경제학석사학위논문

Firm Size and Economic Growth in China

- Evidence from Chinese Industrial Firms

중국의 기업규모와 경제성장

- 중국 공업 기업 데이터에 기초한 실증분석

2014 년 8 월

서울대학교 대학원

경제학부 경제학 전공

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지도교수 이 근

이 논문을 경제학석사 학위논문으로 제출함

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XIN SHANJI 의 석사학위논문을 인준함

2014 년 8 월

위 원 장 _____ 이 영 훈 _____ (인)

부위원장 _____ 이 근 _____ (인)

위 원 _____ 김 병 연 _____ (인)

Abstract

Firm Size and Economic Growth in China

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XIN SHANJI

Department of economics

The Graduate School

Seoul National University

A vast amount of literature is available on the determinants of economic growth and development, and many factors and variables have been suggested theoretically and empirically. Numerous studies have investigated the role played by big businesses as well as small and medium enterprises (SMEs) in promoting economic growth. All of these studies suggest that the net influence of firm size on macroeconomic performance is an important yet unresolved empirical question. In China, the linkage between firm size and economic growth remains unexplored, and no study has examined the entire spectrum of firm size to explore the development dynamics of China. To fill this research gap, this paper presents exploratory empirical evidence based on provincial-level data obtained from 2004 to 2009 in China. We measure firm size in terms of relative sales, relative number of these firms, or absolute number of firms of different sizes in each province. The empirical results of all of the models consistently show three major patterns. First, big businesses have a significant and negative effect on economic growth, medium-sized firms have an insignificant effect on economic growth, and small firms have a significant and positive effect on economic growth. Second, the average size of big businesses and SMEs has a positive effect on economic growth, whereas the number of firms of different size exerts a negative effect on the economy. The average size of various size groups of enterprises, rather than the number of firms, is important in China's economy. Third,

differences in efficiency translate to differences in contribution. Disparity in efficiency exists among large, medium, and small enterprises. This disparity is the primary cause of the performance gap in China.

Keywords: firm size; economic growth; big business; small and medium-sized enterprises (SMEs); average size of firms; entry-exit rate;

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1. Introduction and existing literature

1.1. Motivation

Over the last 30 years, China has experienced unprecedented economic transition involving rapid economic growth, major shifts in industrial structure, and a growing importance of entrepreneurial skills.

China's recent growth has been record-breaking, making the country earn titles such as "factory of the world" or "Asian Giant." This growth has been unstoppable in certain industrial sectors. However, China has experienced economic slowing down since the financial crisis in 2008.

Thus, this study aims to address the following questions: What determines economic growth across China's provinces? What are the major factors that drive high economic growth? What are the roles played by large, medium, and small firms in the economic boom?

Moreover, this study investigates the role and significance of various size groups of enterprises in China's economic development to gain insight into the logic underlying the phenomena.

1.2. Existing literature

Numerous studies have attempted to find and explore the determinants of economic growth. Various factors, such as institutions (Acemoglu et al., 2001, 2002), education (Barro, 1991), and openness of trade (Sachs and Warner, 1997), have been proposed theoretically and empirically.

Since the work of Schumpeter (1942), economists have constantly debated on the effects of firm size on growth. Different studies have examined the influence of firm size on job growth and stability (Davis and Haltiwanger, 1992; Davis et al., 1996; Rob, 1995), productivity growth (Pagano and Schivardi, 2003; Acs et al., 1999; Cheng and Lo, 2004), and income growth (Shaffer, 2002).

However, the relation between firm size and economic growth in China remains unexplored. To fill this research gap, this paper presents exploratory empirical evidence based on a sample of firms from 29 provinces in China.

The roles of big businesses and SMEs in promoting economic growth have been extensively explored in the literature. Studies that examine advantages of big businesses versus small businesses can be divided into two streams. One strand of debate focuses on the positive (Cassis, 1997; Fogel et al., 2008; Lee et al., 2013; Smyth, 2000) or negative (Caree and Thurik, 1998; Caree, 2002) role of big businesses in promoting economic growth. The other strand focuses on the merits of small firms (Beck et al., 2005; Audrestsch et al., 2002; Robbins et al., 2000). All of these studies suggest that the net influence of firm size on macroeconomic performance is an important yet unresolved empirical question.

Lee et al. (2013) posited that gaining real understanding of dynamics development requires that the analysis be extended to the entire spectrum of firm size. We emphasize on the "entire spectrum of firm size" in investigating the role of large, medium, and small enterprises in China's provincial economic growth.

Using provincial-level data obtained from 2004 to 2009, we construct an econometric model that tracks down the effects of big business and SMEs through different channels. This model can calculate the returns to big business and SMEs on economic growth.

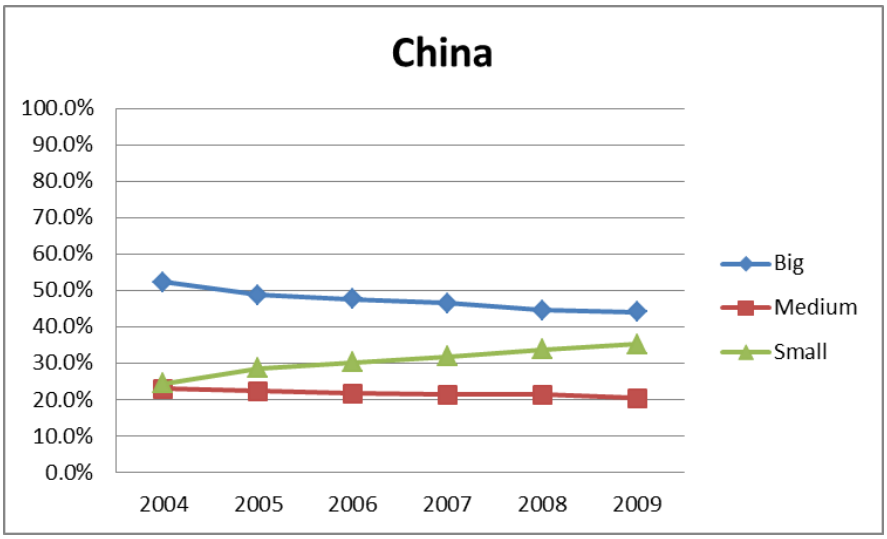
Our dataset is obtained from the annual surveys of Chinese industrial firms conducted by the National Bureau of Statistics. These annual surveys cover all state-owned enterprises and non-state-owned enterprises with annual sales of over five million RMB (Chines currency).

We recalculate and classify the dataset into three types: (i) share of firms by size in total sales (Figs. 1A to 1D); (ii) share of firms by size in total number of firms (Figs. 2A to 2D); and (iii) absolute number of firms.

Figs. 1A to 1D and 2A to 2D present the relative sales and relative number of firms by size in the eastern, central, and western regions, as well as all over China. Figs. 1A to 1D show that during this period, the relative sales of big businesses exhibited a steady growth decline, whereas that of small firms showed significant improvement. In addition, a slight change can be observed in the total sales of medium enterprises. The relative number of small firms exhibited a significant growth with high proportion, whereas that of large and medium-sized enterprises (LMEs) experienced a slight change (Fig. 2A to 2D). All of these phenomena exist not only in

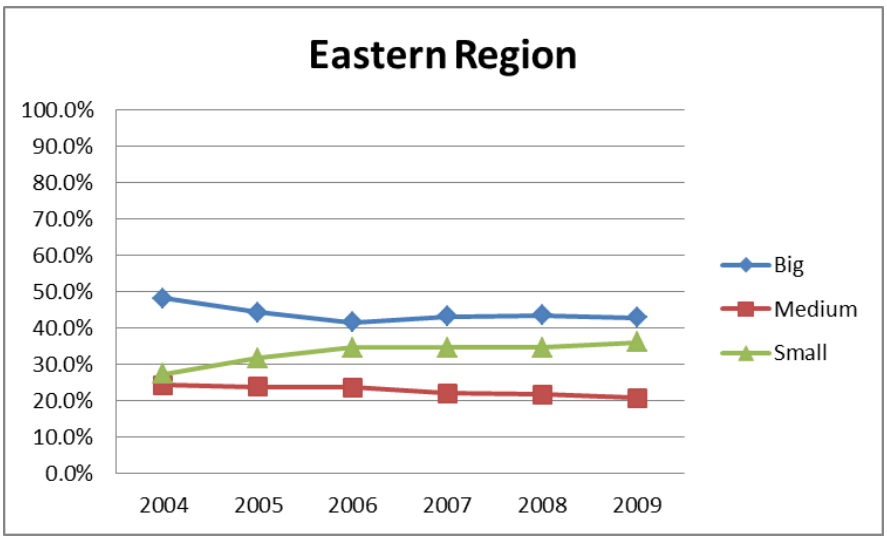
the highly developed eastern provinces but also in the less developed central and western provinces.

Fig. 1A. Share of firms by size in total sales in China



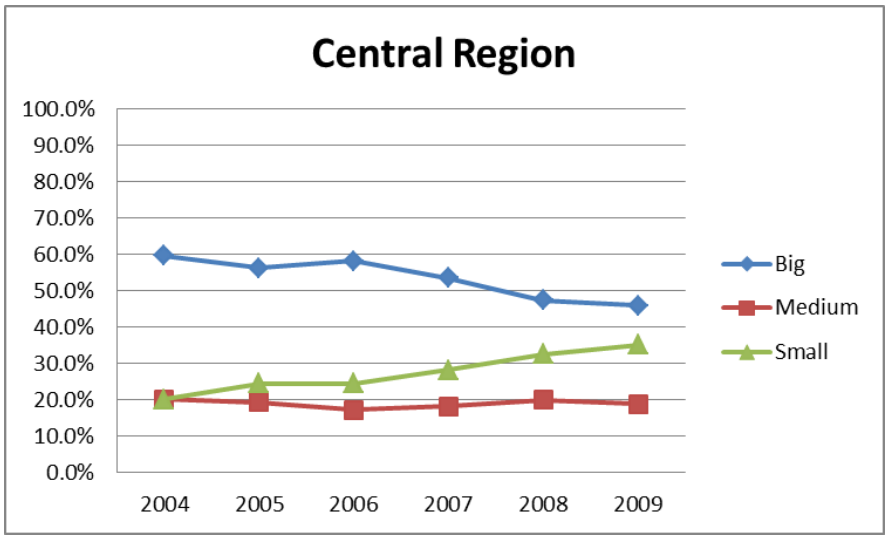
Source: Compiled by the author based on data from various issues of Chinese Industrial Enterprises Database.

Fig. 1B. Share of firms by size in total sales in eastern region



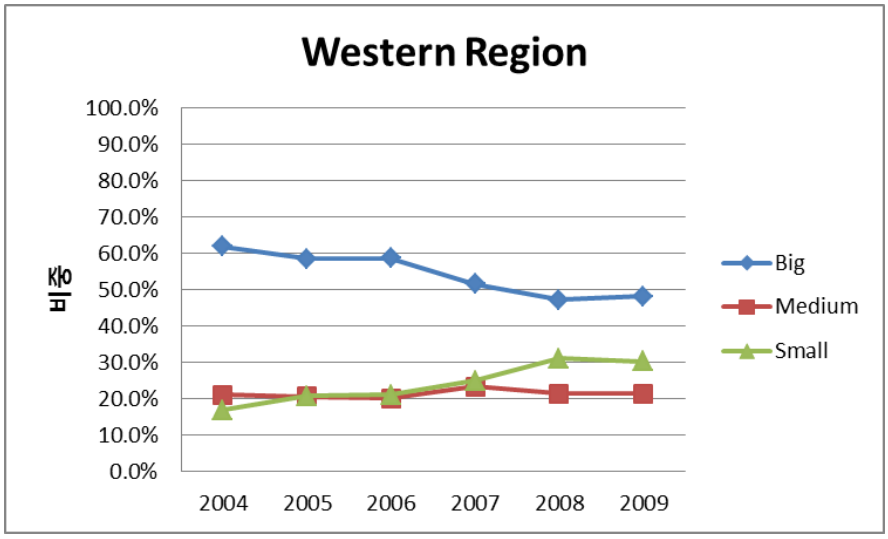
Source: Compiled by the author based on data from various issues of Chinese Industrial Enterprises Database.

Fig. 1C. Share of firms by size in total sales in central region



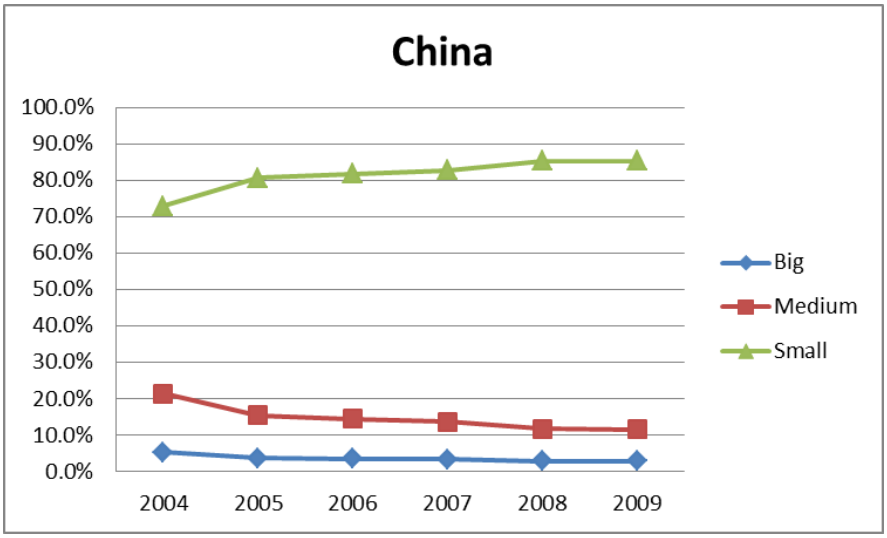
Source: Compiled by the author based on data from various issues of Chinese Industrial Enterprises Database.

Fig. 1D. Share of firms by size in total sales in western region



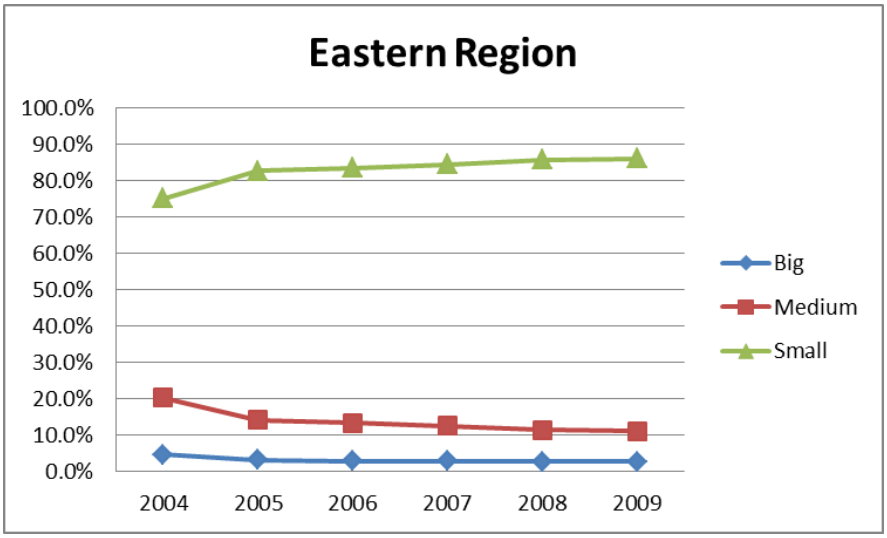
Source: Compiled by the author based on data from various issues of Chinese Industrial Enterprises Database.

Fig. 2A. Share of firms by size in total number of firms in China



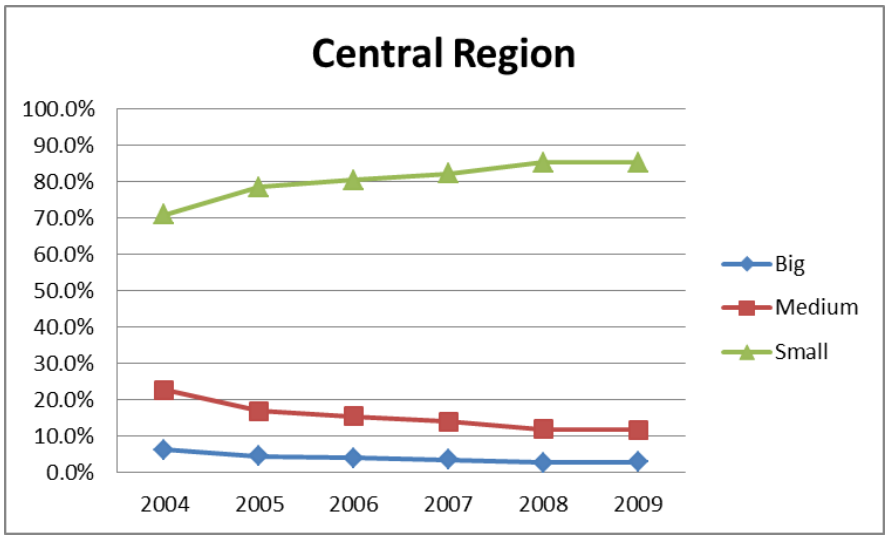
Source: Compiled by the author based on data from various issues of Chinese Industrial Enterprises Database.

Fig. 2B. Share of firms by size in total number of firms in eastern region



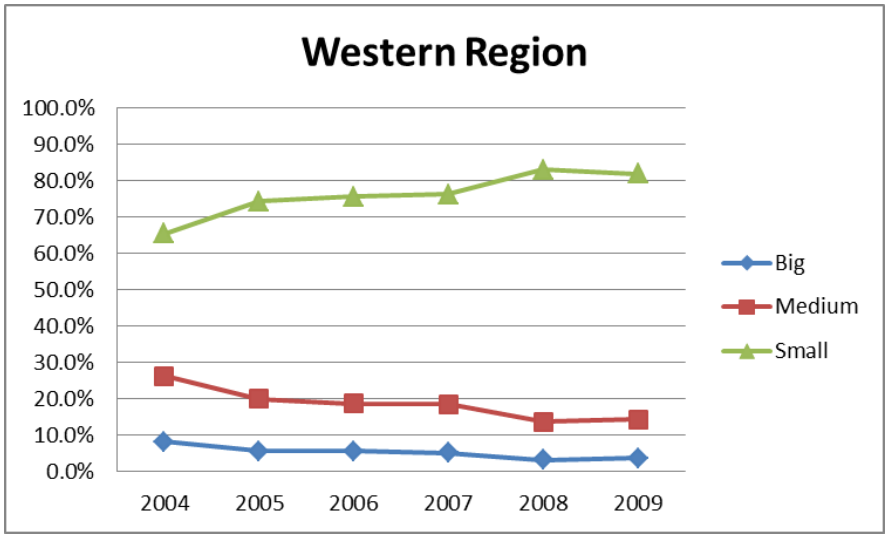
Source: Compiled by the author based on data from various issues of Chinese Industrial Enterprises Database.

Fig. 2C. Share of firms by size in total number of firms in central region



Source: Compiled by the author based on data from various issues of Chinese Industrial Enterprises Database.

Fig. 2D. Share of firms by size in total number of firms in western region

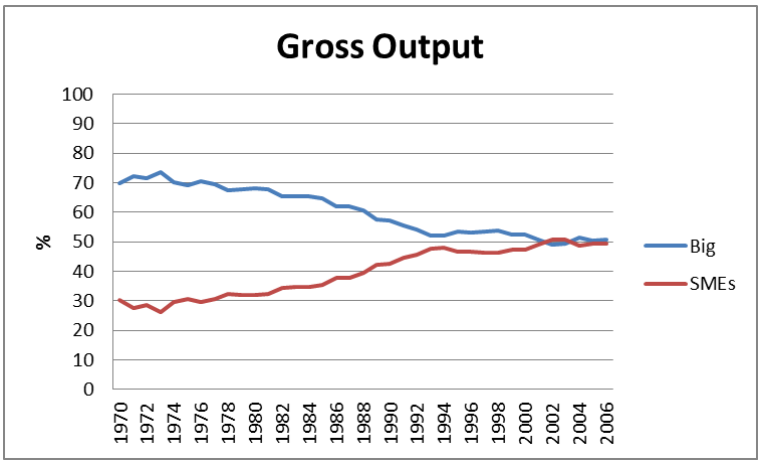


Source: Compiled by the author based on data from various issues of Chinese Industrial Enterprises Database.

1.3. Comparison with other countries

Thus far, we have discussed the trend of relative number or sales of Chinese firms of different sizes. In this section, we consider the events transpiring in other countries as they experienced a period of rapid economic development. South Korea experienced high economic growth from the 1970s to the 1990s. At early stages of economic takeoff, big businesses account for a very high share of total gross output (or value added). In South Korea, big businesses account for 70% of total gross output, whereas SMEs account for 30%. However, the gap in total gross output (or value added) between big businesses and SMEs steadily declined over time. By the year 2000, the proportion of total gross output (or value added) of SMEs has surpassed that of big businesses (Fig. 3A; Fig. 3B). We also consider Japan, which is another important industrialized country in East Asia. SMEs have played important roles in Japan's history, particularly on exports. From the end of the Second World War to the early 1980s, the share of SMEs in total exports has rapidly increased, especially before the mid-1960s when the proportion reached more than 60%. After the economic crisis during the 1970s, SMEs in Western Europe experienced rapid development, and SMEs highly contributed to the growth of exports. In Germany, SMEs' exports represented more than half of total exports during this period. The number of SMEs' inventions in Germany accounted for approximately 70% of the total newest research products. With regard to exports in South Korea, small firms' exports increased year by year, reaching 23% in 1965, 32% in 1970, 35% in 1977, and 39% in 1983 (medium-sized enterprises have been excluded). Overall, we perceive that during early stages of economic growth, industrialized countries experience a sharp increase in the proportion of SME sector and a decrease in that of big businesses.

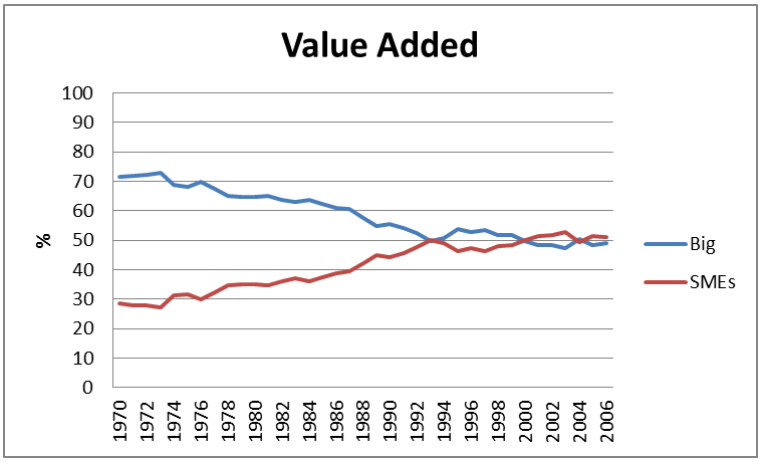
Fig. 3A. Share of manufacturing enterprises by size in total gross output in South Korea (1970~2006)



Note: Since 1974, the boundary of small and medium industry is defined with 300 employees or less and before 200 employees or less. Excluded no. of establishments employed less than 5 persons.

Source: Data for 1970 – 1992 is from various issues of Survey Report on Small and Medium-sized Enterprises in Korea (in Korean). Data for 1993-2006 is from the official database issued by Small and Medium Business Administration.

Fig. 3B. Share of manufacturing enterprises by size in total value added of manufacturing in South Korea (1970~2006)



Note: Since 1974, the boundary of small and medium industry is defined with 300 employees or less and before 200 employees or less. Excluded no. of establishments employed less than 5 persons.

Source: Data for 1970 – 1992 is from various issues of Survey Report on Small and Medium-sized Enterprises in Korea. Data for 1993-2006 is from the official database issued by Small and Medium Business Administration.

1.4. Difference in efficiency

In this section, we determine the factors causing the decrease in the proportion of big businesses and the increase in that of SMEs. We hypothesize that differences in efficiency translate to differences in contributions. In economics, technical efficiency is the effectiveness with which a given set of inputs is used to produce an output. A firm is considered technically efficient if, given the resources (such as labor and machinery) it employs and the best technology available, it produces the maximum output. X-inefficiency occurs when technical efficiency is not being achieved because of the lack of competitive pressure. X-inefficiency was first mentioned in Leibenstein (1966). The causes of x-inefficiency are as follows: (i) monopoly power: a monopoly faces little or no competition; and (ii) state control: a nationalized firm owned by the government may face little or no incentive in making profit.

Table 1 shows that x-inefficiency exists in China's industrial sector. We can see that the ratio of the industrial output value to the total assets of private sector (which is mainly composed of SMEs), is much higher than that of state-owned and state-holding sector (which is mainly composed of LMEs). The ratio of industrial cost to profits in the private sector is much lower than that of the public sector. Therefore, we can assume that the efficiency of LMEs is lower than that of small enterprises.

Table 1 Main indicator on economic benefit of private industrial enterprises and state-owned and state-holding industrial enterprises (2007)

Sector	Ratio of Industrial Output Value to Total Assets (%)	Number of Times of Annual of Turnover Working Capitals (times/year)	Ratio of Profits to Industrial Cost (%)
National Total (Private)	17.18	3.29	6.08
National Total (State-owned and State-holding)	13.79	2.39	9.90

Source: Statistical Yearbook of China (2008)

Table 2 The ratio of exclusively state holding and relatively state holding enterprises to the differently sized enterprises (%)

	2004		2007		2009	
	No. of Firms	**Sales**	**No. of Firms**	**Sales**	**No. of Firms**	**Sales**
Large enterprises	30	51	34	55	31	56
Medium enterprises	15	19	21	25	18	23
Small enterprises	8	9	11	15	7	10

Source: Calculated by the author based on data from various issues of Chinese Industrial Enterprises Database.

Table 2 presents the proportion of state-holding enterprises in different sizes of enterprises. Compared with the very low proportion of state-owned enterprises in all size groups of enterprises (3.5% in 2007; Table 10), we can observe that the share of the state-owned enterprises in large firms accounts for a considerable proportion (34% for the number of firms and 55% for sales in 2007; Table 2). We predict that the inefficiency existing in state-owned enterprises results in the poor performance of large firms in China's economic growth, which is related to x-inefficiency in nationalized firms.

To investigate the abovementioned assumption, we test a set of related hypotheses: (i) China's economic growth is driven by a large number of small enterprises. A small number of big businesses that occupy the greatest portion of the GDP have a negative effect on economic growth, whereas medium firms exert insignificant effect on China's economic growth. With the economic development in China, we see an economy of "small firms-driven economy". (ii) These phenomena exist not only in the more developed eastern area but also in the less developed central and western regions. (iii) The phenomena are related more to the size per firm rather than the number of firms. Investment, consumption, and export are regarded as "the troika" of China's economic growth. In the same way, we compare big, medium, and small firms in terms of the troika that drives China's economy. However, "unbalanced development" is being observed in recent years, in that LMEs are lagging behind emerging small firms. The following section provides the research methodology. Section 3 describes the process of formulating the dataset and the variables used in this study. Section 4 presents the main findings from the empirical investigation and verifies the robustness of the bench mark model. Section 5 extends

our discussion on issues surrounding the absolute number of firms versus the average size of firms in firms of different sizes. Section 6 presents the conclusion.

2. Research methodology

To investigate the relationship between firm size and economic growth, this study uses the economic growth function proposed by Lee et al. (2013), who considered the absolute and relative presence of Global Fortune 500 companies in each country by using fixed effects (FE) and system-GMM models to formulate the function. In this present study, we further introduce an idea that the entire spectrum of firm size affects provincial economic growth, and we employ ordinary least squares (OLS), fixed effects (FE), and system-GMM models. However, several variables in the regressions are potentially endogenous to economic growth. Although an instrumental variable approach can be applied to mitigate this problem, reliable instruments that can be associated only with the explanatory variable and not with the error terms are difficult to find. In this current study, endogeneity is first addressed with panel data models such as OLS, FE, and system-GMM.

The problem of an omitted variable bias can be alleviated by employing FE panel estimation, as in Islam (1995). However, this approach cannot control time-varying country effects and endogeneity. Considering these problems, Caselli et al. (1996) and Bond et al. (2001) applied GMM, which corrected the unobserved heterogeneity, omitted variable bias, measurement error, and potential endogeneity. In particular, a system-GMM, developed by Arellano and Bover (1995) and Blundell and Bond (1998), reduced a small sample bias that characterized the first-differenced GMM used by Caselli et al. (1996).

To gain insight into the influence of firm size on economic growth, we estimate a number of versions of the empirical economic growth equation, for which the basic form is as follows:

$$y_{it} = \alpha + \beta Z_{it1} + \gamma Basic_{it}^{'} + \delta Firmsize_{it} + \rho_{it} \quad (1)$$

where subscript i indicates that the variable refers to the i-th province and subscript t refers to time; y_{it} is the annual growth rate of real Gross Regional Domestic Product (GRDP) per capita in province i at time t; Z_{it1} is the log value of real GRDP per capita in 2004 (i.e., at its very beginning); $Basic_{it}^{'}$ is a vector of control variables often appearing in economic growth models, such as investment ratio, population growth rate, and basic human capital (secondary school

enrollment) of province i at time t; $Firmsize_{it}$ denotes the key variable measured as share of firms by size in total sales, share of firms by size in total number of firms, and log of one plus the number of firms of different size in province i at time t; and ρ_{it} is the error term.

The error term in the equation consists of two components: (i) the time-invariant heterogeneity across the provinces that is specific to the province but is not included in the explanatory variables, and (ii) the time-varying parameters that are likely to be associated with the regressors. Thus,

$$\rho_{it} = \mu_i + \nu_{it} \tag{2}$$

In this study, the problem of time-invariant province-specific heterogeneity is less severe because the data within China has been used. Nonetheless, a number of dummy variables have been incorporated into the empirical model to further address the heterogeneity issue.

Finally, we use the following criteria for model specification tests: the Sargan test of over-identification and the test for second-order serial correlation AR (2), which detects autocorrelation in levels.

3. Data

3.1. Measures of large, medium and small enterprises

We use the official definitions of large, medium, and small enterprises indicated in the "Announcement on Printing and Distributing Provisional Regulations on the Standard for Determining Small and Medium-sized Enterprises", which was formulated by China's National Bureau of Statistics in 2011 (Table 3A).

Table 3A Measures for statistical definitions of large, medium and small enterprises

Sector	Index	Unit	Large	Medium	Small	Micro
Industry*	Employees(X)	Person	X≥1000	300≤X<1000	20≤X<300	X<20
	Business Income(Y)	Million Yuan	Y≥40000	2000≤Y<40000	300≤Y<20000	Y<300

Source: China's National Bureau of Statistics

Note: "Industry*" contains mining, manufacturing, electricity generation, and the production and distribution of gas and water

The dataset that we use is maintained by China's National Bureau of Statistics; this dataset contains firm-level information based on the annual briefing reports filed by all state-owned industrial enterprises and "above scale" (sales volume exceeding CNY 5 million) non-state-owned industrial firms in China from 2004 to 2009. To satisfy the statistical definitions prescribed by the National Bureau of Statistics, we redefine the definition of small firms (Table 3B). After data mining is conducted, the range of small firms is changed, and micro firms are excluded. The definitions of large and medium enterprises remain the same.

Table 3B Measures for definitions of large, medium and small enterprises, and redefined by the author

Sector	Index	Unit	Large	Medium	Small
Industry*	Employees(X)	Person	X≥1000	300≤X<1000	30≤X<300
	Business Income(Y)	Million Yuan	Y≥40000	2000≤Y<40000	500≤Y<20000

Source: China's National Bureau of Statistics

Note: "Industry*" contains mining, manufacturing, electricity generation, and the production and distribution of gas and water

3.2. Variables used in the regressions

Descriptive statistics and data sources are reported in Table 4. The initial dataset contained 1.68 million companies from 2004 to 2009. In the period from 2004 to 2009, a wide variation exists in the share of large enterprises in total sales across all of the provinces in our sample, ranging from 27% in Zhejiang to 83% in Gansu. A substantial variation also exists in the growth rate of GRDP per capita and government expenditure.

Table 4 Descriptive statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max	Source
big1	174	52.00	12.61	27.08	82.84	Chinese Industrial Enterprises Database
medium1	174	20.77	5.50	6.02	37.61	
small1	174	27.23	9.05	9.24	54.54	
big2	174	4.26	1.71	1.48	9.72	
medium2	174	15.95	4.57	7.92	28.65	
small2	174	79.79	6.02	61.63	90.31	
big3	174	4.98	1.02	2.08	7.17	
medium3	174	6.33	1.10	3.40	8.50	
small3	174	7.98	1.19	4.82	10.22	
bentry	174	2.40	1.65	0.51	9.01	
mentry	174	9.32	6.10	2.22	31.50	
sentry	174	50.79	20.40	20.96	119.04	
bsales	174	14.14	0.52	12.57	15.36	
msales	174	11.85	0.46	10.84	13.20	
ssales	174	10.46	0.34	9.67	11.47	
grdpgr	174	0.15	0.07	-0.02	0.33	Statistical Yearbook of China
inigrdp	174	9.41	0.54	8.37	10.71	
popgr	174	5.20	2.68	0.00	11.78	
invt	174	52.38	13.12	29.25	89.35	
infl	174	2.95	2.44	-2.30	10.10	
gov	174	17.23	6.70	7.92	45.02	
edu2	174	38.37	6.05	24.71	49.65	
central	174	0.28	0.45	0.00	1.00	
western	174	0.38	0.49	0.00	1.00	

Table 5 shows the correlations among level of firm size, dependent variable, and basic control variables. Simple correlations indicate that the size of the LMEs and SMEs sector is negatively and positively correlated with the growth rate of GRDP per capita, respectively.

Table 5 Correlation matrix

	grdpgr	big1	medium1	small1	big2	medium2	small2
grdpgr	1						
big1	-0.1821	1					
medium1	-0.0090	-0.7739	1				
small1	0.2592	-0.9230	0.4706	1			
big2	-0.2526	0.6170	-0.2346	-0.7170	1		
medium2	-0.3455	0.3869	0.0785	-0.5867	0.7936	1	
small2	0.3342	-0.4692	0.0072	0.6494	-0.8869	-0.9849	1
big3	-0.2023	-0.3892	0.3025	0.3585	-0.1001	-0.0168	0.0412
medium3	-0.1913	-0.4954	0.3895	0.4536	-0.2486	-0.0558	0.1131
small3	-0.0822	-0.5863	0.3436	0.6081	-0.4773	-0.3522	0.4031
inigrdp	-0.2303	-0.2503	0.1993	0.2277	-0.3618	-0.3479	0.3670
popgr	0.0548	0.1533	-0.0895	-0.1593	0.2483	0.2698	-0.2755
invt	0.1670	-0.0972	-0.0803	0.1842	-0.1417	-0.2820	0.2544
infl	0.4311	0.0320	-0.0292	-0.0268	0.1358	0.1155	-0.1263
gov	0.0333	0.4278	-0.3350	-0.3924	0.2255	0.0691	-0.1166
edu2	0.0714	-0.1283	-0.0817	0.2284	-0.0459	-0.1767	0.1472
bentry	-0.4041	0.3819	-0.0914	-0.4766	0.7612	0.6762	-0.7299
mentry	-0.4500	0.1554	0.1376	-0.3002	0.5581	0.7196	-0.7051
sentry	-0.234	-0.1210	0.0937	0.1116	0.0317	0.1008	-0.0856
bsales	0.1092	0.2870	-0.4965	-0.0982	-0.4252	-0.5896	0.5686
msales	0.2162	-0.4020	0.2268	0.4223	-0.5912	-0.7273	0.7203
ssales	0.2415	-0.4281	0.0965	0.5378	-0.4925	-0.6024	0.5974
central	0.0557	0.1010	-0.2326	0.0006	-0.0031	-0.0265	0.0210
western	0.1387	0.2715	-0.0521	-0.3466	0.3946	0.3299	-0.3627

	big3	medium3	small3	inigrdp	popgr	invt	infl
big3	1						
medium3	0.9772	1					
small3	0.9177	0.9534	1				
inigrdp	0.3999	0.4261	0.5048	1			
popgr	-0.4314	-0.4325	-0.4885	-0.4890	1		
invt	-0.4328	-0.4295	-0.3110	-0.3962	0.1610	1	
infl	-0.1247	-0.1384	-0.1631	-0.1719	0.1016	-0.1248	1
gov	-0.7995	-0.8190	-0.7873	-0.4660	0.4035	0.4880	0.0481

edu2	0.4390	0.3847	0.4093	0.0640	-0.2286	0.0059	0.0054
bentry	0.0011	-0.0950	-0.2880	-0.2408	0.1759	-0.0969	0.2081
mentry	0.1044	0.0782	-0.1338	-0.1908	0.1469	-0.1666	0.2330
sentry	0.1250	0.1328	0.1038	-0.0114	-0.0130	0.0618	0.2671
bsales	-0.2252	-0.2088	-0.0179	0.307	-0.2033	0.1938	-0.1700
msales	0.0685	0.0953	0.3077	0.4743	-0.3065	0.2716	-0.1798
ssales	0.1644	0.1754	0.3443	0.3638	-0.2058	0.3033	-0.1142
central	0.0348	0.0316	0.0393	-0.2577	-0.1144	0.0095	0.0431
western	-0.5899	-0.6175	-0.6802	-0.5595	0.4408	0.3740	0.1102

	gov	**edu2**	**bentry**	**mentry**	**sentry**	**bsales**	**msales**
gov	1						
edu2	-0.4642	1					
bentry	0.1387	-0.0151	1				
mentry	-0.0063	-0.0497	0.8835	1			
sentry	-0.0455	0.0732	0.5787	0.7076	1		
bsales	0.2151	0.0236	-0.4623	-0.5656	-0.2539	1	
msales	-0.0452	0.1229	-0.5513	-0.5840	-0.1947	0.6411	1
ssales	-0.1055	0.2695	-0.4797	-0.4950	-0.1685	0.5473	0.8529
central	-0.1538	0.4373	0.0045	0.0037	0.0625	-0.0045	-0.1825
western	0.6724	-0.4875	0.2601	0.1542	-0.0598	-0.1524	-0.2120

	ssales	**central**	**western**
ssales	1		
central	-0.1239	1	
western	-0.2137	-0.4825	1

Table 6 summarizes the variables used in regressions, which include the dependent variable, firm variables, basic control variables, and geographic dummy variables.

Table 6 Variable definitions

Variable	Description	Variable Definition
Dependent Variable		
grdpgr	GRDP per capita growth rate	Annual real GRDP per capita growth rate (constant, preceding year=100)
Firm Variables		
big1	Large enterprises	Share of large enterprises in total sales (%)
medium1	Medium enterprises	Share of medium enterprises in total sales (%)
small1	Small enterprises	Share of small enterprises in total sales (%)
big2	Large enterprises	Share of large enterprises in the total number of firms (%)
medium2	Medium enterprises	Share of medium enterprises in total number of firms (%)
small2	Small enterprises	Share of small enterprises in total number of firms (%)
big3	Large enterprises	Log of one plus the number of large enterprises
medium3	Medium enterprises	Log of one plus the number of medium enterprises
small3	Small enterprises	Log of one plus the number of small enterprises
bentry	Entry rate	Entry rate of large enterprises (%)
mentry	Entry rate	Entry rate of medium enterprises (%)
sentry	Entry rate	Entry rate of small enterprises (%)
bsales	Average size of large enterprises	Log value of average sales per large enterprise (constant, year 2004)
msales	Average size of medium enterprises	Log value of average sales per medium enterprise (constant, year 2004)
ssales	Average size of small enterprises	Log value of average sales per small enterprise (constant, year 2004)
Basic Control Variables		
inigrdp	Initial GRDP per capita	Log value of real GRDP per capita in 2004
popgr	Population growth rate	Natural growth rate of population (%)
invt	Investment ratio	Total investment in fixed assets by status (% of GRDP)
infl	Inflation rate	Overall consumer price index in each province (%)
gov	Government expenditure	Total government expenditure (% of GRDP)

edu2	Secondary school enrollment	Share of the population with junior-secondary-school attainment in the total population aged 6 and above (%)
Dummy Variables		
central	Geographic dummy for central provinces	Dummy for Shanxi, Jilin, Heilongjiang, Anhui, Jiangxi, Henan, Hubei and Hunan
western	Geographic dummy for western provinces	Dummy for Inner-Mongolia, Guangxi, Chongqing, Sichuan, Guizhou, Yunnan, Shaanxi, Gansu, Qinghai, Ningxia, and Xinjiang

4. Empirical results

4.1. The bench mark model

First, the bench mark model verifies the key relationship between firm size and economic growth. This relationship is specified as follows:

$$grdpgr = f(big / medium / small, inigrdp, popgr, invt, infl, gov, edu2, central, western) \quad (3)$$

where the dependent variable is the growth rate of real GRDP per capita. Explanatory variables include the initial levels of GRDP per capita (*inigrdp*), population growth rate (*popgr*, as a proxy of the change in the labor force participation rate) (Blomström et al., 1996), and investment ratio (*invt*, as physical capital) (Barro, 1991, 1997; Barro and Lee, 1994; Caselli et al., 1996; Levine and Renelt, 1992; Mankiw et al., 1992). These variables are standard economic-growth determinants directly predicted by the Solow economic-growth model. To capture the government's involvement in the economy, inflation rate (*infl*) (Barro, 1997, 2000; Clarke, 1997; Levine and Renelt, 1992; Kormendi and Meguire, 1985) and government expenditure (*gov*) (Barro, 1991, 1997, 2000; Clarke, 1997; Barro and Lee, 1994) are introduced to the equation. Inflation rate captures the macroeconomic conditions or business cycle effects, and government consumption represents the government interference in economic activities (Wan et al., 2006). Geographic variables such as central region (*center*) and western region (*western*) were also included in the economic-growth equation, in accordance with Levine and Renelt (1992) and Sala-i-Martin (1997).

Unlike previous models in the literature, one of the key features of our model is the inclusion of the variable of firm size as regressors. In these models and in those that follow, firm size is measured by three different methods. In the bench mark model, the results are represented by the estimates of two methods (measured by the relative sales and relative number of firms by size). Then, in the extended model, estimations use the firm size to analyze the impact of the absolute number of firms and the average size of firms. In the robustness tests, firm size is estimated by the share of firms by size in total sales only because of the high correlation between firm variables measured by other methods and basic control variables.

Table 7 shows a list of provinces with the corresponding number of large, medium, and small enterprises. As shown in the table, the number of big and medium enterprises decreases, whereas that of small firms increases. This finding is consistent across the eastern, central, and western regions. Given the noticeable productivity disparity among big, medium, and small firms, the factors causing the rapid growth of small firms are as follows: market opening, reduction in sunk costs, lower barriers to entry, and rapid growth of economy scale and scope.

Table 8A presents the regression results using share of firms by size in total sales in each province based on the OLS, FE, and GMM models. These results show the negative and significant coefficients of the Firmsize variables of big firms as well as the positive and significant coefficients of the Firmsize variables of small firms. The empirical results of medium enterprises are insignificant and unstable. All of these results remain the same regardless of whether they are based on the OLS, FE, or GMM.

In the FE model, the coefficient of the share of big businesses in total sales with respect to the growth rate of GRDP per capita is stable at approximately –0.0023. This result suggests that if the proportion of big businesses in total sales decreases by 1% (e.g., from 52% to 51%), then the growth rate of GRDP per capita increases by approximately 0.23% (e.g., from a growth rate of 15% to 15.23%). In comparison, the magnitude of the effect of small enterprises on growth rates, according to the FE results, is approximately 0.0049. This result suggests that if the ratio of sales volume of small enterprises to total sales increases by 1% (e.g., from 27% to 28%), then the growth rate of GRDP per capita increases by approximately 0.49% (e.g., from a growth rate of 15% to 15.49%).

Table 8B shows the results with the relative number of enterprises by size in each province, which is consistent with that based on the share of firms by size in total sales. The ranges of the coefficients of big businesses are stable in the range of –0.02 to –0.04 in all models. Regardless of whether OLS, FE, or GMM model is used, the results are still consistent with previous results. The coefficients of small firms are stable at approximately 0.01 across all of the models. Moreover, the above regressions (whether using the share of firms by size in total sales or share of firms by size in total number of firms) are quite consistent with one another.

Table 7 The number of large, medium, and small enterprises in each province

Number of Firms	2004				2009			
	Big	**Medium**	**Small**	**All**	**Big**	**Medium**	**Small**	**All**
Eastern Region								
Beijing	135	644	3,351	4,130	93	338	2,764	3,195
Tianjin	171	696	2,820	3,687	86	405	2,990	3,481
Hebei	434	1,629	5,019	7,082	259	866	6,101	7,226
Liaoning	480	1,872	6,574	8,926	214	885	9,819	10,918
Shanghai	386	1,779	8,463	10,628	181	875	7,225	8,281
Jiangsu	1,032	4,901	21,401	27,334	702	2,781	27,403	30,886
Zhejiang	852	4,807	21,337	26,996	439	2,602	26,666	29,707
Fujian	478	1,944	5,661	8,083	298	1,448	7,939	9,685
Shangdong	838	3,663	11,276	15,777	719	2,457	21,423	24,599
Guangdong	1,122	4,091	10,416	15,629	1,304	4,768	23,073	29,145
Subtotal	**5,928**	**26,026**	**96,318**	**128,272**	**4,295**	**17,425**	**135,403**	**157,123**
Central Region								
Shanxi	276	1,009	2,907	4,192	205	551	1,497	2,253
Jilin	161	450	1,470	2,081	84	299	2,818	3,201
Heilongjiang	249	657	1,910	2,816	100	280	1,829	2,209
Anhui	180	729	2,225	3,134	127	583	5,733	6,443
Jiangxi	150	736	1,822	2,708	131	674	5,463	6,268
Henan	509	1,669	5,750	7,928	338	1,490	8,680	10,508
Hubei	284	1,076	3,271	4,631	215	722	5,881	6,818
Hunan	191	963	3,315	4,469	137	715	6,526	7,378
Subtotal	**2,000**	**7,289**	**22,670**	**31,959**	**1,337**	**5,314**	**38,427**	**45,078**
Western Region								
Inner-Mongolia	133	435	1,339	1,907	84	314	1,936	2,334
Guangxi	113	561	1,394	2,068	79	479	2,488	3,046
Chongqing	147	520	1,322	1,989	119	412	2,893	3,424
Sichuan	1,055	3,110	6,691	10,856	226	1,041	5,900	7,167
Guizhou	81	271	936	1,288	59	240	1,190	1,489
Yunnan	100	399	984	1,483	76	340	1,531	1,947
Shaanxi	159	402	1,104	1,665	122	283	1,898	2,303
Gansu	82	298	821	1,201	60	176	850	1,086
Qinghai	15	54	149	218	15	38	200	253
Ningxia	34	97	276	407	25	58	369	452
Xinjiang	66	148	639	853	52	153	841	1,046
Subtotal	**1,985**	**6,295**	**15,655**	**23,935**	**917**	**3,534**	**20,096**	**24,547**

Source: Calculated by the author based on data from various issues of Chinese Industrial Enterprises

Table 8A

Basic results: using the share of firms by size in total sales

Model	**OLS**			**Fixed effects**			**System GMM**		
big1	-0.0012			-0.0023			-0.0030		
	(-2.64)***			(-2.82)***			(-3.56)***		
medium1		-0.0003			-0.0025			0.0073	
		(-0.30)			(-1.50)			(3.08)***	
small1			0.0027			0.0049			0.0037
			(4.11)***			(4.87)***			(4.08)***
inigrdp	-0.0131	-0.0141	-0.0109				-0.4476	-0.8594	-0.3754
	(-0.81)	(-0.85)	(-0.69)				(-4.82)***	(-6.62)***	(-5.00)***
popgr	-0.0015	-0.0011	-0.0017	-0.0014	-0.0057	-0.0030	-0.0439	-0.0517	-0.0567
	(-0.71)	(-0.52)	(-0.85)	(-0.14)	(-0.58)	(-0.33)	(-4.15)***	(-4.69)***	(-5.22)***
invt	0.0007	0.0013	0.0002	0.0013	0.0018	0.0002	-0.0018	-0.0014	-0.0009
	(1.35)	(2.89)***	(0.38)	(1.48)	(2.18)**	(0.25)	(-1.75)*	(-1.38)	(-1.04)
infl	0.0119	0.0126	0.0114	0.0122	0.0135	0.0109	0.0120	0.0112	0.0128
	(6.10)***	(6.35)***	(5.95)***	(5.71)***	(6.33)***	(5.3)***	(5.55)***	(4.56)***	(6.20)***
gov	-0.0006	-0.0023	-0.0003	-0.0026	-0.0020	-0.0026	0.0010	-0.0064	0.0006
	(-0.51)	(-1.84)*	(-0.27)	(-0.92)	(-0.70)	(-0.97)	(0.46)	(-2.82)***	(0.30)
edu2	0.0007	0.0001	0.0006	-0.0053	-0.0044	-0.0057	0.0026	0.0091	-0.0042
	(0.67)	(0.11)	(0.64)	(-1.50)	(-1.24)	(-1.72)*	(1.05)	(3.17)***	(-1.77)*
central	0.0120	0.0016	0.0182				-0.5129	-1.0170	-0.4248
	(0.65)	(0.09)	(1.02)				(-4.73)***	(-6.79)***	(-4.72)***
western	0.0255	0.0156	0.0406				-0.2248	-0.5110	-0.1723
	(1.17)	(0.71)	(1.86)*				(-3.37)***	(-5.63)***	(-2.81)***
constant	0.2434	0.2135	0.1045	0.4207	0.2969	0.2494	4.9263	8.6276	4.2145
	(1.38)	(1.17)	(0.61)	(2.92)***	(2.17)**	(2.04)**	(5.19)***	(6.57)***	(5.08)***
R^2	0.30	0.27	0.33						

R^2 (within)				0.27	0.24	0.34			
AR(2) test							0.602	0.969	0.777
observations	174	174	174	174	174	174	174	174	174
provinces	29	29	29	29	29	29	29	29	29

T-statistics are provided in parentheses.

P-values are presented for AR (2) test.

The instruments used in GMM are lags one and above of the dependent variable, investment ratio, and the share of firms by size in total sales.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

Table 8B

Basic results: using the share of firms by size in total number of firms

Model	**OLS**			**Fixed effects**			**System GMM**		
big2	-0.0198			-0.0426			-0.0458		
	(-6.46)***			(-11.49)***			(-9.02)***		
medium2		-0.0097			-0.0155			-0.0158	
		(-8.89)***			(-13.77)***			(-9.28)***	
small2			0.0073			0.0126			0.0116
			(8.83)***			(14.78)***			(9.32)***
inigrdp	-0.0182	-0.0365	-0.0326				-0.0203	-0.0498	-0.0677
	(-1.23)	(-2.64)***	(-2.37)**				(-0.43)	(-1.59)	(-1.71)*
popgr	-0.0007	0.0001	0.000002	-0.0092	-0.0096	-0.0101	0.0052	-0.0050	-0.0100
	(-0.36)	(0.09)	(0.00)	(-1.31)	(-1.51)	(-1.66)*	(1.16)	(-0.84)	(-1.66)*
invt	0.000004	-0.0005	-0.0005	-0.0012	-0.0013	-0.0016	0.0004	-0.0018	-0.0017
	(0.01)	(-1.13)	(-1.24)	(-1.79)*	(-2.18)**	(-2.78)***	(0.51)	(-1.84)*	(-1.84)*
infl	0.0121	0.0115	0.0116	0.0111	0.0100	0.0100	0.0125	0.0102	0.0107
	(6.84)***	(7.03)***	(7.08)***	(7.16)***	(7.06)***	(7.34)***	(7.91)***	(6.24)***	(6.76)***
gov	-0.0015	-0.0033	-0.0028	-0.0041	-0.0079	-0.0074	-0.0060	-0.0048	-0.0035
	(-1.52)	(-3.53)***	(-3.00)***	(-2.01)**	(-4.12)***	(-4.04)***	(-3.13)***	(-3.01)***	(-2.29)**
edu2	0.0016	-0.0001	0.0005	-0.0051	-0.0053	-0.0053	-0.0068	-0.0026	-0.0033
	(1.78)*	(-0.08)	(0.65)	(-1.97)*	(-2.26)**	(-2.36)**	(-2.6)***	(-1.01)	(-1.43)
central	0.0195	0.0180	0.0206				0.0698	0.0879	0.0588
	(1.18)	(1.2)	(1.36)				(0.87)	(1.59)	(0.96)
western	0.0635	0.0628	0.0693				0.0967	0.1603	0.1175
	(3.02)***	(3.34)***	(3.63)***				(1.8)*	(3.64)***	(2.33)**
constant	0.3043	0.6649	-0.1433	0.6706	0.8212	-0.4204	0.7573	1.0562	0.0972
	(1.89)*	(4.25)***	(-0.93)	(6.57)***	(8.56)***	(-4.48)***	(1.57)	(3.56)***	(0.20)
R^2	0.41	0.50	0.50						

R^2 (within)				0.60	0.67	0.70			
AR(2) test							0.779	0.762	0.893
observations	174	174	174	174	174	174	174	174	174
Provinces	29	29	29	29	29	29	29	29	29

T-statistics are provided in parentheses.

P-values are presented for AR (2) test.

The instruments used in GMM are lags one and above of the dependent variable, investment ratio, and the share of firms by size in total number of firms.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

4.2. Robustness test

$$grdpgr = f(medium1, small1, inigrdp, popgr, invt, infl, gov, edu2, central, western) \quad (4)$$

As shown in Equation (4), the robustness test is conducted with the use of both small and medium business variables in a single equation. Checking the robustness of small firm variables together with medium firm variables is meaningful because we can find whether the results are stable by using additional explanatory variables. The results shown in Table 9 demonstrate that small firm variables remain significant in this robustness test. The magnitude of the effect of small businesses on growth rate is approximately two times greater than that of medium firms, and the coefficients have opposite signs.

Other control variables, such as initial levels of GRDP per capita, population growth rate, or government expenditure, tend to show the normal signs and levels of significance; although the levels of significance are not entirely the same across OLS, FE, and GMM estimations. The results also indicate some convergence of the growth rate of GRDP per capita, as shown by the negative sign coefficients of the initial income levels.

Table 9

Medium enterprises versus small enterprises in provincial economic growth

Model	**OLS**	**Fixed effects**	**System GMM**
medium1	-0.0022	-0.0039	-0.0018
	(-2.24)**	(-2.54)**	(-1.02)
small1	0.0033	0.0054	0.0041
	(4.71)***	(5.34)***	(4.73)***
inigrdp	-0.0093		-0.1778
	(-0.60)		(-4.08)***
popgr	-0.0017	-0.0061	-0.0261
	(-0.87)	(-0.69)	(-3.93)***
invt	0.0001	-0.0001	0.0001
	(0.25)	(-0.18)	(0.06)
infl	0.0112	0.0107	0.0128
	(5.94)***	(5.31)***	(6.57)***
gov	-0.0011	-0.0023	-0.0026
	(-0.91)	(-0.88)	(-1.58)

edu2	0.0002	-0.0056	-0.0014
	(0.20)	(-1.71)*	(-0.82)
central	0.0178		-0.2043
	(1.01)		(-3.55)***
western	0.0495		-0.0248
	(2.26)**		(-0.63)
constant	0.1491	0.3441	2.0067
	(0.87)	(2.74)***	(4.20)***
R^2	0.35		
R^2 (within)		0.37	
AR(2) test			0.404
Sargan test			0.998
observations	174	174	174
provinces	29	29	29

T-statistics are provided in parentheses.

P-values are presented for AR (2) test.

The instruments used in GMM are lags one and above of the dependent variable, investment ratio, and the share of medium and small firms in total sales.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

5. What is changing growth engine in China?

- The absolute number of firms versus The average size of firms

5.1. Number and size measures

Thus far, the regression results support our hypotheses that small firms can promote rapid economic growth, whereas big businesses have a negative effect on economic growth. In this section, we attempt to elucidate this phenomenon by determining whether the positive effect of small firms (or the negative effect of big businesses) results from the increasing number of those firms or the growing size of those enterprises. For this purpose, we introduce the concepts of entry rate and average sales per firm.

Entry and exit measures

We construct summary measures of both the number of entrants and exiters as well as their size relative to other firms in the industry. The following discussion can be made more precise by defining the following variables:

$NE_i(t)$: number of firms that enter industry i between year t-1 and t
$NT_i(t-1)$: total number of firms in industry i in year t-1
$NX_i(t)$: number of firms that exit industry i between year t-1 and t

Using these variables, we define the entry and exit rates for industry i between years t-1 and t as

$$ER_i(t) = NE_i(t) / NT_i(t-1)$$
$$XR_i(t) = NX_i(t) / NT_i(t-1) \quad (5)$$

The denominator in both cases is the total number of firms in the industry in year t-1.

Table 10 shows the entry and exit patterns for China's industry, and the variation in Total Factor Productivity (TFP) among existing, entry, and exit firms. Interestingly, in 2004, 2006, and 2007, the TFP of entry firms is lower than that of exit firms, indicating that firms with low productivity dominate firms with high productivity. Moreover, the firms participating in market

competition are mainly private firms, which are mostly composed of small firms. Considering this fact, we can posit that the inefficiency existing in the large firm sector results from the lack of competition.

Table 10 Entry and exit patterns for China's industry, and variation in TFP among existing, entry, and exit firms

Year	Entry Rate (ER)	Exit Rate (XR)	TFPE	TFPN	TFPX
1999	0.28	0.22	510.92	440.47	349.55
	(0.72)	(0.63)			
2000	0.25	0.22	570.20	442.39	384.46
	(0.74)	(0.66)			
2001	0.43	0.33	612.49	509.55	447.59
	(0.80)	(0.69)			
2002	0.31	0.22	637.87	516.70	446.59
	(0.80)	(0.59)			
2003	0.49	0.33	720.89	597.05	529.69
	(0.84)	(0.73)			
2004	0.94	0.46	807.63	568.34	630.78
	(0.86)	(0.81)			
2005	0.22	0.21	754.70	611.02	590.58
	(0.92)	(0.76)			
2006	0.23	0.15	872.53	632.49	719.50
	(0.92)	(0.81)			
2007	0.24	0.17	978.51	721.98	779.11
	(0.93)	(0.84)			

Source: Li et al., (2013), "A Study of How Market Entry and Exit Matter for Productivity in China' 426 Industries"

Notice: The proportion of private firms in total number of entrants and exiters is provided in parentheses. TFPE stands for TFP of existing firms. TFPN stands for TFP of entry firms. TFPX stands for TFP of exit firms.

Size Measures

We use average sales per firm as the measure for the average size of firms. We introduce these variables to determine whether the patterns in Figs. 1A to 1D and 2A to 2D result from the increase in the number of firms of various size groups or from the growth of the firms in each pool.

5.2. The absolute number of firms versus the average size of firms

$$grdpgr = f(big3/medium3/small3, sales(b/m/s), \\ inigrdp, popgr, invt, infl, edu2, central, western) \quad (6)$$

We use the log of the number of firms by size as the measure for changes in numbers and the average sales per firm in corresponding provinces as the measure for changes in sizes [Equation (6)]. With the present regression, we can test if provinces with a large number of each type of firms (or growing size of each type of enterprises) can sustain rapid economic growth. This subsection examines the hypothesis that the average size of enterprises and not the number of firms really matters in China's economy. The results are shown in Table 11, which are based on OLS, FE, and GMM estimators.

We find that the absolute number of big or medium firms generally affects growth negatively. Although the levels of significance are not completely the same across OLS, FE, and GMM estimations, the results show that the number of those firms has a negative effect on economic growth. In this model, the results of small firms are unstable. However, the coefficients of the average sales per firm of large, medium, and small enterprises are positive and significant. These results do not change regardless of whether we use OLS, FE, or GMM models. Furthermore, the magnitude of the effect of average sales on economic growth is considerably greater than that of the absolute number of firms. The regression results indicate that the rapid growth is not the result of the increasing number of those firms but of the growing size of various size groups of enterprises. Therefore, the growing size of each type of firms in each province contributes to growth. These results imply that the best economic structure for a province is to have a growing size of big, medium, and small firms in proportion to its number.

Taking the findings on both the absolute and relative sizes of big, medium, and small firms in a provincial economy, we can imagine the dynamics of various size groups of enterprises; that is, a growing size of enterprises and a proportional growing number of all types of firms. In other words, the best scenario is to enlarge the scale of various size groups of enterprises and to form a dynamic process growing from small firms to medium enterprises, and from medium firms to big businesses.

5.3. Robustness test

$$grdpgr = f(big1/medium1/small1, inigrdp, popgr, invt, infl, gov, edu2, sales(b/m/s), entry(b/m/s), central, western) \quad (7)$$

In this subsection, the test of robustness is conducted with the use of additional variables. These factors are the entry rate of big, medium, or small firms, and average sales of corresponding firms [Equation (7)]. Checking the robustness of relatively firm-sized variable together with the entry rate variable and average sales variable is meaningful because we can combine the phenomenon with the reason underlying it together in one regression. The results of the firm size variable in Table 12 are consistent with the results on Table 8A; however, the coefficient of relative sales of big businesses loses significance in OLS estimation. The entry rate of each firm group is significant and negative in all estimations. The average sales variable is still significant and positive in FE and GMM estimations, but loses significance in OLS estimation of medium enterprises. All these results are consistent with the results in Table 11.

Table 11

The absolute presence of firms, average sales, and provincial economic growth

Model	**OLS**			**Fixed effects**			**System GMM**		
big3	-0.0042			-0.1189			-0.0922		
	(-0.61)			(-6.24)***			(-4.73)***		
bsales	0.0278			0.0480			0.0693		
	(2.55)**			(3.44)***			(3.81)***		
medium3		-0.0060			-0.1176			-0.0192	
		(-1.16)			(-5.17)***			(-1.90)*	
msales		0.0784			0.0702			0.1761	
		(6.24)***			(3.98)***			(8.29)***	
small3			-0.0014			0.0377			0.0237
			(-0.28)			(1.39)			(1.96)**
ssales			0.0892			0.1487			0.1746
			(5.11)***			(6.27)***			(6.12)***
inigrdp	-0.0299	-0.0584	-0.0469				-0.1202	-0.2891	-0.1933
	(-2.37)**	(-4.62)***	(-3.75)**				(-5.04)***	(-7.17)***	(-5.50)***
popgr	-0.0021	-0.0014	-0.0023	-0.0128	-0.0107	-0.0085	-0.0168	-0.0192	-0.0241
	(-0.98)	(-0.74)	(-1.11)	(-1.74)*	(-1.47)	(-1.00)	(-3.52)***	(-3.71)***	(-4.01)***
invt	0.0004	-0.0007	-0.0003	-0.0015	-0.0019	-0.0019	-0.0037	-0.0063	-0.0021
	(0.90)	(-1.56)	(-0.60)	(-2.50)**	(-3.00)***	(-2.43)**	(-4.49)***	(-6.50)***	(-2.27)**
infl	0.0124	0.0120	0.0118	0.0097	0.0091	0.0120	0.0074	0.0076	0.0130
	(6.27)***	(6.61)***	(6.30)***	(5.61)***	(5.20)***	(6.16)***	(3.50)***	(4.16)***	(6.35)***
edu2	0.0014	0.0007	-0.0004	-0.0034	-0.0054	-0.0089	0.0095	0.0027	-0.0103
	(1.41)	(0.84)	(-0.48)	(-1.29)	(-2.02)**	(-2.86)***	(3.49)***	(1.41)	(-3.31)***
central	-0.0130	-0.0022	0.0009				-0.1113	-0.0658	-0.0311
	(-1.04)	(-0.19)	(0.08)				(-3.97)***	(-2.05)**	(-0.94)
constant	-0.0398	-0.2118	-0.3245	0.3069	0.3966	-1.2569	0.6851	1.2280	0.5559

	(-0.23)	(-1.53)	(-2.07)**	(1.20)	(1.35)	(-4.59)***	(5.58)***	(4.04)***	(1.69)*
R^2	0.29	0.40	0.36						
R^2 (within)				0.56	0.56	0.41			
AR(2) test							0.235	0.972	0.595
observations	174	174	174	174	174	174	174	174	174
provinces	29	29	29	29	29	29	29	29	29

T-statistics are provided in parentheses.

P-values are presented for AR (2) test.

Since the correlation between the firm variables with government expenditure variable is relatively high, we remove government expenditure (*gov)* in this model.

The instruments used in GMM are lags one and above of the dependent variable, investment ratio, and the log of one plus the number of differently sized firms.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

Table 12

Firm size and provincial economic growth, controlling for entry rate and average sales (using the share of firms by size in total sales)

Model		**OLS**			**Fixed effects**			**System GMM**	
big1	-0.0006			-0.0030			-0.0018		
	(-1.14)			(-4.24)***			(-2.82)***		
medium1		0.0007			0.0003			0.0026	
		(0.92)			(0.24)			(1.49)	
small1			0.0022			0.0029			0.0039
			(3.48)***			(2.98)***			(2.54)**
inigrdp	-0.0210	-0.0337	-0.0200				-0.2231	-0.5362	-0.2676
	(-1.52)	(-2.58)**	(-1.37)				(-3.19)***	(-5.37)***	(-3.59)***
popgr	-0.0003	0.00003	-0.0015	-0.0131	-0.0118	-0.0105	-0.0058	-0.0200	-0.0416
	(-0.19)	(0.03)	(-0.88)	(-2.12)**	(-1.88)*	(-1.36)	(-0.73)	(-2.6)***	(-4.15)***
invt	0.0001	0.0001	0.0003	-0.0016	-0.0003	0.00001	-0.0016	-0.0023	-0.0006
	(0.16)	(0.39)	(0.63)	(-2.59)**	(-0.46)	(0.01)	(-2.08)**	(-2.89)***	(-0.71)
infl	0.0141	0.0150	0.0147	0.0122	0.0143	0.0137	0.0136	0.0125	0.0152
	(8.97)***	(10.38)***	(8.43)***	(8.69)***	(10.37)	(7.28)***	(8.94)***	(7.76)***	(8.05)***
gov	-0.0020	-0.0028	-0.0010	-0.0055	-0.0064	-0.0049	-0.0031	-0.0079	-0.0002
	(-1.97)*	(-3.09)***	(-1.00)	(-3.00)***	(-3.4)***	(-2.11)**	(-1.81)*	(-4.68)***	(-0.11)
edu2	0.0013	0.0002	-0.0001	-0.0025	-0.0010	-0.0027	-0.0014	0.0015	-0.0040
	(1.61)	(0.20)	(-0.07)	(-1.09)	(-0.43)	(-0.94)	(-0.78)	(0.73)	(-1.32)
bsales	0.0172			0.0746			0.0609		
	(1.34)			(4.88)***			(2.52)**		
bentry	-0.0221			-0.0183			-0.0265		
	(-6.65)***			(-5.72)***			(-5.84)***		
msales		0.0193			0.0440			0.0787	
		(1.47)			(2.55)**			(2.90)***	
mentry		-0.0068			-0.0067			-0.0048	

		(-8.92)***			(-8.31)***			(-3.94)***	
ssales			0.0343			0.0643			0.0112
			(1.94)*			(2.23)**			(0.22)
sentry			-0.0013			-0.0012			-0.0012
			(-6.08)***			(-4.96)***			(-3.78)***
central	0.0200	0.0141	0.0206				-0.1770	-0.5126	-0.2761
	(1.38)	(1.06)	(1.33)				(-2.17)**	(-4.47)***	(-3.27)***
western	0.0602	0.0398	0.0341				-0.0390	-0.2444	-0.0994
	(3.39)***	(2.50)**	(1.80)*				(-0.80)	(-3.66)***	(-1.72)*
constant	0.0964	0.2550	-0.0669	-0.3966	-0.1350	-0.3421	1.7903	4.7495	2.9744
	(0.55)	(1.63)	(-0.36)	(-2.26)**	(-0.78)	(-1.29)	(2.45)**	(4.97)***	(3.83)***
R^2	0.57	0.63	0.51						
R^2 (within)				0.70	0.70	0.53			
AR(2) test							0.527	0.014	0.000
observations	174	174	174	174	174	174	174	174	174
provinces	29	29	29	29	29	29	29	29	29

T-statistics are provided in parentheses.

P-values are presented for AR (2) test.

The instruments used in GMM are lags one and above of the dependent variable, investment ratio, and the share of firms by size in total sales.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

6. Conclusions

This paper provides the first cross-province evidence on the links between firm size and economic growth using a newly built Chinese Industrial Enterprises Database. We believe that no rigorous quantitative attempt has been made yet to measure this effect.

First, big businesses have a significant and negative effect on economic growth. Considering both the absolute and the relative presence of big businesses within each province, they are both negatively linked to economic growth.

Second, medium-sized firms have little effect on economic growth in China. The empirical results are insignificant and unstable.

Third, small firms have a significant and positive effect on economic growth. Considering both the absolute and the relative presence of small firms within each province, their relative presence is significant and positively linked to economic growth, whereas the absolute presence of small firms within the provincial economy is insignificant.

Fourth, when we explore the underlying reasons of the phenomena, the pattern exists mainly because of the average sales per firm, rather than the number of firms. We find that for every size group of enterprises, average sales per firm exert a significant positive effect on growth, whereas the number of firms exerts a negative role in the economy. We can conclude that not the number of firms but the average size of various size groups of enterprises really matters in the China's economy.

Fifth, difference in efficiency makes difference in contribution, where efficiency disparity among large, medium, and small enterprises exists. The efficiency disparity of different-sized firms is the essential reason of the performance gap in China.

However, we are not emphasizing the need to foster only small firms. We suggest that keeping the balance or proportion of each type of firms is more helpful to China's economy. We can imagine that we can increase the absolute number of various size groups of firms and enlarge the average size of enterprises at the same time. Considering the fact that the average sales per firm has a positive effect on economic growth in all size groups of firms, fostering the small and

medium-sized firms into big businesses results in the absolute increase in the number of big companies, which in turn has a positive effect on economic growth. Therefore, the number of firms and the average size of firms do not contradict each other.

Subsequently, the study implies that the best scenario is to enlarge the scale of various size groups of enterprises and to form a dynamic process growing from small firms to medium enterprises, and from medium firms to big businesses.

Although this study has meaningful implications, it also has limitations. First, the Chinese Industrial Enterprises Database only covers non-listed enterprises, which may cause bias on the sample selection of research on big business. Second, we deal with large, medium, and small enterprises. The role of micro firms or start-up firms in each province is not considered in this study because of the lack of data. In recent years, China's government issued a serial tax free policy on micro firms. Those firms may be equally important and are possibly different from large, medium, and small firms. Third, the role and the importance of different sizes of firms may change over time. These limitations can be addressed by future research.

Furthermore, to gain a real understanding of development dynamics, the analysis must be extended to investigate the dynamics of growth–inequality nexus in each province. We may employ the simultaneous model to capture this kind of mechanism. China has experienced 30 years of remarkable achievements, but it is now suffering from problems that include a wide gap in the income among its people, regions, and between urban and rural areas. Therefore, additional studies on the interaction between economic growth and inequality from the perspective of firm size may be of significance.

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국문 초록

경제성장과 발전의 결정적 요인에 대한 연구는 많이 되어 왔고, 다양한 요인과 변수들이 이론적 및 실증적으로 제시 되어 왔다. 또한 경제성장에 대한 대기업 및 중소기업의 역할에 대한 연구도 많이 진행 되어 왔다. 이 모든 연구들은 기업의 규모가 거시 경제 성과에 중요한 영향을 준다고 제시하나, 이에 대한 실증분석 연구는 아직 미흡하다. 특히 대, 중, 소 기업별로 중국의 기업규모와 경제성장의 관계에 대한 연구는 아직 되어 있지 않다. 본 논문에서는 2004 년부터 2009 년 사이의 중국의 성별 패널 데이터를 활용하여 상대적 매출액, 상대적 기업수와 절대적 기업수 등 세가지 방법으로 기업규모를 측정 하였고, 이를 토대로 중국의 기업규모와 경제성장의 관계에 대하여 실증분석을 진행 하였다. 분석결과, 본 논문의 주요 발견은 다음과 같다. 첫째, 경제성장에 대해 대기업은 유의미한 부적적인 영향을, 중견기업은 유의미 하지 않은 영향을, 소기업은 유의미한 긍정적인 영향을 준다. 둘째, 모든 유형의 기업에서 기업사이즈가 커지는것은 경제성장에 긍정적인 영향을 주지만, 기업수가 증가 하는것은 그렇지 못하다. 셋째, 경제성장에 대한 기여의 차이는 각 유형 기업의 효율성의 차이에서 비롯 된다.

주요어: 기업규모; 경제성장; 대기업; 중소기업; 평균 기업규모; 진입-퇴출율

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