ENTRY, EXIT AND THE DYNAMICS OF PRODUCTIVITY GROWTH IN CHINESE MANUFACTURING INDUSTRY

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Abstract
In this paper we have attempted to examine aspects of the competitive selection process, firms' entry, survival and exit, in an important sector of Chinese manufacturing, looking in particular for changes resulting from the latest stage of reform, dubbed the transition to the "socialist market economy". These dynamic processes may be becoming increasingly important for the continuing growth of manufacturing, as the agricultural sector as a source of surplus labour begins to decline.

Our analysis suggests that the competitive selection process is taking shape in China, with new firm entries contributing substantially to both output growth and productivity growth, however old firm is still an important stabilizing element in determining the trend of the economy. Our analysis also suggests that it is insufficient to analyse the competitive process from the point of view of new firm entry and incumbent firm growth alone; firms' exit needs to be examined as well.

JEL Codes: D24, L11, O12, P31

Keywords: Entry, Exit, Survival, Productivity, Economic Reform, Chinese Enterprises

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1. Introduction

Since 1978, while transforming itself from a centrally planned economy to an emerging market economy, China has achieved a 10% average rate of growth in GDP, with per capita GDP more than quadrupling. Compared with transition economies in Eastern Europe, the countries of the former Soviet Union China's recent economic performance is of course considerably more impressive. However, a central paradox of the recent impressive record in China is that it has been achieved in the absence of a number of factors commonly deemed to be essential in a successful transition. These include reasonably complete market liberalization, large-scale privatisation, secure private property rights, and democracy (Chow, 1997). Resolution of the paradox is important when assessing the role of current and future reforms.

There are a number of ways in which the effectiveness of the reform process can be judged, and the most popular approach has been to compare total factor productivity over time and across different firms. For a recent review see Jefferson et al. (1996). A possible problem with this technique is the perfect competition assumption underlying the production function, which is not applicable, especially in the context of transition economies. Also, given the tendency of the small firms and firms in the non-state sector to enter market niches, it seems likely that the comparison may not be robust to the output deflators employed. Moreover, the general positive TFP growth conclusion drawn from such an approach contradicts the deteriorating firm profitability reality (for a general review see Sachs and Woo (2000)). Further, the approach represents something of a black box from a micro-dynamic perspective. Is TFP growth indicative of what is happening to incumbent firms or the impact of entry and exit? As we shall see, this question is particularly important given the high rates of "churning" of enterprises and small enterprises in particular.

In this paper, I first tried to estimate instead the effect of economic reform upon firms' efficiency, another indicator of firms' performance; I found however that firms' efficiency showed a tendency to diverge in the period between 1987 and 1996. As it was observed, this was contradicting to the result that might have been expected of the transition from the former centrally planned economy to market economy. Therefore, it is hypothesised in this paper that two of the reasons underlying the divergence of technical efficiency are the entry of more efficient firms paralleled with the survival of inefficient and value destroying firms, especially inefficient state-owned firms. However this can only have sustained as long as growth remains strong.

As such, an alternative approach to the assessment of the reforms is therefore to consider firms' entry, exit, and survival explicitly and to gauge the extent to which the competitive process has improved as a result of the latest bout of reform since 1992, dubbed as the transition to the "socialist market economy", while the reform before 1992 had been dubbed as "crossing the river by groping the stone". This paper attempts to address the competitive selection process directly by investigating the micro-dynamics of entry, exit, and aggregate productivity growth using firm level data on Chinese manufacturing. Specifically, it has three main objectives:

1. to document the actual patterns of firm entry and exit;

2. to analyse the post-entry and pre-exit behaviour of Chinese enterprises; and

3. to estimate the contribution of new entries, exits and survival firms to aggregate productivity growth.

This paper is organized as follows: Section 2 briefly surveys the literatures on firms' entry and exit; Section 3 describes the pattern of entry and exit in the Chinese electrical engineering industry; section 4 analyses the longitudinal performance of surviving and exiting firms; section 5 decomposes the aggregate productivity growth; and section 6 concludes the paper.

2. The Entry and Exit in Advanced and Transition Economies

There is a long-standing interest in understanding firms' entry and exit behaviour and their determinants. Following Bain's (1956) research on the process of entry and Edwin Mansfield's (1962) plea for a greater emphasis on the research on the dynamic aspects of industrial organization, there comes an explosion of such research. Several theories have been developed to study the process that generates each firm's entry, exit, productivity growth, and market share change. They generally related to the process of "creative destruction" (Schumpeter, 1942). In most models, each of the above dimensions of performance is depicted as the optimal behaviour of forward-looking entrepreneurs with rational expectations but limited information.

Hopenhayn (1992) provides a relatively tractable model of firms' dynamics. In his model, firms differ only in terms of their productivity levels, each of which evolves as a random process over time according to an exogenous Markov

process. He relates the exogenous characteristics of the industry, such as the entry cost, total demand and the stochastic process for the productivity parameter to the steady-state distribution of firms and to the process of entry and exit. Under such a set up, new firms enter when the distribution from which they draw their initial productivity level is sufficiently favourable that their expected future profit stream, net of annual fixed costs, will cover the sunk costs of entry. Firms exit when they experience a series of adverse productivity shocks, driving their expected future operating profits sufficiently low that exit is their least costly option.

Hopenhayn's (1992) model shares a number of implications with other representations of industrial evolution developed by Jovanovic (1982) and Ericson and Pakes (1995). By modeling firms' evolution as a passive learning process, Jovanovic (1982) showed that firm productivity varies initially but eventually settles down to a constant level. As firms only learn about their true efficiency by effectively operating and producing, a process of natural selection arises whereby less efficient firms leave the industry while more efficient firms grow to their optimal size. This selection mechanism results in younger firms being on average smaller and more heterogeneous but less productive than older firms. In contrast to this 'passive learning' by firms, Ericson and Pakes (1995) stressed the importance of 'active learning' by firms through investments in productivity enhancement. Within their model, a firm explores its economic environment actively and invests to enhance its profitability under competitive pressure from both within and outside the industry. Its potential and actual profitability changes over time in response to the stochastic outcomes of the firm's own investment, and those of other actors in the same market. The firm grows if successful, and shrinks or exits if unsuccessful.

As we can see from the models, both entry and exit are modelled as the optimal responses made by innovative entrepreneurs contingent on the balance between future expected return and costs. At any point in time, an entire distribution of firms with different sizes, ages and productivity levels exist, and simultaneous entry and exit is the norm. Young firms have not yet survived a shakedown process, so they tend to be smaller and to exit more frequently. Large firms are the most efficient, on average, so their mark-ups are the largest. Nonetheless, despite all the heterogeneity, equilibrium in both Jovanovic's and Hopenhayn's model maximize the net discounted value of social surplus. Thus market interventions—such as artificial entry barriers, severance laws, or policies that prop up dying firms—generally make matters worse. The exogenous fixed costs—such as economies of large scale, product differentiation and absolute

cost advantages of incumbent firms compared with entrants—pose barriers to both entry and exit.

A number of recent studies have examined empirically the dynamic aspects of firm behaviours in the context of advanced economies—such as Acs and Audretsch's (1989) and Audretsch's (1995) work on the U.S Manufacturing, Baldwin and Gorecki's (1989, 1991) work on Canadian industry, Geroski's (1991) work on British Manufacturing industry, Dunne's (1988,1989) work on US manufacturing industry, Mata's (1993) work on Portugal Manufacturing industry, and Schwalbach (1991) on German manufacturing industries. They found substantial variations in entry and exit rates across industries and that entry and exit rates tend to be correlated across industries. They also found that entrants and exits are small in terms of both number and market share, and entrants are less likely to be successful. The entry and exit flows are positively correlated, and are described as a revolving door at the bottom of the industry size distribution (for a general discussion, see Caves (1998)).

In fact, the research on industrial dynamics has generalised the following stylised facts:

- Both entry and exits are common; they are large in number but small in size (Dunne, 1988; Schwalbach, 1991; Geroski, 1995)
- Exit and entry rates are highly positively correlated (Shapiro, 1987), which indicates that entry and exit are part of a process of change in which a large number of new firms displace a large number of older firms.
- High rates of entry are often associated with high rates of innovation and increases in efficiency.
- The exit rates of new entrants tend to be high (Dunne, 1988, Geroski, 1991), and it takes a long time for successful entrants to achieve a size comparable to the average incumbent.
- The entry barriers, which also impede exit, tend to be high (Shapiro, 1987; Geroski, 1991; Sutton, 1991).
- Firms' exit rate is closely related to both firms' size and age (Audretsch, 1995).
- Entry survival rate varies considerably across industries, however most of the total variation in entry across industries and over time is within industry variation rather than between industry variation (Geroski, 1995; Audretsch, 1995; Dunne, 1988).

As the formerly centrally planned economies are transforming into market economies, the creation, survival and growth of the newly established firms, and

the downsizing and exit of the traditionally large, dominant state-owned firms are vital to the success of this transition process. It is also central to the long-term health of those economies. However, all the above studies are conducted in advanced economies, such as US, UK, Germany, Japan, etc. They all assume that firms are profit maximizing and respond in the same way to the same market signal, apart from the difference caused by their scale advantage or disadvantage. They also assume the environment in which firms operate is homogeneous. These assumptions might be quite appropriate in advanced economies, but are not appropriate for economies in the transition, where the new market economic institutions are still in the making, and the old central planning legacies remain. For example, in Russia, "the most productive companies not only can't make a buck, but are being driven out of business by government-subsidized productivity laggards" (Lewis, 1999). But, at least to my knowledge, no such studies have been conducted in the transition economies.

3. Entry and Exit in the Electrical Engineering Sector of Liao Ning Province, China

Using firm level data from the Chinese electrical engineering sector of Liao Ning Province, this section observes some measurable characteristics of the processes of entry, exit and growth in this representative industrial sector, and examines how they have changed with the pace of reform.

3.1 Rationale for Considering Electrical Engineering Industry

The data set we use in this paper covers an almost complete sample of Chinese firms in electrical engineering industry from a Northern China Province, Liao Ning, over the ten-year period from 1987 to 1996. Liao Ning province used to be the centre of China's Manufacturing Industry, and is the area where the central planning system was most deeply rooted. Of its 14 cities, there are 5 coastal cities, and one of them, DaLian, was one of the earliest cities that opened up to the outside world. Moreover, other aspects of reform has made a clear impact: China's first shareholding company is set up in this province, and China's first case of bankruptcy happened here, within the electrical engineering industry in fact. Moreover, the reform process led to the fragmentation of the domestic market (Young, 2000; Branstetter and Feenstra, 1999), therefore the enterprises reform in this province, especially the reform of state-owned enterprises, is arguably representative of the enterprise reform in China. Electrical engineering industry accounted for about 5% of the province's gross industry output, and it accounted for about 5-6% of the gross output of Chinese

electrical engineering industry. This data set contains 3,992 firms, of which 1996 firms exited in the 10-year period.

Electrical engineering industry is the sector where traditionally the SOEs dominated, and currently the new entry of non-SOEs is relatively easy, therefore the selection of this sector is to some extent representative of the current reform situation, with a clear probability that competition has worked over the reform period. Some simple statistics of the dataset are shown in Table 1.

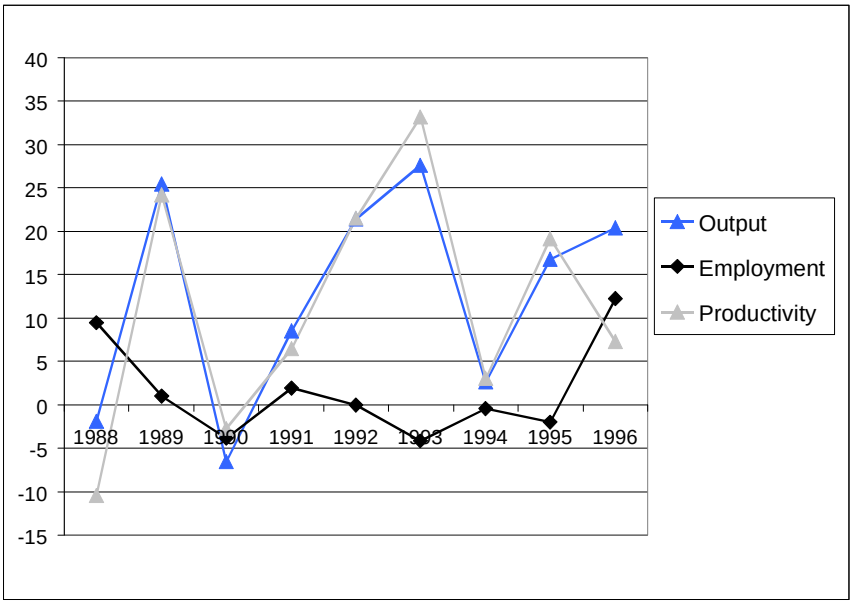
Table 1. *Numbers of Enterprises in Electrical Engineering Industry, Liao Ning Province (1987-1996)*

	Total	By Size			By Ownership			
		Large	Medium	Small	SOEs	COEs	Foreign	Others
1987	1092	17	23	1052	134	944	0	14
1988	1170	19	26	1125	138	1021	1	10
1989	1246	22	28	1196	149	1087	2	8
1990	1309	22	29	1258	168	1130	3	8
1991	1292	26	33	1233	164	1116	6	6
1992	1418	24	41	1353	183	1210	16	9
1993	1514	26	49	1439	169	1285	36	24
1994	1335	28	43	1264	130	1117	42	46
1995	1334	31	43	1260	129	1132	60	13
1996	1632	32	51	1549	168	1343	74	47

Notes:
SOE: State Owned Enterprises;
COEs: Collectivelly Owned Enterprises
Foreign: Foreign Owned or Foreign Invested Firms
Others: enterprise other than the above three groups, mainly includes domestic private firms (including shareholding companies) and state and/or collective and private cooperative firms.

Over the ten-year period, the number of firms increased by 540 units; 500 of them are small firms, and 400 of them are COEs. Foreign invested firms, including joint ventures and foreign investor-owned firms, increased from 0 in 1987 to 74 in 1996. And the growth of both gross industrial output and labour productivity has been positive except in 1988 and 1990 (see Figure 1); the employment in this sector has declined from its peak of 268 thousands in 1989 to 245 thousands in 1995, but in 1996 it increased again to the level of 1989.

Figure 1. Growth Rate of Output, Employment and Productivity



3.2 Firm's Efficiency: A DEA (Data Envelopment Analysis) Analysis

In order to estimate whether firms' efficiency has been improved as the result of economic reform, we quantify firms' efficiency by applying the Data Envelopment Analysis (DEA).

DEA is the most frequently used mathematical programming approach, proposed by Charnes, Cooper and Rhodes (1978), involving the use of linear programming methods to construct a non-parametric piece-wise surface (or frontier) over the data, and against which the efficiency is measured.

The basic DEA frontier model is described as follows:

$$\max_{u,v} \frac{u^T y_i}{v^T x_i}$$

subject to:

$$\frac{u^T y_j}{v^T x_j} \le 1 \qquad j = 1,2,...,i,...n$$

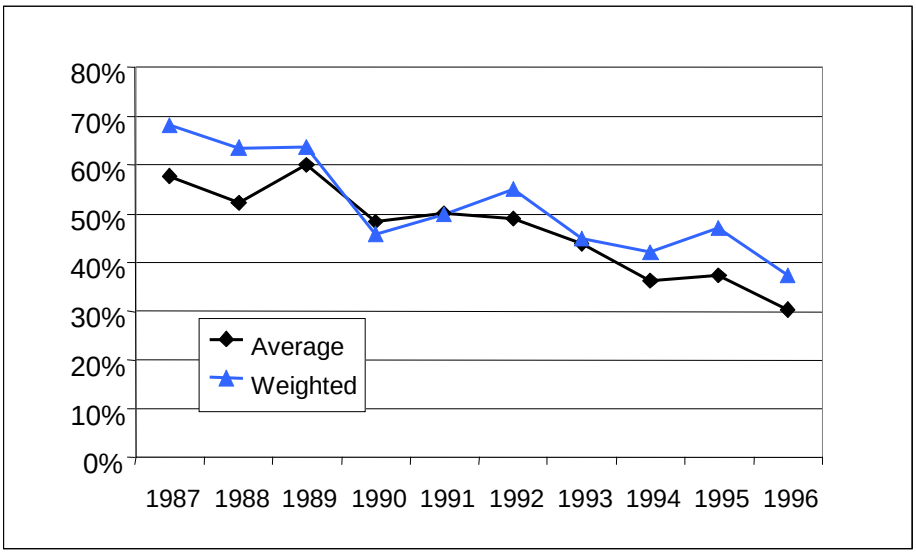
$$u, v \ge 0$$

where (x_i, y_i) is the input-output vector to be evaluated, and (x_j, y_j) is the input output vector of the j th production unit in the sample. The idea of this model is to estimate a set of non-negative weights that maximize the ratio of weighted

output-to-input ratio for the producer being evaluated. This ratio reflects how far the observed input-output vector is away from the production frontier.

By applying DEA techniques, firms' efficiency index is estimated for the 10-year period, and average and output-weighted average efficiency indexes are shown in Figure 2, which displays a tendency of divergence in firms' efficiency over time.

Figure 2. Average Efficiency Index in Electrical Engineering Industry in Liao Ning Province



3.3 The Contribution of Different Types of Firms to Output Growth

This section first considers some simple decompositions of output change by firm size, and by firms' ownership. It then looks into the contribution of young firms, defined as less than 5 years of age.

Figure 3a depicts how various size classes contributed to output growth over the period 1987-1996. Two sub-periods are considered, corresponding to periods before and after the most recent set of reforms. Note that the contribution of small enterprises, while considerable, actually falls somewhat between the two sub-periods. This might indicate that successful small firms survive and develop into medium-sized firms. In fact, we do observe a relatively bigger contribution of medium firms in the second period.

Figure 3a. Contributions to Output Growth by Firm Size

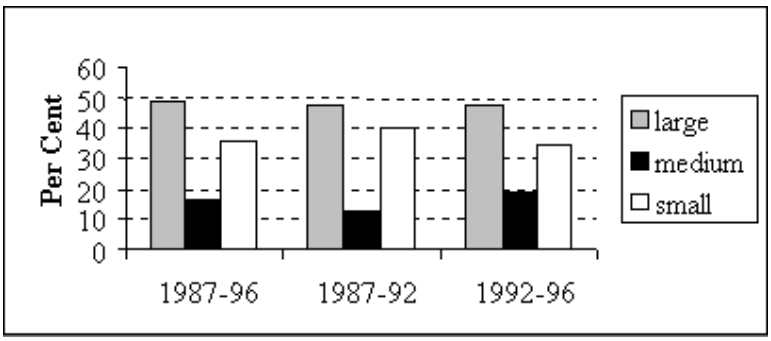


Figure 3b examines the contribution of output growth by ownership type. The main point to note is that there was a big fall in the contribution of SOEs. This is mainly accounted for by the sharp rise in the contribution of foreign related ownership including investment from Hong Kong, Macau and Taiwan in the most recent period.

Figure 3b. Contributions to Output Growth by Ownership Type

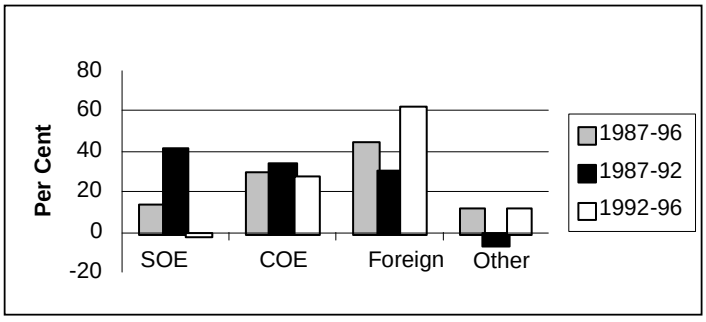
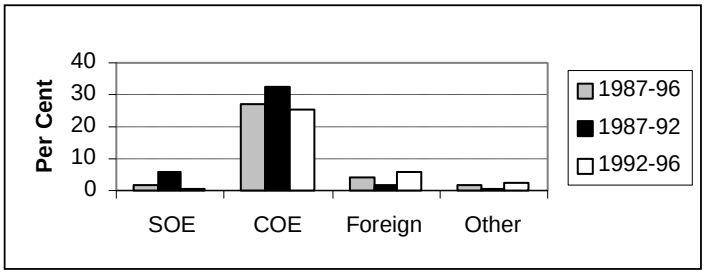


Figure 3c focuses on the small firms themselves. Small firms' main activity is mainly concentrated among Collectively Owned Enterprises (COEs), although foreign firm participation and other types have latterly become much more significant.

Figure 3c. The Contribution of Small Enterprises to Output Growth by Ownership Type



Now, let us turn to the contribution of young firms. For the period between 1987 and 1996, firms under 5 years old accounted for around a third of the number of firms, yet less than 13% of employment. The larger contribution of younger firms, in terms of number of firms, indicates that those firms are usually small ones. They accounted for only around 10% of total employment and output, but their contributions seem to have been increasing since 1992. Compared with the average, they are more productive but less efficient.

Table 2. *Performance of Young Firms (Age <5)*

%	Share of Firm Number	Share of Employment	Share of Output	Labour Productivity Relative to Average	Efficiency Relative to Average
1987	39.8	10.5	8.1	77.0	96.4
1988	33.7	7.4	7.6	101.7	100.8
1989	30.2	6.3	6.2	98.9	99.8
1990	29.3	5.6	7.1	127.8	88.0
1991	26.3	6.3	9.8	157.5	88.6
1992	26.4	5.0	6.6	132.3	89.1
1993	33.3	8.9	11.2	125.6	98.6
1994	35.0	11.1	15.6	140.4	103.0
1995	23.3	8.2	15.7	191.7	95.2
1996	33.9	12.9	17.9	138.5	98.8

The importance of young firms can be compared with the evidence from other countries. Aw et al. (1997) report that in nine manufacturing industries in Taiwan one to five-year old firms account for approximately two-thirds of the number of firms in operation and between one-third and one-half of each industry's production in 1991. Roberts (1996) finds that the combined market share of one to five-year old plants varies between 18.3 and 20.8 per cent, depending on the year for Colombian manufacturing plants. While for Chile, Tybout (1996) finds that one to five-year old plants account for 15.0 to 15.7 percent of manufacturing output. For US manufacturing firms, Dunne, Roberts, and Samuelson (1988) find the market share of one to five-year old firms varies from 13.6 to 18.5, depending on the year. Hahn (2000) finds, in the context of Korean Manufacturing industry, that one to five-year old plants accounted for around 40% of the plant number, and 15% of output during the period between 1995 and 1998. Thus, the importance of new firms in China seems to be less pronounced than that in both advanced economies and newly developed economies, such as Taiwan and Korea.

3.4 The Pattern of Entry and Exit of Different Types of Firms

Utilizing the longitudinal aspect of our data set, we can define surviving firms, entrants, and exiting firms. Here we adopted the definition of surviving firms, entrants, and exiting firm by Dunne et al. (1988). For the period between year $t-k$ and year t, an entrant is defined as the firm that appears in the last year (t), but not in the first year ($t-k$), an exit is defined as the firm that appears in the first year ($t-k$), but not in the last year (t). A surviving firm is defined as the one that appears both in the first year ($t-k$) and the last year (t) of the period. Under such definitions, all firms that entered before the last year of the given period are regarded as entrants and all firms that exited after the first year are regarded as exitors. We define the following variables:

$NE(t)$ = number of firms that enter the industry between years $t-k$ and t;
$NT(t)$ = total number of firms in the industry in the year t.
$NX(t-k)$ = number of firms that exits the industry between years $t-k$ and t
$QE(t)$ = total output of firms that enter the industry between years $t-k$ and t
$QT(t)$ = total output of all firms in the industry in year t
$QX(t)$ = total year $t-k$ output of firms that exit the industry between years $t-k$ and t

The entry and exit rate for the industry between years $t-k$ and t are thus defined as:

$$ER(t) = NE(t)/NT(t-k)$$
$$XR(t-k) = NX(t-k)/NT(t-k)$$

where $ER(t)$ is entry rate and $XR(t-k)$ is exit rate between years $t-k$ and t.

In order to look at the contributions of new entrants and exits to industry output, we define the market shares of firms that enter or exit between the years $t-k$ and t as:

$$ESH(t) = QE(t)/QT(t)$$
$$XSH(t-k) = QX(t-k)/QT(t-k)$$

where $ESH(t)$ is the market share of new entries and $XSH(t-k)$ is the market share of exiting firms.

The entry of new firms in China takes various forms, such as the entry of both domestic private and foreign-owned firms, the entry of new COEs including TVEs (Township and Village Enterprises), and the entry of new SOEs. In

addition to these, some established firms might enter the electrical engineering sector by switching from other manufacturing sectors; however as we focus on this single electrical engineering industry, we do not distinguish between the switches and the new entries. The number of new entries and the entry rates in each year are presented in Table 3.

Table 3. *The Number of Entries in Electrical Engineering Industry from 1988-1996*

	Total Number of New Entries	Share of New Entries (%)			
		Small Firms	SOEs	COEs	Others
1988	195	99.5	3.1	95.9	0
1989	205	99.5	6.3	93.2	0.5
1990	213	99.5	10.8	88.7	0.5
1991	170	99.4	8.8	90.0	1.2
1992	333	99.7	8.7	89.2	2.1
1993	536	98.3	5.2	89.0	5.8
1994	320	98.4	3.4	83.1	13.4
1995	472	97.7	5.9	87.3	6.8
1996	634	97.8	9.8	81.5	8.7

Most of the new entries are small firms and COEs, accounting for more than 97%, and 80% of new entries respectively.

Table 4. *The Entry Rate (%) in Electrical Engineering Industry, 1988-1996*

	Total	Small Firms	SOEs	COEs	Others
1988	16.0	17.2	4.5	19.8	0.0
1989	16.5	17.1	9.4	18.7	10.0
1990	16.3	16.9	15.4	17.4	9.1
1991	13.2	13.7	8.9	13.5	16.7
1992	23.5	24.5	17.7	26.6	28.0
1993	35.4	36.6	15.3	39.4	51.7
1994	24.0	24.9	6.5	20.7	48.9
1995	35.4	36.6	21.5	36.9	45.7
1996	38.8	40.0	36.9	38.5	45.5

Firms in this dataset have shown an increasing entry rate after 1992. For example, between 1988 and 1991, the entry rate ranges between 13.2% and 16.7%; and between 1992 and 1996, the entry rate ranges between 23.5% and 38.8%. The entry of non-public ownership (Others) is the most significant after 1992, ranging between 28% and 51.7%.

There are many reasons for firms to exit this particular electrical engineering sector as well. First, the owner(s), either government department in terms of SOEs, the community in terms of COEs or privates in terms of both foreign and domestic private-owned enterprises, may decide to close down an under-performing enterprise. Second, firms exit due to merger and acquisition. The bureaucratic overhead of the enterprises may decide to merge a poor-performing enterprise with a successful one, aiming to save poor performing enterprise from bankruptcy. The mergers may also happen voluntarily without the interference of the government. A third reason is the change of ownership, which takes various forms: such as joint ventures where foreign capital dominates, firms being sold out to the public, firms being sold out to individuals, and firms being sold out to employees and management. The fourth reason is that firms switch to another manufacturing industry. The number of exits and the exit rate in each year for the period between 1988 and 1996 are presented in Tables 5 and 6.

Table 5. *The Number of Exits in Electronic Engineering Industry from 1988-1996*

	Total Number of Exits	Share of Exits (%)			
		Small Firms	SOEs	COEs	Others
1988	117	99.1	5.1	94.0	0
1989	134	100.0	2.2	97.8	0
1990	150	100.0	6.7	93.3	0
1991	187	99.5	11.8	88.2	0
1992	207	100.0	5.3	94.7	0
1993	450	99.1	9.3	89.6	1.1
1994	502	98.2	9.0	88.0	3.0
1995	329	98.8	5.8	84.5	8.5
1996	343	97.4	7.6	87.5	5.0

Again most of the exits are small firms and COEs, accounting for more than 97% and 84% of exits respectively.

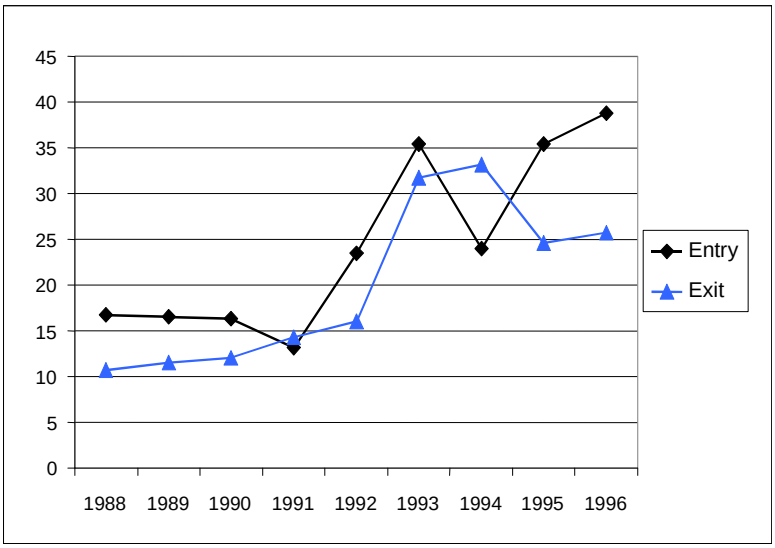
Table 6. *The Exit Rate (%) in Electronic Engineering Industry, 1988-1996*

	Total	Small Firms	SOEs	COEs	Others
1988	10.7	11.0	4.5	11.7	0.0
1989	11.5	11.9	2.2	12.8	0.0
1990	12.0	12.5	6.7	12.9	0.0
1991	14.3	14.8	13.1	14.6	0.0
1992	16.0	16.8	6.7	17.6	0.0
1993	31.7	33.0	23.0	33.3	20.0
1994	33.2	34.3	26.6	34.4	25.0
1995	24.6	25.7	14.6	24.9	31.8
1996	25.7	26.5	20.2	26.5	24.3

Similarly, we also observe an increasing exit rate after 1992. In 1988, only 10.7% of firms exited, but in 1994 around a third of the firms exited. The firm exit rate among new entries is even higher than the exit rate among all firms, which will be discussed in the following section. However, the pace of exit among SOEs is 6%-11% below that of the population average, except in 1991.

As that in developed economies, the entry rate and exit rate seem to be highly correlated. However, entry rates are higher than exit rates in general. This is consistent with the growing feature of the electrical engineering sector and the whole Chinese economy. The fact that the paces of both entry and exit have accelerated since 1992 corresponds to the positive effects of the accelerating pace of economic reform since 1992.

Figure 4. Entry and Exit Rates Between 1988 and 1996 (%)



In order to quantify the contribution of entrants and exits to output growth, we conduct some simple decompositions of output change by firm types and in terms of survivorship. The results are shown in Figure 4, which shows the contribution of entry, exit, and surviving firms to the growth of output for the whole period and the two sub-periods.

Figure 5a suggests that there was a big increase in the importance of "churning" of enterprises between the two sub-periods with both the positive contribution of entry and the negative contribution of "exit" increasing substantially. Indeed, in the period since the reforms, the net impact of entry and exit is clearly more important than the growth of surviving firms.

Figure 5a. The Contributions of Entry, Exit and Survival to Output Growth

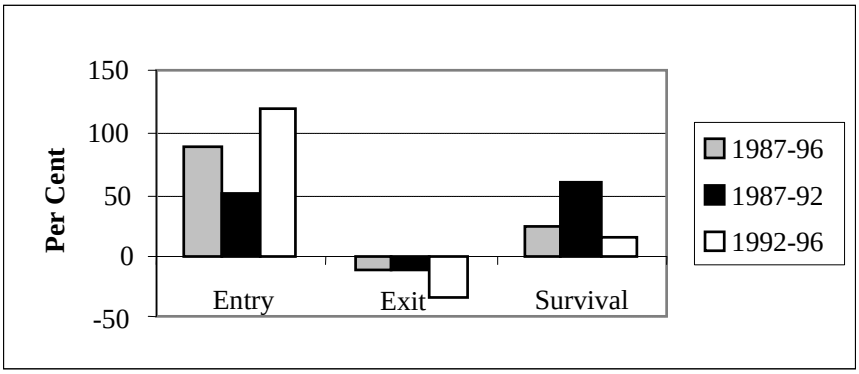
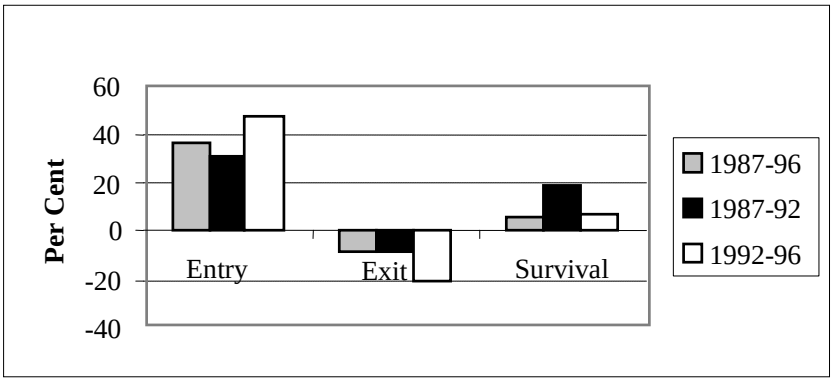


Figure 5b concentrates on the small firm sector. It shows that a similar phenomenon was also occurring here, with big increases in the role of both entry and exit.

Figure 5b. The Contribution of Entry, Exit and Survival Among Small Firms



3.5 Productivity and Efficiency Differential among Entering, Exiting and Continuing Firms

In order to identify the relationship between firm productivity, firm efficiency and firm turnover patterns, we compare efficiency and productivity levels of continuing firms, entrants, and exiting plants at the time of entry and exit. Table 7 shows the relative productivity and efficiency levels of entrants, survival and exit firms (relative to the productivity and efficiency levels of all firms) in electrical engineering industry at a given year.

Table 7. *Average Productivity and Efficiency Index of Entrants, Exits and Survival Firms Relative to Population Average (%)*

	Entry		Exit		Survival	
	Labour Productivity	Efficiency	Labour Productivity	Efficiency	Labour Productivity	Efficiency
1987			65.8	98.4	100.7	100.0
1988	50.3	105.8	51.1	103.7	101.1	99.7
1989	112.8	105.6	55.5	96.6	101.7	100.4
1990	56.0	101.6	45.2	98.1	102.2	100.4
1991	90.8	100.9	46.0	93.1	104.5	101.1
1992	59.8	101.2	74.7	99.6	103.2	87.3
1993	87.5	105.9	61.4	97.2	110.4	101.3
1994	110.8	105.6	83.5	99.8	103.3	100.6
1995	102.2	99.6	79.0	94.0	102.5	101.7
1996	81.2	101.7				

The main features of Table 7 are summarized as follows. First, exitors in a given year are, on average, less productive and less efficient than both continuing firms and new entries in that year. Exitors are generally more than 20% less productive than continuing firms. This result is consistent with the prediction by models of firm heterogeneity that market selection forces sort out low-productivity plants from high-productivity firms. Second, new entries are on average less productive than continuing firms in the first year they are observed except in 1989, 1994 and 1995; however, of all the new entries in these three years, only around 10% of them have above average labour productivity. New entries are the most efficient. Initial low productivity of new firms relative to continuing firms is not consistent with the presence of the simple vintage effect that new firms are more productive than older firms. However, it is not necessarily contradictory to the prediction of several recent models of firm dynamics, such as Jovanovic (1982) and Hopenhayn (1992). Potential entrants who are uncertain about their productivity but hold a positive outlook on their post-entry productivity performance - i.e. who expect they

could catch up with the incumbents in terms of productivity sooner or later - might enter despite their initially low productivity. Of course, new firms themselves are also heterogeneous in terms of productivity, as will be discussed later. Initial low productivity of new firms relative to incumbents is also documented by other studies, such as Aw et al. (1997)[1] for Taiwanese manufacturing industries, and Foster et al. (1998)[2] for US manufacturing industry.

Also from the Table 7 we can see that the productivity gap between new entries and continuing firms tends to become narrow. This fact on one hand conforms well with the presumption of recent R&D-based endogenous growth models, such as Grossman and Helpman (1991), that potential entrants receive externality from previous innovation. On the other hand, it reflects the fact that many new entrants are actually privatised continuing firms.

The above discussion suggests that observed patterns of firm turnovers in the electrical engineering sector reflect the underlying productivity and efficiency differential, indicating the functioning of the competitive selection process within China. Lower productivity and efficiency of exitors relative to continuing firms and new firms is consistent with the prediction of theoretical models. Yet, the relative lower productivity of new entries relative to continuing firms casts doubt on the aggregate productivity gain from new entries.

4. Market Selection Process: Longitudinal Performance of Surviving and Exiting Firms

In this section, we examine whether the market selection forces have in fact sought out low productivity and inefficient firms among new entrants, and promote the growth of successful new entrants. By focusing on the behaviour of both entry cohorts and exit cohorts, we first examine the post entry performance of survival firms, secondly we examine the pre-exit performance of exiting firms, and finally we examine the performance of survival firms.

4.1 Post Entry Performance of Survival Firms

In our sample, there are nine cohorts of new firms according to birth years, 1988 to 1996. Focusing on a particular birth-year cohort has the advantage that possible age effects and reform effects on survival are controlled for. Table 8 presents the market shares, average sizes of surviving firms, relative labour productivity and efficiency, and failure rate for each entry cohort in each year.

Table 8. *Market Shares, Average Firm Sizes, Productivity and Exit Rates of Entry Cohorts*

Market Shares[3] (%)									
	1988	1989	1990	1991	1992	1993	1994	1995	1996
≤1987	95.9	92.4	89.4	86.5	80.2	69.4	59.2	46.5	36.4
1988 Entry	4.1	3.4	3.5	2.9	2.9	1.6	1.4	1.0	1.1
1989 Entry		4.3	5.2	6.5	6.8	7.4	8.9	9.5	7.2
1990 Entry			1.8	1.7	2.2	1.6	1.5	0.8	0.7
1991 Entry				2.6	3.4	2.3	2.1	1.8	2.2
1992 Entry					7.2	6.5	5.2	4.3	1.7
1993 Entry						13.2	12.0	11.5	15.5
1994 Entry							11.4	8.2	11.0
1995 Entry								17.6	20.6
1996 Entry									14.7
Average Size[4] of Surviving Firms Relative to All Firms in the Industry (%)									
	1988	1989	1990	1991	1992	1993	1994	1995	1996
≤1987	107.8	125.4	139.7	146.2	150.1	185.9	205.5	232.6	290.4
1988 Entry	49.4	46.7	55.2	52.5	74.1	95.2	69.0	76.5	110.6
1989 Entry		23.0	28.3	39.2	46.8	34.5	109.3	145.8	194.3
1990 Entry			20.0	21.3	28.0	30.1	30.2	32.7	32.5
1991 Entry				21.7	30.2	46.8	51.7	46.0	50.3
1992 Entry					51.1	65.5	74.4	84.5	87.9
1993 Entry						42.7	39.1	44.6	66.3
1994 Entry							42.8	40.3	59.0
1995 Entry								48.8	62.0
1996 Entry									70.3
Average Labour Productivity Relative to All Firms in the Industry (%)									
	1988	1989	1990	1991	1992	1993	1994	1995	1996
≤1987	104.5	101.7	101.1	99.9	101.8	99.2	89.4	76.9	69.4
1988 Entry	50.3	61.7	69.3	64.1	54.7	41.5	64.1	56.0	54.8
1989 Entry		112.8	152.7	175.3	171.2	227.6	222.0	222.9	186.4
1990 Entry			56.0	65.2	84.7	102.0	129.1	97.8	110.1
1991 Entry				90.8	118.3	89.6	88.2	124.8	181.7
1992 Entry					59.8	73.6	62.2	64.3	64.5
1993 Entry						87.5	134.6	199.5	222.2
1994 Entry							110.8	180.2	245.0
1995 Entry								102.2	132.6
1996 Entry									81.2

Table 8. *Market Shares, Average Firm Sizes, Productivity and Exit Rates of Entry Cohorts (continued)*

Average Efficiency Index Relative to all Firms in the Industry (%)									
	1988	1989	1990	1991	1992	1993	1994	1995	1996
≤1987	99.0	97.4	98.3	96.8	96.6	95.2	91.3	89.3	85.9
1988 Entry	105.8	109.8	107.2	107.1	106.1	103.6	94.8	100.1	90.9
1989 Entry		105.6	102.6	99.9	99.4	92.7	98.2	89.4	99.4
1990 Entry			101.6	113.1	110.6	99.5	135.3	95.8	109.0
1991 Entry				100.9	104.9	102.7	103.4	80.8	94.8
1992 Entry					101.2	100.9	92.1	95.0	83.6
1993 Entry						105.9	107.3	133.8	105.4
1994 Entry							105.6	94.2	110.6
1995 Entry								99.6	108.0
1996 Entry									101.7
Entry Cohort Exit Rates (%)									
	1988	1989	1990	1991	1992	1993	1994	1995	1996
≤1987	10.7	7.5	8.2	7.6	2.7	24.5	24.6	19.1	15.5
1988 Entry		25.1	17.1	6.6	11.5	40.0	31.7	24.4	6.5
1989 Entry			22.4	23.3	0.8	37.2	35.5	20.4	30.8
1990 Entry				25.8	17.7	40.0	34.6	35.3	24.2
1991 Entry					20.6	37.8	28.6	31.7	19.5
1992 Entry						39.0	26.6	29.5	29.5
1993 Entry							43.3	43.1	17.3
1994 Entry								53.1	31.3
1995 Entry									28.2

From the above table we should note the significant role played by firms set up before 1987; in 1992 these firms account for 80% of the gross industry output, and by 1996 they still account for more than a third of the gross industrial output. In fact, it is only since 1995 that the contribution of these firms reduced to less than 50%. This suggests that firms set up before 1987 have been an important stabilizing factor in Chinese economy, at least in Chinese manufacturing industries.

Another feature is that the market share of each entry cohort following entry tends to decline as the cohort ages, on average. For example, the market share of 1988 entry cohort is 4.1% in 1988, but this figure is only 1.1% in 1996. This decline in market share is the result of two processes: the change in the size of surviving firms in the cohort, and the exit of firms from this cohort. In order to examine the former, we summarize the average size of the surviving firms. The average firm size within each cohort increases relative to the industry average as the cohort ages. For example, the average size of 1988 entry cohort is only

49.4% of industry average in 1988; by 1996 it is 10.6% bigger than the industry average. So survivors have grown and gained in size relative to incumbent firms in the competitive selection process.

The third feature to be noted is that each entry cohort shows very rapid productivity improvement following entry, and catches up with continuing firms in productivity level after several years. For example, the productivity disadvantage of 1988 entry cohort relative to1987 survival cohort is about 50%; by 1996 this figure narrows to 20%. And for some other entry cohorts, their productivity even surpasses that of 1987 survival cohort in 1996. Thus, the results are supportive of the presence of rapid learning by surviving members of births, especially during the first several years after entry.

In terms of efficiency, on average, entry cohort tends to be more efficient than 1987 survival cohort. However, the efficiency of entry cohorts tends to decrease as entry cohorts age, which is probably due to the entry of newer firms, and newer technologies. Entry cohort tends to have a higher failure rate in the first few years after entry, and the failure rates for all entry cohorts increased since 1993.

4.2 Pre-exit Performance of Exit Firms

In this section, we examine the pre-exit performance of exit firms in order to understand another dynamic aspect of the market selection process: exit. Table 9 presents the average performance (productivity, efficiency and firm size) for each exit cohort in each year before their exits.

Table 9 shows clearly that, for each exit cohort reported here, exiting firms are both less productive and less efficient than surviving firms at the time of exit, and they are much smaller in firm size. In fact, the performance differences between exiting firms and surviving firms are highly significant. For example, the surviving firms are 50% to 100% more productive than exitors depending on exit year. And average firm size of surviving firms is between 1.5 and 5 times bigger than that of exitors depending on exit year. Thus, the results strengthen the conclusion we drew earlier that markets sort out firms on the basis of productivity.

Moreover, the productivity differences occur not just at the time of exit, in fact these differences exist for years before exit. This suggests that firm exits reflect underlying productivity differences that have existed for quite a period of time. For example, for 1996 exit cohort, the productivity disadvantage relative to the surviving group is about 25 per cent in 1995. However, the productivity

differential goes back as early as 1990, when the productivity disadvantage was already 10 per cent. Similar results hold for other death cohorts. Thus, firms' exit seems to reflect not only point-in-time productivity disadvantage around exit but also persistent bad productivity performance.

Table 9. *Productivity, Efficiency and Firm Size of Exit Cohorts By Year*

Average Labour Productivity Pre-Exit Relative to All Firms(%)									
	1987	1988	1989	1990	1991	1992	1993	1994	1995
1988 Exit	65.8								
1989 Exit	39.9	51.1							
1990 Exit	43.6	65.1	45.0						
1991 Exit	57.3	67.3	49.5	45.2					
1992 Exit	43.4	52.4	37.7	36.4	46.0				
1993 Exit	42.3	57.8	42.3	63.9	70.5	74.7			
1994 Exit	59.8	61.8	38.0	62.5	58.1	65.8	61.4		
1995 Exit	96.4	154.1	122.9	78.4	71.1	80.2	80.2	83.5	
1996 Exit	149.1	114.5	82.0	112.7	97.4	83.8	95.4	97.3	79.0
Survivor[5]	126.4	116.8	82.0	124.1	121.6	115.7	116.0	104.6	102.5
Average Efficiency Index Pre-Exit Relative to all Firms (%)									
	1987	1988	1989	1990	1991	1992	1993	1994	1995
1988 Exit	98.4								
1989 Exit	105.7	103.7							
1990 Exit	99.0	99.7	94.0						
1991 Exit	101.3	96.9	99.6	98.1					
1992 Exit	96.9	94.0	95.6	96.7	93.1				
1993 Exit	101.7	102.4	100.8	105.0	101.6	99.6			
1994 Exit	92.9	91.5	93.2	97.4	96.2	96.5	97.2		
1995 Exit	99.3	101.4	96.8	98.5	103.7	99.4	101.3	99.8	
1996 Exit	97.9	97.6	98.0	98.2	101.6	98.9	104.7	106.3	94.0
Survivor	103.4	105.4	98.0	101.8	103.0	103.1	100.9	99.2	101.7
Average Firm Size of Pre-Exit Relative to All Firms (%)									
	1987	1988	1989	1990	1991	1992	1993	1994	1995
1988 Exit	35.6								
1989 Exit	23.9	18.6							
1990 Exit	44.5	34.2	30.9						
1991 Exit	35.2	34.3	30.9	26.5					
1992 Exit	87.3	67.5	64.4	63.5	40.0				
1993 Exit	46.4	51.1	47.2	39.2	38.9	35.9			
1994 Exit	76.4	77.8	85.2	73.3	64.8	68.8	63.4		
1995 Exit	74.7	75.2	75.6	70.7	69.2	64.8	50.3	71.5	
1996 Exit	81.0	95.3	86.3	82.8	82.9	83.7	66.9	51.8	47.0
Survivor	215.3	211.6	211.5	222.7	217.1	200.5	160.2	146.7	117.0

Another feature demonstrated by table 9 is that the relative size of the pre-exit firms tends to decrease compared with the average size of the whole sample as they come to the point of exit. For example, for the 1996 exit cohort, their average firm size is 81% of that of the industrial average in 1987, and by 1995, a year before their exits, their average size is only 47% of the population average. Similar patterns are found for other death-year cohorts as well.

4.3 Transition Matrix Analysis

Up until now, we have been examining firms' post-entry and pre-exit performance by focusing on the *average* productivity and efficiency differentials among various entry and exit cohorts. In this section, we focus on the long run performance of survival firms by analysing the movement of firms across productivity and efficiency distribution over time. One way of summarizing the above features of our data, and complement our previous analysis, is to rely on transition matrix analysis. Following Baily et al. (1992), we set up transition matrices for two time intervals, 1987-1992 and 1992-1996. In order to do this, the efficiency score and labour productivity of surviving firms within the industry are compared to the industrial average in the beginning and end years of each period, and firms are divided accordingly into 5 quintiles.

For example, in terms of productivity, firms are divided according to the following:

Quintile 1: $(P_{it} - \overline{P}) / \overline{P} \geq 60\%$
Quintile 2: $60\% > (P_{it} - \overline{P}) / \overline{P} \geq 20\%$
Quintile 3: $20\% > (P_{it} - \overline{P}) / \overline{P} \geq -20\%$
Quintile 4: $-20\% > (P_{it} - \overline{P}) / \overline{P} \geq -60\%$
Quintile 5: $-60\% > (P_{it} - \overline{P}) / \overline{P}$

Then, for each quintile in 1987 and 1992, we calculate what fractions of those firms are in each quintile in 1992 and 1995 respectively, and what fractions have exited. The transition matrix for productivity and efficiency for each period are shown in Table 10.

Table 10. *Transition Matrix of Survival Firms*

Relative Productivity Rankings (1987-1992)											
	1992										
	Number of Firms							Share (%)			
1987	1	2	3	4	5	Exit	Total	Up	Stable	Down	Exit
1	46	14	24	14	13	10	121	0.0	38.0	53.7	8.3
2	11	14	16	14	10	11	76	14.5	18.4	52.6	14.5
3	16	17	33	61	25	40	192	17.2	17.2	44.8	20.8
4	14	9	39	95	66	83	306	20.3	31.0	21.6	27.1
5	6	5	9	30	49	166	265	18.9	18.5	0.0	62.6
Total	93	59	121	214	163	310	960	16.3	24.7	26.8	32.3

Relative Productivity Rankings (1992-1996)											
	1996										
	Number of Firms							Share (%)			
1992	1	2	3	4	5	Exit	Total	Up	Stable	Down	Exit
1	22	4	17	26	16	66	151	0.0	14.6	41.7	43.7
2	5	1	10	13	19	51	99	5.1	1.0	42.4	51.5
3	6	1	6	24	54	90	181	3.9	3.3	43.1	49.7
4	2	3	3	16	95	262	381	2.1	4.2	24.9	68.8
5	2	2	3	5	68	333	413	2.9	16.5	0.0	80.6
Total	37	11	39	84	252	802	1225	2.6	9.2	22.7	65.5

Relative Efficiency Rankings (1992-1996)											
	1996										
	Number of Firms							Share (%)			
1992	1	2	3	4	5	Exit	Total	Up	Stable	Down	Exit
1	1	3	7	1	0	28	40	0.0	2.5	27.5	70.0
2	3	12	56	19	2	113	205	1.5	5.9	37.6	55.1
3	10	23	97	86	14	429	659	5.0	14.7	15.2	65.1
4	1	3	21	36	19	195	275	9.1	13.1	6.9	70.9
5	0	0	3	3	0	11	17	35.3	0.0	0.0	64.7
Total	61	58	101	88	120	776	1204	5.6	12.1	17.9	64.5

Starting from the first row of table 10, of the firms that were in the top quintile in 1987, about 38 percent of them were again in the top quintile in 1992, and 53.7% of firms experienced downward movement in relative productivity ranking, of which only 19% of firms moved down to the bottom two quintiles in 1992. Among the firms that were in the second quintile in 1987, 18.4 % of them stayed in the second quintile and 14.5% of them moved up to the first quintile in 1992, and again more than 50% of firms moved downwards in relative productivity rankings. In total 24.7% of firms moved upwards in relative

ranking, 26.8% stayed in the same quintile, and 26.8% of firms moved downwards.

The high percentage of upward and stable movements of firms (about 41% of firms moved upwards and stayed in the same quintile) indicate the persistence of productivity. As expected, the percentage of exits conditional on the 1987 productivity quintile gets higher as we go down the productivity quintiles. In the top quintile about 8.3 % of the firms exited within five years, while as much as 62.6 % exited in the bottom quintile during the same period. One interesting observation here is that there are many high productivity exits. For the period of 1992 to 1996, only less than 12% of firms moved upward or stayed in the same quintile, 22.7% of firms moved downward, and 65.5% of firms exited. The percentage of exits conditional on the 1992 productivity quintile becomes higher as well when we go down the productivity quintiles, but it is higher than that for the period between 1987 and 1992.

In term of efficiency ranking, for the period between 1987 and 1992, 13.9% of firms moved upwards in relative efficiency ranking, 33.5% of firms stay in the same quintile, and 20.5 % move downwards. And for the period between 1992 and 1996, only 5.6% of firms moved upwards, and 12.1% stayed in the same quintile. In terms of the percentage of firm exits conditional on the 1987 efficiency quintile, there is no significant difference among different quintiles. However, the percentage of firm exits conditional on 1992 efficiency quintile tends to get higher as we go down the efficiency quintiles.

5. Entry, Exit and Aggregate Productivity Growth

Superficially, the evidence from the above sections suggests a sharpening of the competitive process over the period under investigation. More correctly, however, establishing the result depends on both the hazard represented by exit, and the competitiveness of new entrants. In this section, we evaluate the competitiveness of the new entrants by examining the contributions of the entry and exit of firms, or more broadly, the resource reallocation among firms to aggregate productivity growth. We first examine the methods for productivity decomposition, and then we decompose the growth of labour productivity in the electrical engineering industry in Liao Ning province.

5.1 Productivity Decomposition Methods

There exist several alternative decomposition methods, and the decomposition results are sensitive to decomposition methods (see Foster et al. (1998),

Bartelsman and Doms (2000) Ahn (2001) for a general review). Aggregate productivity in a given sector is normally calculated as a weighted average of each individual firm's productivity in the sector. That is:

$$P_t = \sum_i \theta_{it} p_{it}$$

where P_t is an aggregate productivity measure (labour productivity or total factor productivity) for the sector at time t; θ_{it} is the share of firm i (employment share or output share) in the given sector at time t; and p_{it} is the productivity measure of an individual firm i at time t.

Aggregate productivity changes are generally decomposed into three components:

i) within-firm productivity changes in continuing firms;

ii) productivity changes resulting from changes in market shares of high-productivity firms and low-productivity firms; and

iii) productivity changes resulting from the process of entry and exit.

Baily et al. (1992) used the following decomposition:

$$\Delta \ln TFP_t = \sum_{i \in C} \theta_{it-k} \Delta \ln TFP_{it} + \sum_{i \in C} \ln TFP_{it} \Delta \theta_{it} + \sum_{i \in E} \theta_{it} \ln TFP_{it} - \sum_{i \in X} \theta_{it-k} \ln TFP_{it-k}$$

where θ_{it} is the output share of firm i in the given sector at time t; productivity growth ($\Delta \ln TFP_t$) is measured between the base year $t-k$ and the end year t; and C, E and X are sets of continuing, entering, and exiting firms, respectively.

A problem with the above decomposition method is that if the market share of the entrants is very low and if the market share of the exitors is very high, the net entry effect will be negative even when entrants are more productive than exitors (Haltiwanger, 1997). Furthermore, it doesn't account for the cleansing effect of the exiting which sort out the low productivity firms. To overcome these problems, Haltiwanger (1997) modified the above decomposition as follow:

$$\Delta P_t = \sum_{i\in C}\theta_{it-k}\Delta p_{it} + \sum_{i\in C}\Delta\theta_{it}(p_{it-k} - P_{t-k}) + \sum_{i\in C}\Delta\theta_{it}\Delta p_{it} + \sum_{i\in E}\theta_{it}(p_{it} - P_{t-k}) - \sum_{i\in X}\theta_{it-k}(p_{it-k} - P_{t-k})$$

where ΔP_t refers to aggregate productivity changes over the k-year interval between the first year $(t-k)$ and the last year (t); θ_{it} is the share of firm i in the given sector at time t; C, E, and X are sets of continuing, entering, and exiting firms, respectively; and P_{t-k} is the aggregate productivity level of the sector as of the first year $t-k$. Under this decomposition method, an entrant or exitor will contribute positively to productivity growth when it has higher or lower productivity than the initial industry average. The five components of the above decomposition are: the within-firm effect, the between-firm effect, the "cross effect", the entry effect and the exit effects.

Foster, Haltiwanger and Krizan (1998) suggested another version of decomposition, which is related to Haltiwanger (1997):

$$\Delta P_t = \sum_{i\in C}\overline{\theta_i}\Delta p_{it} + \sum_{i\in C}\Delta\theta_{it}(\overline{p_i} - \overline{P}) + \sum_{i\in E}\theta_{it}(p_{it} - \overline{P}) - \sum_{i\in X}\theta_{it-k}(p_{it-k} - \overline{P})$$

where a bar over a variable indicates the average of the variable over the base and end year. This method uses the time averages of the first and last years for $\overline{\theta_i}$, $\overline{P_i}$, and $\overline{P}$. As a result of this decomposition method, the cross-effect disappears.

5.2 Decomposition of Labour Productivity in Electrical Engineering Industry

As we have discussed the methods of productivity decomposition, here we turn to the decomposition of aggregate productivity growth in the context of electrical engineering industry in Liao Ning Province and we focus on labour productivity. Ideally we would want to examine total factor productivity, however we suspect that, within a specific sector, movements in labour productivity may represent a reasonable proxy for movements of total factor productivity. Moreover,

As we are more concerned about the contribution of new entries and exits to productivity growth than the contributions of survival firms, we simply decompose the productivity growth into the productivity growth from new entry, exitors and the survival firms, rather than decompose the contribution of survival firms into within-firm effect, between-firm effect, and the cross effect. We decompose the growth of labour productivity as follows:

$$\begin{aligned}\Delta P_t &= (\sum_{i\in C}\theta_{it}(p_{it}-\overline{P})-\sum_{i\in C}\theta_{it-k}(p_{it-k}-\overline{P})) \\ &\quad +\sum_{i\in E}\theta_{it}(p_{it}-\overline{P})-\sum_{i\in X}\theta_{it-k}(p_{it-k}-\overline{P})\end{aligned}$$

where $\sum_{i\in C}\theta_{it}(p_{it}-\overline{P})-\sum_{i\in C}\theta_{it-k}(p_{it-k}-\overline{P})$ represents the change of labour productivity attributed to survival firms, $\sum_{i\in E}\theta_{it}(p_{it}-\overline{P})$ represents the change of labour productivity attributed to new entry, and $\sum_{i\in X}\theta_{it-k}(p_{it-k}-\overline{P})$ represents the change of labour productivity due to firms' exit.

In practice, we divided the 10-year period between 1987 and 1996 into two sub-periods, 1987-1992 and 1992-1996. We first decompose the labour productivity growth for the two sub-periods, then decompose the labour productivity growth for the whole period between 1987 and 1996. The results of the decomposition are shown in Figures 6a and 6b.

Figure 6a. The Contribution of Entry, Exit, and Survival to Productivity Growth (all enterprises)

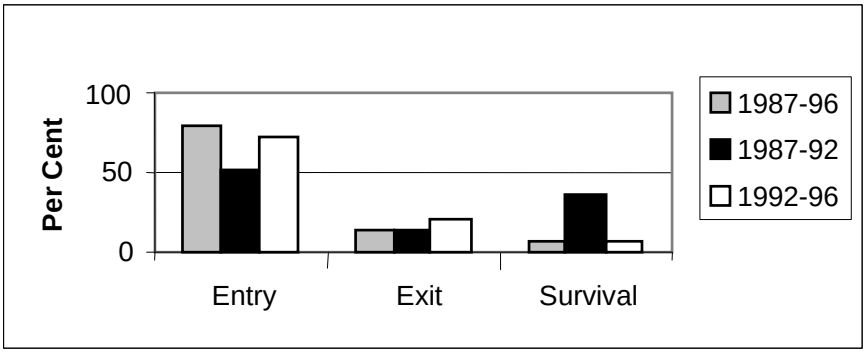


Figure 6b. The Contribution of Small Firms to Productivity Growth

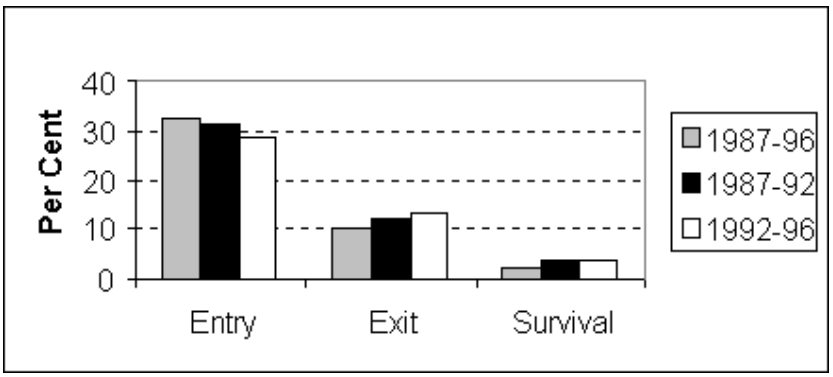


Figure 6a shows the contribution of entry, exit, and survival to the sector's productivity growth. It suggests that all three (on average) made positive contributions to productivity growth over both periods. However the major impact comes from entrants, with only a limited part played by survival and exits. Exits do appear to have increased their role a little over the sub-periods, but there is clearly no obvious impact on the contribution of survivors. Looking solely at the contribution of small enterprises to overall productivity growth, Figure 6b suggests that survival is even less important among small firms, while exit is considerably more important.

6. Conclusions

In this paper we have attempted to examine aspects of the competitive selection process in an important sector of Chinese manufacturing, looking in particular for changes resulting from the latest stage of reform, dubbed the transition to the "socialist market economy". These dynamic processes may be becoming increasingly important for the continuing growth of manufacturing as the agricultural sector, as a source of surplus labour, begins to decline.

Our analysis suggests that the competitive selection process is taking shape in China, with new firm entries contributing substantially to both output growth and productivity growth, however old firm is still an important stabilizing element in determining the trend of the economy. Our analysis also suggests that it is insufficient to analyse the competitive process from the point of view of new firm entry and incumbent firm growth alone. Indeed the substantial rate of churning of enterprises that we observe in this sector means that a study of exit is just as important as that of entry. Moreover this rate of churning appears to have increased substantially in the latest phase of reform. In fact our productivity decomposition suggests that exits do contribute to productivity improvement especially within the small firm. Our analysis suggests that, for small firms and COEs, the competitive selection process operates much as we would expect it to in a private market economy. However, for SOEs, the rate of exit is much slower, and compared with new entry the contribution of exit to productivity growth is trivial.

Notes

[1] Aw et al. (1997) reported that entrants in 1986 are, depending on industry, between 0.6 per cent and 6.9 per cent less productive than incumbent firms in the same year.

[2] Foster et al. (1998) report that, in terms of labour productivity, entering plants have lower productivity than continuing plants even at ten-year intervals.

[3] Market share is calculated as the share of firms' sale to aggregate sale.

[4] Average Size is calculated as the average employment.

[5] Survivors: Firms that survived up until 1996.

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