0.038***	0.008	0.082**	0.064**	0.016	0.045	0.038	0.009
	(0.01)	(0.01)	(0.01)	(0.03)	(0.03)	(0.01)	(0.03)	(0.02)	(0.01)
Firm Age	0.001***	0.001***	-0.000	0.001	0.000	-0.000**	-0.003	-0.002	-0.000
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Capital	-0.027***	-0.024***	0.004***	-0.044***	-0.042***	0.001	-0.064***	-0.056***	0.008**
	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.00)
Sales	-0.000	-0.004**	-0.001	-0.009***	-0.005**	0.005*	-0.049***	-0.044***	-0.010*
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)
Constant	-1.592***	-1.099***	0.102	-1.562*	-0.667	0.464**	5.379	3.430	0.670
	(0.54)	(0.35)	(0.12)	(0.88)	(0.71)	(0.19)	(3.86)	(2.43)	(0.48)
Time FE	x	x	x	x	x	x	x	x	x
Province FE		x			x			x	
Firm FE			x			x			x
Number of obs.	467,240	467,240	467,240	519,688	519,688	519,688	271,187	271,187	271,187
R-sq. within	0.053	0.095	0.852	0.091	0.142	0.863	0.131	0.184	0.837
adj. R-sq.	0.053	0.095	0.768	0.091	0.142	0.768	0.131	0.184	0.765

Standard errors are clustered at province level and reported in parentheses. Coefficients are significant at the 10 percent (* p<0.10), 5 percent (** p<0.05) or 1 percent (*** p<0.01) level. The dependent variable is the export share on total output. *GE* is our measure of governments efficiency. *Firm Age* specifies year of establishment. *Sales* defines sales in logarithmic scale. *Labor* and *Capital* are controls for employment and capital stock. Estimations in column (1) to (3) exclusively include SOEs, column (4) to (6) private owned firms and column (7) to (9) foreign owned firms. Column (2) and (5) report estimations including province fixed effects, while column (3) and (6) represent results with firm fixed effects. All regressions include year dummies.

Table 3: *Regression results with export volume as dependent variable*

Dependent Variable: ln(exports)

	(1) b/se	(2) b/se	(3) b/se	(4) b/se	(5) b/se	(6) b/se
Labor	0.322***	0.267***	0.068***	0.333***	0.282***	0.068***
	(0.06)	(0.03)	(0.01)	(0.05)	(0.02)	(0.01)
GE	-0.081	-0.429	-0.253	0.028	-0.389	-0.253
	(1.12)	(0.63)	(0.17)	(1.02)	(0.59)	(0.17)
GE × Labor	0.137	0.130	0.061**	0.098	0.116	0.061**
	(0.14)	(0.09)	(0.03)	(0.13)	(0.08)	(0.03)
Firm Age	0.021***	0.017***	-0.001	0.011***	0.010***	-0.001
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Capital	-0.183***	-0.170***	0.022**	-0.214***	-0.192***	0.022**
	(0.02)	(0.02)	(0.01)	(0.02)	(0.02)	(0.01)
Sales	0.749***	0.777***	0.910***	0.762***	0.781***	0.910***
	(0.03)	(0.02)	(0.03)	(0.02)	(0.01)	(0.03)
Private				0.275***	0.210***	-0.024**
				(0.03)	(0.03)	(0.01)
Foreign				0.745***	0.573***	0.012
				(0.09)	(0.04)	(0.01)
Constant	-40.590***	-33.179***	1.190	-22.256***	-20.150***	1.171
	(3.82)	(2.55)	(1.10)	(2.06)	(2.02)	(1.10)
Time FE	x	x	x	x	x	x
Province FE		x			x	
Firm FE			x			x
Number of obs.	362,458	362,458	362,458	362,458	362,458	362,458
R-sq. within	0.401	0.442	0.910	0.430	0.457	0.910
adj. R-sq.	0.401	0.442	0.859	0.430	0.457	0.859

Standard errors are clustered at province level and reported in parentheses. Coefficients are significant at the 10 percent (* p<0.10), 5 percent (** p<0.05) or 1 percent (*** p<0.01) level. The dependent variable is the export volume in logarithm. *GE* is our measure of governments efficiency. *Firm Age* specifies year of establishment. *Sales* defines logarithmic sales. *SOE*, *Private* and *Foreign* identify firm ownership and stand for state owned enterprise (including collective owned enterprises), private owned firms as well as foreign owned firms (including firms of Hong Kong and Taiwan). Column (2) and (5) report estimations including province fixed effects, while column (3) and (6) represent results with firm fixed effects. All regressions include year dummies.

(6). Consequently, the positive effect of firm size on export volume is intensified by high government efficiency. The direct effect of efficiency, *GE*, is insignificant.

The estimates of our controls, *Firm Age* and *Capital* are in line with our

benchmark regression results: Younger firms are associated with higher export volumes, clarified by the highly significant and positive coefficient of *Firm Age*. The estimated coefficient of *Capital* exhibits a negative sign including time and province fixed effects. The opposite holds controlling for unobserved heterogeneity by including firm fixed effects.

As a further robustness check, we substitute the number of employees in the interaction term by *Sales*. The results can be found in Table 4 in Appendix III. Additionally, we substitute *Labor* and *Capital* by a proxy of total factor productivity, TFP. Our results are robust. Firm size, approximated by *Sales* is highly significant and positively associated with export volume. By the same token the interaction term is positive and highly significant when firm fixed effects are included in column (3) and (6). This suggests an intensifying effect of high provincial governments efficiency on the positive relation between firm size and export volume. But the negative and highly significant coefficient of government efficiency, GE, under consideration of the interaction term suggests that this positive effect appears only for firms with size over a certain treshold. According to our estimation results, government efficiency fosters the positive relation between firm size and export volume from a turnover of 26,254 million RMB. This corresponds to approximately 57.53% out of all exporting firms and 16.15% out of all firms in our dataset in 2006.

Our control variables are in line with the benchmark results. *Firm Age* is positively related with export volume. Younger firms tend to export more. Similarly, the number of employees, *Labour* is highly significant and positively associated with export volume. The coefficient of *Capital* is again negative when time and province fixed effects are included, but turns into positive including firm fixed effects.

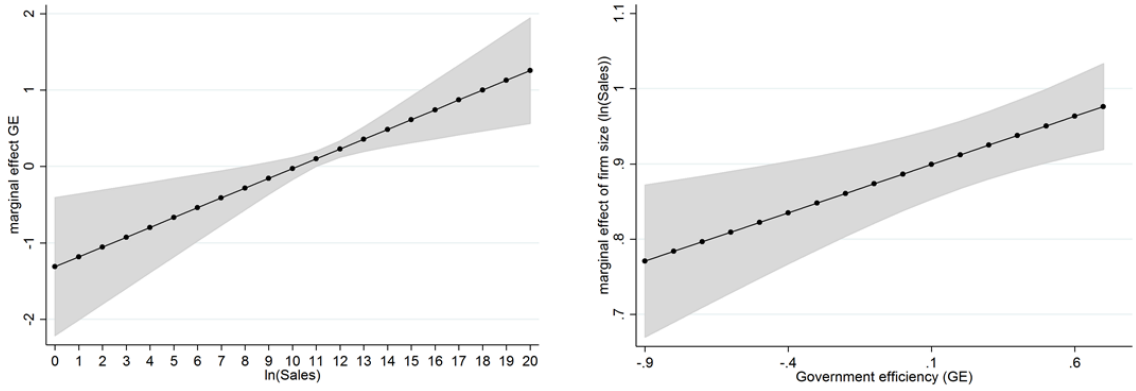
The estimates for TFP are highly significant and negative when unobserved

firm heterogeneity is absorbed by fixed effects. This result is counterintuitive. We would expect a positive relation between total factor productivity and exports. To analyze this result in more detail, we estimate our specification for private, foreign and state owned enterprises, separately (results can be found in Table 5 to 7 in Appendix III). Controlling for the time trend and province-specific characteristics, total factor productivity tends to foster export volume observing SOEs and private firms, which is congruent with trade theory. Including firm fixed effects, the effect of total factor productivity becomes negative. Estimating the model exclusively for foreign owned enterprises changes the results: a higher total factor productivity is associated with lower export volumes. Hence, the counterintuitive results regarding the correlation between total factor productivity and export volume seems to be driven by foreign owned firms. This result supports the intuition described before: Especially foreign owned enterprises are well integrated in global supply chains and tend to be more engaged in export activities relative to SOEs and private firms. In addition, labor is relatively cheap in China, which should lead to a labor intensive, less efficient production. The negative result regarding total factor productivity in our regression could also be driven by sample selection. Brandt et al. (2014) note that the Chinese NBS firm-level data is possibly biased at the lower end generated by the chosen threshold of a certain level of sales. Productive small firms enter the dataset. Small firms do probably not enter the export market even if they are characterized by high productivity levels, as suggested by our regression results.

Substituting TFP by $Capital$ and $Labor$ in Column (4) to (6) in Table 4 restores our benchmark regression results. Figure 6 visualizes the estimated marginal effects of government efficiency, GE, and sales as an alternative proxy

for firm size, under consideration of the interaction term.[10]

Figure 6: *Marginal effects of firms size and government effectiveness 2*



Sales are significantly positive related to export volume. By the same token, the interaction term is highly significant and positive including firm fixed effects. Consistently, the positive association between firm size and export volume is intensified by high governments efficiency (right panel). Simultaneously, the highly significant negative coefficient of our institutional quality measurement *GE* suggests the reinforcing effect appears not until a certain threshold of sales is reached (left panel). According to the results of this specification the threshold equals 26,265 million RMB, which is fairly close to our estimation in Table 3. These results support our hypothesis that larger firms tend to export more and that this positive effect is intensified by high governments' efficiency.

However, the direction of the relation between government efficiency and a firm's export volume is not unambiguous and we might have an issue of endogeneity. On the one hand, it could be imagined that regions characterized by high quality institutions attract firms. On the other hand, the advantage regarding governments efficiency of the coastal regions in China could be also explained by firm sorting. This is an interesting topic for further research.

[10]We plot the results of Table 4, column (6), including firm fixed effects.

III. Conclusion

The paper explores the role of institutional quality on firms' exports in China. Our results show that governmental efficiency has an impact on a firm's export volume. However, our results also suggest that only large firms benefit. The literature that relates institutional quality to international trade argues that low institutional quality has a dampening effect on trade by affecting firm productivity negatively and by raising transportation cost.

To analyze our derived hypothesis we conduct a panel data regression analysis based on Chinese NBS firm level data and the *Chinese provincial government efficiency index*. We identify a magnification effect of governments' efficiency on the positive relation between firm size and firms' exports. However, this positive effect depends on firm size itself and shows up for large firms only. Focusing on the intensive margin by estimating the specification with logarithmized export volume as dependent variable, we were able to support our benchmark results. As a robustness check, we use sales of a firm as a proxy for firm size. The results are in line with our benchmark regressions and the hypothesized link between government efficiency, firm size and exports: The positive correlation between firm size and export shares is intensified by high governmental efficiency. Further research has to investigate causality behind our results. So far, we did not adress endogeneity in our regression analysis. It is not clear if the results are driven by firm sorting or by productivity effects due to the impact of institutional quality. Therefore, our results must be seen as motiviating evidence for further research dealing with endogeneity issues.

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IV. Appendix

I. Components of Chinese provincial government efficiency index

Indicator	Sub-indicator	Index
Government public service	Service of science, education, culture and health	Expenditure on science per capita (new product trial fees, testing fees, and subsidies for major research projects, in yuan), qualified product rate (in %), patent application granted (invention patents, utility model patents, and design patents (per 100 000 people)), turnover per capita in technology market (in yuan), primary school students teachers ratio (reverse index), secondary school students teachers ratio (reverse index), functional illiteracy rate (in %, reverse index), state education budget (in % of GDP), literary publishing units (per 100 000 people), health beds (100 000 people), health personnel (100 000 people)
	Public security service	accident rate (traffic accidents, fires, and environmental pollution (one per 100 000 people, reverse index), loss of three accidents per capita (in yuan, reverse index), legislation (new legislation, amendments including laws, bills, and regulations), accepted case in court of first instance, concluded case in court of first instance, arrested suspect by the prosecutor's office, criminal case cracked or registered by the Public Security Bureau, criminal case rate (per thousand people, reverse index)
	Meterological service	Site for agricultural meteorology service (per 100 000 people), seismic monitoring stations (per 100 000 people)
	Social security Service	Employment agencies (per 100 000 people), urban community service facilities (per 100 000 people), rural social security network (per 100 000 people)
Government public infrastructure	Basic social infrastructure	basic infrastructure and renovation investment within state budget (RMB 100m), ratio of local projects and central government projects in basic infrastructure and renovation investment, basic infrastructure and renovation project completed rate (in %), industrial 'three wastes' treatment efficiency (waster, residue, and gas waste, in %), reservoir capacity per 10 000 people (100 million cubic meters per 10 000 people), ratio of nature reserve area (in %)
	Basic urban	city gas penetration rate (in %), urban public transport vehicles per 10 000 people, urban road area per capita (square meters), urban public green area per capita (square meters), urban public toilets per 10 000 people
Size of Government		proportion of administrative staff in the total population (per 10 000 people, reverse index), proportion of administrative employment in total employment (in %, reverse index), ratio of government consumption and final consumption (in %, reverse index), ratio of government consumption and GDP (in %, reverse index), ratio of income from confiscation and administration on total revenue (in %, reverse index)
Residents' economic welfare		per capita net income of rural households (in yuan), per capita urban disposable income of households (in yuan), Engel coefficient of rural residents (in %, reverse index), Engel coefficient of urban residents (in %, reverse index), consumer price index (previous year = 100, reverse index), per capita GDP (in yuan), ratio of subsidy expenditure and financial expenditure (in %)

Source: Tang, R., Tang, T. and Lee, Z. (2014): The efficiency of procincial governments in China from 2001 to 2010: measurement and analysis, p. 147/148

II. Summary Statistics

	Observations	Mean	Std. Dev.	Min	Max
Exports	470,127	9.346	1.704	0	18.839
GE	1,284,417	.147	.237	-.88	.77
Firm Age	1,723,594	1991.78	13.042	1850	2006
Sales	1,689,998	9.816	1.418	0	18.878
TFP	1,577,174	-.399	1.357	-15.908	9.522
Labor	1,696,467	4.753	1.184	0	12.053
Capital	1,700,306	3.846	1.671	-5.478	13.789
Private	1,723,594	.331	.471	0	1
Foreign	1,723,594	.205	.404	0	1
SOE	1,723,594	.463	.499	0	1
N	1,723,594				

Source: Own calculations based on Chinese NBS firm level data. Exports, sales, TFP, Labor and Capital are reported in logarithm.

III. Further robustness checks

Table 4: *Regression results including interaction with sales*

Dependent Variable: ln(exports)

	(1) b/se	(2) b/se	(3) b/se	(4) b/se	(5) b/se	(6) b/se
Sales	0.753***	0.764***	0.945***	0.745***	0.766***	0.890***
	(0.03)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)
GE	-0.320	-0.547	-1.333***	-0.396	-0.736	-1.272***
	(1.07)	(0.83)	(0.47)	(0.95)	(0.79)	(0.45)
GE × Sales	0.068	0.068	0.131***	0.090	0.092	0.125***
	(0.08)	(0.06)	(0.04)	(0.07)	(0.06)	(0.04)
TFP	-0.005	0.014	-0.031***			
	(0.03)	(0.02)	(0.01)			
Age	0.012***	0.010***	-0.001	0.012***	0.011***	-0.001
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Private	0.309***	0.229***	-0.027***	0.271***	0.209***	-0.023**
	(0.04)	(0.03)	(0.01)	(0.03)	(0.03)	(0.01)
Foreign	0.697***	0.507***	0.006	0.735***	0.566***	0.007
	(0.10)	(0.04)	(0.01)	(0.09)	(0.04)	(0.01)
Labor				0.352***	0.303***	0.074***
				(0.03)	(0.02)	(0.01)
Capital				-0.216***	-0.195***	0.020*
				(0.02)	(0.02)	(0.01)
Constant	-22.490***	-19.742***	1.140	-22.846***	-20.649***	0.957
	(3.23)	(2.61)	(1.14)	(2.39)	(2.24)	(1.14)
Time FE	x	x	x	x	x	x
Province FE		x			x	
Firm FE			x			x
Number of obs.	344,644	344,644	344,644	344,644	344,644	344,644
R-sq. within	0.390	0.426	0.912	0.427	0.454	0.912
adj. R-sq.	0.390	0.426	0.860	0.427	0.454	0.860

Standard errors are clustered at province level and reported in parentheses. Coefficients are significant at the 10 percent (* p<0.10), 5 percent (** p<0.05) or 1 percent (*** p<0.01) level. The dependent variable is the export volume in logarithm. *GE* is our measure of governments efficiency. *Firm Age* specifies year of establishment. *Sales* defines logarithmic sales. *TFP* is Total Factor Productivity. *SOE*, *Private* and *Foreign* identify firm ownership and stand for state owned enterprises (including collective owned enterprises), private owned firms as well as foreign owned firms (including firms of Hong Kong and Taiwan). Column (2) and (5) report estimations including province fixed effects, while column (3) and (6) represent results with firm fixed effects. All regressions include year dummies.

Table 5: *Regression analysis - SOE*

Dependent Variable: ln(exports)

	(1)	(2)	(3)	(4)	(5)	(6)
	b/se	b/se	b/se	b/se	b/se	b/se
Sales	0.678***	0.693***	0.969***	0.755***	0.743***	0.893***
	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)	(0.03)
GE	0.870**	0.297	-0.031	0.902**	0.291	-0.036
	(0.38)	(0.40)	(0.10)	(0.35)	(0.36)	(0.10)
Age	0.012***	0.010***	-0.001	0.011***	0.010***	-0.001
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
TFP	0.050*	0.038*	-0.042***			
	(0.03)	(0.02)	(0.01)			
Labor				0.324***	0.310***	0.093***
				(0.03)	(0.03)	(0.02)
Capital				-0.281***	-0.248***	0.051***
				(0.02)	(0.02)	(0.02)
Constant	-21.408***	-18.272***	0.132	-21.113***	-18.699***	-0.082
	(3.22)	(2.86)	(1.71)	(2.53)	(2.35)	(1.74)
Time FE	x	x	x	x	x	x
Province FE		x			x	
Firm FE			x			x
Number of obs.	79,576	79,576	79,576	79,576	79,576	79,576
R-sq. within	0.324	0.353	0.918	0.354	0.378	0.918
adj. R-sq.	0.324	0.353	0.856	0.354	0.378	0.856

Standard errors are clustered at province level and reported in parentheses. Coefficients are significant at the 10 percent (* p<0.10), 5 percent (** p<0.05) or 1 percent (*** p<0.01) level. The dependent variable is the export volume in logarithm. *GE* is our measure of governments efficiency. *Firm Age* specifies year of establishment. *Sales* are log sales. *TFP* is Total Factor Productivity. *Labor* and *Capital* are controls for employment and capital stock. Exclusively state owned enterprises are included in this specification. Column (2) and (5) report estimations including province fixed effects, while column (3) and (6) represent results with firm fixed effects. All regressions include year dummies.

Table 6: *Regression analysis - private owned enterprises*

Dependent Variable: ln(exports)

	(1) b/se	(2) b/se	(3) b/se	(4) b/se	(5) b/se	(6) b/se
Sales	0.742***	0.758***	0.984***	0.760***	0.813***	0.937***
	(0.02)	(0.02)	(0.02)	(0.05)	(0.03)	(0.04)
GE	1.047	0.305	0.114	1.087*	0.377	0.113
	(0.62)	(0.31)	(0.12)	(0.56)	(0.29)	(0.12)
Age	0.009***	0.007***	-0.002*	0.008***	0.006***	-0.002*
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
TFP	0.012	0.045***	-0.023			
	(0.03)	(0.02)	(0.02)			
Labor				0.351***	0.270***	0.074***
				(0.05)	(0.01)	(0.01)
Capital				-0.233***	-0.218***	0.008
				(0.02)	(0.03)	(0.02)
Constant	-17.118***	-13.259***	3.506	-14.880***	-10.968***	3.494
	(2.02)	(2.92)	(2.22)	(1.92)	(2.23)	(2.17)
Time FE	x	x	x	x	x	x
Province FE		x			x	
Firm FE			x			x
Number of obs.	101,855	101,855	101,855	101,855	101,855	101,855
R-sq. within	0.276	0.337	0.908	0.319	0.367	0.908
adj. R-sq.	0.276	0.337	0.827	0.319	0.367	0.827

Standard errors are clustered at province level and reported in parentheses. Coefficients are significant at the 10 percent (* p<0.10), 5 percent (** p<0.05) or 1 percent (*** p<0.01) level. The dependent variable is the export volume in logarithm. *GE* is our measure of governments efficiency. *Firm Age* specifies year of establishment. *Sales* are log sales. *TFP* is Total Factor Productivity. *Labor* and *Capital* are controls for employment and capital stock. Exclusively private owned enterprises are included in this specification. Column (2) and (5) report estimations including province fixed effects, while column (3) and (6) represent results with firm fixed effects. All regressions include year dummies.

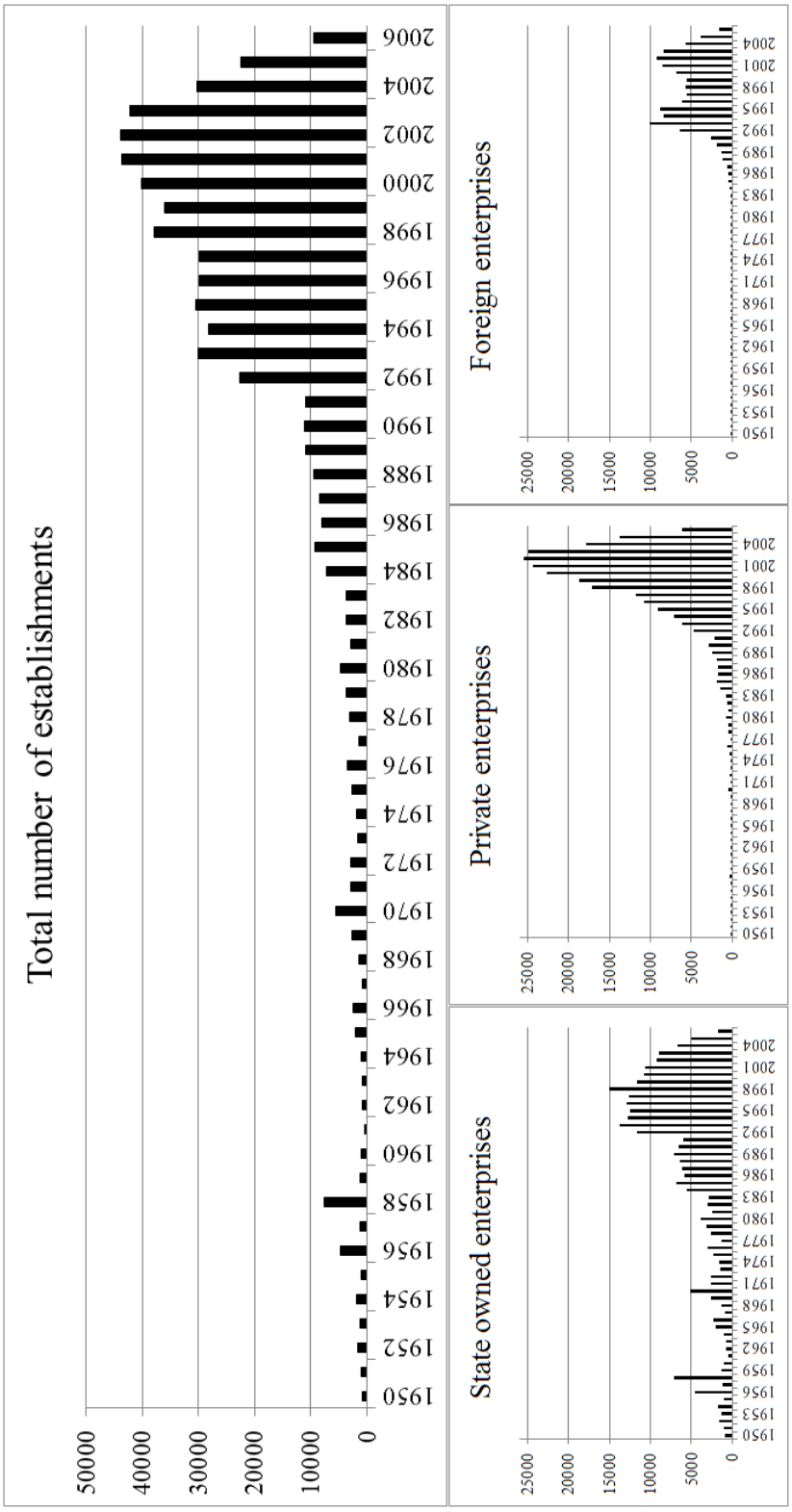
Table 7: *Regression analysis - foreign owned enterprises*

Dependent Variable: ln(exports)

	(1)	(2)	(3)	(4)	(5)	(6)
	b/se	b/se	b/se	b/se	b/se	b/se
Sales	0.849***	0.852***	0.967***	0.778***	0.793***	0.909***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)	(0.02)
GE	-0.525**	-0.022	0.138*	-0.219	0.074	0.135*
	(0.20)	(0.11)	(0.07)	(0.17)	(0.11)	(0.07)
Age	0.004	0.005**	-0.001	0.004	0.006**	-0.000
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
TFP	-0.041**	-0.026	-0.034***			
	(0.02)	(0.02)	(0.01)			
Labor				0.357***	0.330***	0.073***
				(0.02)	(0.02)	(0.01)
Capital				-0.153***	-0.148***	0.022**
				(0.02)	(0.02)	(0.01)
Constant	-7.628	-10.094**	0.626	-8.342	-10.645**	0.355
	(6.97)	(4.50)	(1.95)	(5.74)	(4.31)	(2.00)
Time FE	x	x	x	x	x	x
Province FE		x			x	
Firm FE			x			x
Number of obs.	163,213	163,213	163,213	163,213	163,213	163,213
R-sq. within	0.457	0.474	0.913	0.494	0.506	0.913
adj. R-sq.	0.457	0.474	0.869	0.494	0.506	0.869

Standard errors are clustered at province level and reported in parentheses. Coefficients are significant at the 10 percent (* p<0.10), 5 percent (** p<0.05) or 1 percent (*** p<0.01) level. The dependent variable is the export volume in logarithm. *GE* is our measure of governments efficiency. *Firm Age* specifies year of establishment. *Sales* are log sales. *TFP* is Total Factor Productivity. *Labor* and *Capital* are controls for employment and capital stock. Exclusively foreign owned enterprises are included in this specification. Column (2) and (5) report estimations including province fixed effects, while column (3) and (6) represent results with firm fixed effects. All regressions include year dummies.

IV. Firm establishments by year (1950 - 2006)



Source: Own calculations based on Chinese NBS firm level data.