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Job Creation and Destruction in the Industrial Sector**

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# **The Dynamics of China's Labor Market: Job Creation and Destruction in the Industrial Sector**

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## **Abstract**

This paper demonstrates that China has made substantial progress in its transition to a market-driven economy, and privatization and federalization have been very important factors in improved business efficiency. To date, not much systematic research has been done to reveal the details of the dynamics of China's labor market and its relation to China's extensive restructuring process. This study provides an in-depth and initial look at the gross job flows for China's large and medium industrial enterprises during 1995-2003. By exploring a firm level data set, we focused on deriving a time series of gross job flow statistics and link them with associated entrants, exits, or firms with continuing operations. The time series of job flow statistics exhibits wide-ranging enterprise restructuring, which has increasing effects on the labor market from year 1998 on. Our gross job flow analysis also illustrates that government controlled enterprises and federally administered firms were at the center of restructuring. Because of the extensive reorganization in the labor market, the labor productivity of China's large and medium industrial firms as a whole was astounding, growing at an annual rate of 20.4 percent. Although private firms still outperformed government controlled firms, these government controlled firms pushed up their labor productivity growth by shedding off redundant employment and reorganizing into joint stock enterprises. Shifts of governmental regulation to more local areas have also created a productivity stimulus for federally administered firms to catch up with firms at the local government level.

*Keywords:* China, Productivity, Labor market; *JEL Classification:* O14, P3

## **1. Introduction**

China's transition to a market economy has been ongoing for almost three decades. As part of this process, China has undergone massive restructuring of its industrial enterprises and granted market access to foreign and private domestic firms. Much existing research has been devoted to assessing the progress of China's reforms. However, not much systematic research has been done to reveal the details of the dynamics of China's labor market and its relation to China's heavy restructuring process. This study provides an in-depth and initial look at the gross job flows for China's large and medium industrial enterprises during 1995-2003.

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In a previous study we documented that China's massive restructuring, which has been crucial to its rapid growth and its emergence as an international competitor with expanding exports to developed countries, was also generating fewer manufacturing jobs. (McGuckin and Spiegelman, 2004a and 2004b) We also identified the large drop in shares of employment and output being produced in State Owned Enterprises (SOEs) and concomitantly, the increased employment and output attributable to the private sector.

This paper is based on a new database developed in cooperation with the National Bureau of Statistics of China (NBS). The database follows large and medium sized industrial firms, roughly 22,500 firms per year, from 1995 to 2003. We identify job creation, job destruction, and job reallocation—gross job flow statistics—and link them with associated entrants, exits, or firms with continuing operations. Linking the firms over time allows us to identify which firms are creating jobs (entrants and continuing firms that grow employment) and which firms are destroying jobs (exits and continuing).

The times series of job flow statistics exhibits wide-ranging enterprise restructuring, which has increasing effects on the labor market from year 1998 on. Our gross job flow analysis also illustrates that government controlled enterprises and federally administered firms were at the center of restructuring. This confirms that China has undertaken large scale federalization and privatization reform, a transition to market-supporting federalist system.

In order to link the gross job flows with China's business performance, we conducted labor productivity analysis so as to measure China's reform progress during the period of heavy industrial restructuring between 1995 and 2002. Because of the extensive reorganization in the labor market, the labor productivity of China's large and medium industrial firms as a whole was astounding, growing at an annual rate of 20.4 percent. Although private firms still outperformed government controlled firms, these government controlled firms pushed up their labor productivity growth by shedding off redundant employment and reorganizing into joint stock enterprises. Shifts of governmental regulation to more local areas have also created a productivity stimulus for federally administered firms to catch up with firms at the local government level. In sum, this paper demonstrates that China has made substantial progress in its transition to a market-driven economy, and that privatization together with federalization have been very important factors in improving business efficiency.

It is important to be a bit cautious in interpreting the results since creating and maintaining linkages of firm over time is difficult and subject to much error. Shifts in ownership types, changes in a firm's industry classification because of a change in products produced, shifts in headquarter location, or regulatory and registration procedures that are controlled and undertaken by other agencies, not to mention mergers, divestitures, and other forms of reorganization, make it extremely difficult to link firms across time.

Despite the data limitations, this study reveals some key features of the dynamics of labor market for China's large and medium industrial firms during the period of 1995-2003. These features may be listed as follows:

- Compared to U.S. job flows, China's job creation and job destruction present much higher magnitudes. For the U.S., the average annual job creation and destruction rate in manufacturing is 9.1 percent and 10.3 percent, respectively during the years

1973-1988; 9.4 percent and 12.6 percent during 1998-2002. For China, the average annual rate of gross job gains and losses over 9 years (1995-2003) is 16.2 percent and 20.2 percent respectively. Both China's job creation rate and job destruction rate are about two thirds more than that of the U.S.

- Consistent with the findings of our earlier study (McGuckin and Spiegelman, 2004b), both China and the U.S. are losing jobs in the industrial or manufacturing sector. On average, each year of the study period of 1995-2003, China lost 1.3 million jobs out of 30.8 million workers; while the U.S. lost 341.3 thousand jobs out of 16.7 million workers. Cumulatively, China lost 10 million industrial workers and the U.S. lost 2.7 million manufacturing jobs over 9 years.
- Privatization of SOEs has resulted in extensive downsizing of SOEs and upsizing of joint stock enterprises, which was the form that most large SOEs converted to. China's SOEs have lost 18.5 million jobs over 9 years (1995-2003), of which, 4.5 million jobs were lost due to reclassification of SOEs into joint stock enterprises. But China's joint stock enterprises also gained a total of 6.0 million jobs during the same period including 4.3 million transferred from SOEs, which accounts more than two thirds of the net job increases for the joint stock enterprises.<sup>1</sup>
- Thus, even though 5 million SOE jobs were reclassified to other ownership types, SOEs still lost 13.4 million jobs during the study period.
- In terms of job flows, SOEs have the lowest job creation rate (12.2 percent) and a relatively low job destruction rate (23.5 percent). But the large size of this group accounts for a 12 percent net job loss during 1995-2003, the greatest loss among all types of firms.
- Domestic private firms' employment grew at an exceptionally high rate of 76 percent during the study period, the highest among all types of firms. This high rate of growth was generated by an annual job creation rate of 102 percent and an annual job destruction rate of 25.9 percent.
- On average, the foreign invested firms performed better than the domestic firms. Among them, the pure foreign enterprises grow more rapidly than HK/TW/MA invested and other foreign invested firms (36.3 percent vs. 13.7 percent and 9.5 percent respectively). This is consistent with the fact that the Chinese government has gradually loosened up controls over pure foreign enterprises, which were the most restricted area.
- Productivity in China's industrial sector grew at 20.4 percent annually from 1995-2003. Annual productivity growth rates for entrants, continuers, and exits were 15.2 percent, 22.5 percent, and 14.5 percent, respectively. Reclassified expanding continuers (upsizers) grew marginally faster than reclassified contracting continuers (downsizers) (14.6 percent vs. 13.8 percent annually).

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<sup>1</sup> About 204.8 thousand employments were lost from China's industrial sector along with the reclassification process of changing from SOEs to joint stock enterprises.

- The restructuring process promoted huge productivity growth for SOEs. The yearly productivity growth rate for SOEs was 11.4 percent in 1995-1998 and 17.6 percent in 1998-2003, which is higher than the annual productivity growth rates for pure foreign firms (3.5 percent), HK/TW/MA<sup>2</sup> invested firms (10.1 percent), domestic private firms (13.1 percent), and collective firms (15.1 percent) during the same period (1998-2003). Nonetheless, SOEs were outperformed by all other types of firms in terms of productivity levels.
- Due to the productivity performance of joint stock enterprises, the SOEs restructuring effects were not noticeable in the earlier years, but were enormous in the later years; the productivity growth rate of 4.6 percent in 1995-1998 jumped to 18.3 percent in 1998-2003.
- Foreign joint ventures (excluding pure foreign enterprises and HK/TW/MA invested enterprises) outperformed all other type of firms both in terms of productivity levels (from year 1999 on) and productivity growth rate (18 percent annually during 1995-2003).

## 2. Data description and some basic facts

China's industrial enterprise statistics are collected and maintained by NBS. They are derived from the 1995 Chinese Industrial Census and Annual Report of Industrial Statistics for 1996-2003.<sup>3</sup> The database is at the individual firm level for 39 industries covering the mining, manufacturing and utility sectors. After 1998, the scope of the firm level data has changed to focus on the size of firms with probability sampling introduced more recently. These firms include all state-owned industrial enterprises and non-state industrial enterprises with annual sales over 5 million Yuan.

Our study sample is a subset of the industrial data set described above, which covers China's large and medium size firms of the industrial sector for the year 1995-2003 (Figures 1-3). On average, the database contains about 22.5 thousands firms each year.

The large and medium firms differ from small firms in some important ways. First, in terms of firm size, the average number of employees per large and medium firm is seven times greater than smaller firms. Second, in terms of production scale, the average gross output is nine times larger than small firms. Thus, the sector-wide employment share of smaller firms is much larger than their output share. Additionally, the large and medium firms exhibit 15.4 percent higher labor productivity than small ones.

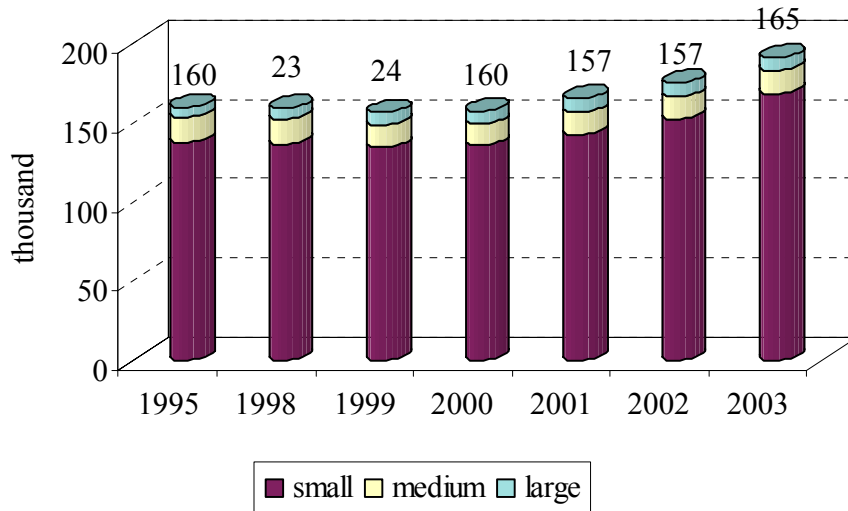
The major advantage of using a large and medium firm sample is that data quality is much better for larger firms. For example, firm level statistics for small industrial enterprises were not collected for the year 1996 and 1997. Moreover, the larger firms are monitored more closely and the editing routines are more extensive. In terms of this paper, another advantage is that the linkages of firms over time are better in large and medium firms than in small firms.

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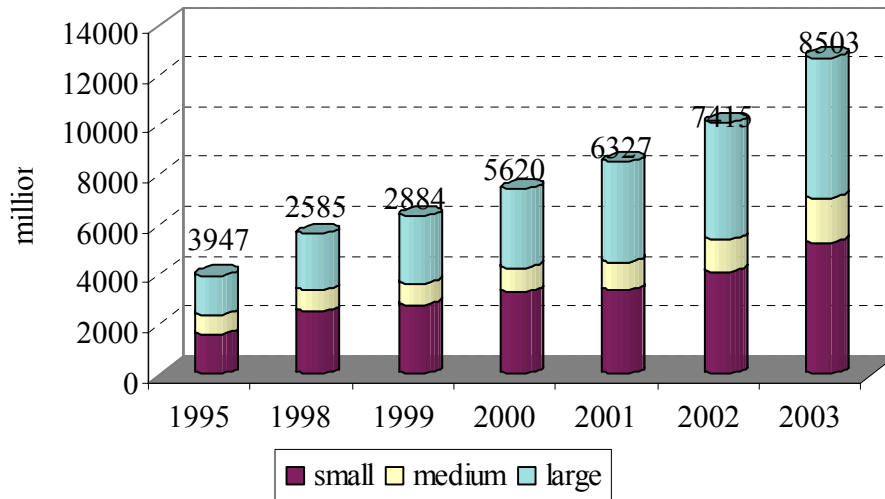
<sup>2</sup> HK/TW/MA is the abbreviation for Hong Kong/Taiwan/Macao.

<sup>3</sup> A new complete census is now underway in 2005.

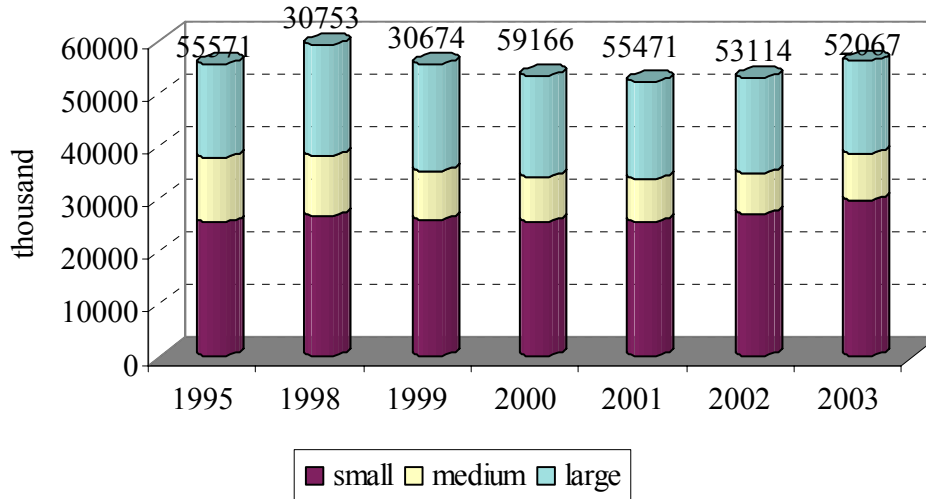
**Figure 1: Number of China's industrial firms, 1995-2003**



**Figure 2: China's industrial gross output (1990 price), 1995-2003**



**Figure 3: China's industrial employment, 1995-2003**



This sample is not designed to be statistically representative—it accounts for 13 percent of China's industrial firms—however, it accounts for large shares of both output (57 percent) and employment (32 percent). In terms of growth and changes, large and medium firms' performance demonstrates deeper restructuring than the rest of the sector. The large and medium firms show a 28.9 percent net job loss between 1995 and 2002, much higher loss than that of the entire industrial sector—16.7 percent. Nonetheless, the broader sector sees slightly slower output growth (17.5 percent annually vs. 18.9 percent in the large and medium) between 1998 and 2003. These suggest that large and medium firms show a faster pace of restructuring than the whole industrial sector.

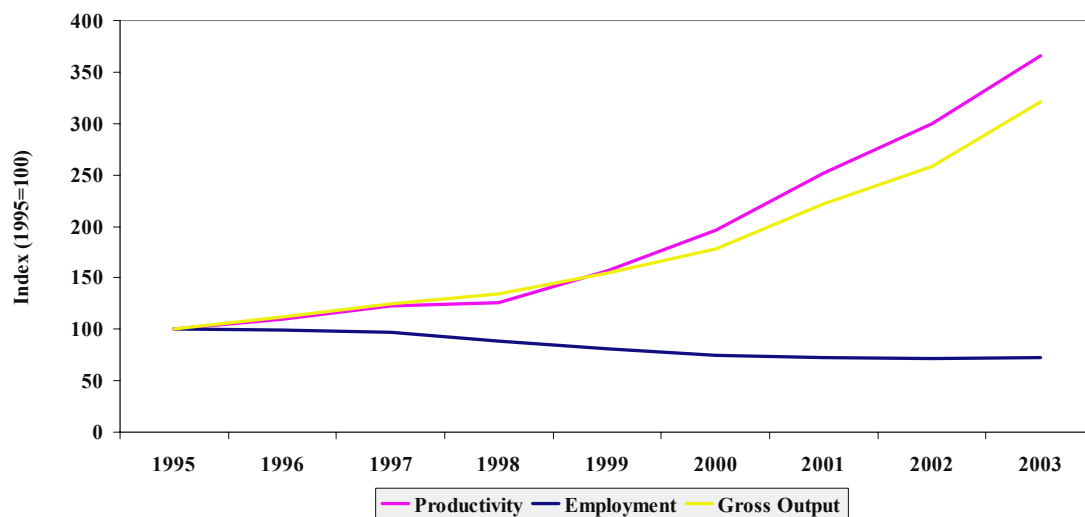
Table 1 briefly summarizes the sample statistics. Consistent with our previous study on China's employment (McGuckin and Spiegelman 2004b), China's industrial jobs fell dramatically from year 1998 on. While the annual employment losses were not too much different for the first three years of our study period than the last five years (3.8 percent for the years 1995-1998 vs. 4 percent for the years 1998-2003), the gross output increased more in the period 1998-2003 than in 1995-1998 (18.9 percent vs. 10.5 percent). Therefore, the labor productivity growth accelerated from 14.9 percent before 1998 to 23.9 percent after 1998. In fact, including the slow growth period 1995-1998, it was 20.4 percent over the whole sample period.

### **3. The gross job flows definitions and its compositions**

#### *3.1 The gross job flow definitions*

Gross job flow calculations look at firms between time  $t-1$  and time  $t$ . In theory, the time span between time  $t-1$  and  $t$  could be almost any: one month, one quarter, one year, or even one decade. Since NBS data are annual statistics, the frequency in our study is annual or a multiple of years.

**Figure 4: China's productivity, employment and gross output levels for large and medium firms, 1995-2003**



**Table 1: China's large and medium firms' employment, gross output, and productivity**

Year	Sample size	Employment (1000 persons)	Gross output (1990 price, 1b RMB)	Gross output (current price, 1b RMB)	Productivity (1000 RMB/wk)	Productivity growth rate
1995	22,081	36,562	2,316	3,030	63	
1996	23,089	36,169	2,585	3,366	71	13%
1997	23,521	35,666	2,884	3,643	81	13%
1998	22,857	32,518	3,124	3,695	96	19%
1999	21,695	29,673	3,576	4,082	121	25%
2000	21,196	27,479	4,126	4,838	150	25%
2001	22,454	26,641	5,138	5,668	193	28%
2002	22,801	25,989	5,973	6,459	230	19%
2003	22,766	26,518	7,433	8,262	280	22%
Average	22,496	30,802	4,128	4,783	143	20.6%
Annual growth (1995-1998)	1.2%	-3.8%	10.5%	6.8%	14.9%	
Annual growth (1998-2003)	-0.1%	-4.0%	18.9%	17.5%	23.9%	
Annual growth (1995-2003)	0.4%	-3.9%	15.7%	13.4%	20.4%	



The gross job flows definitions adopted in this study follows Davis et.al.'s work (1995). We use year  $t$  or year  $u$  to denote years, where  $t < u$ . So  $t$  is the beginning and  $u$  is the ending point of the interval over which time is measured. Assume there are a total of  $N+M$  firms in year  $t$  and  $u$ .<sup>4</sup> Among them,  $N$  firms are entrants, expanded firms or firms that have the same number of employment,  $M$  firms are exiting or contracting firms. In other words,  $E_{i,u} - E_{i,t} \geq 0$  for  $N$  firms, and  $E_{i,u} - E_{i,t} < 0$  for  $M$  firms, where  $E$  stands for employment, and  $i$  refers to each individual firm.

*Definition 1* (Gross) job creation at year  $u$  equals employment gains summed over all firms that expand or start up (enter) between year  $t$  and  $u$ .

$$JC = \sum_{i=1}^N (E_{i,u} - E_{i,t}), \text{ for } E_{i,u} > E_{i,t}.$$

*Definition 2* (Gross) job destruction at year  $u$  equals employment gains summed over all firms that contract or shut down (exit) between year  $t$  and  $u$ .

$$JD = \sum_{j=N+1}^{N+M} (E_{j,t} - E_{j,u}), \text{ for } E_{j,u} < E_{j,t}.$$

*Definition 3* The net employment change at year  $u$  is the difference between employment at year  $t$  and employment at year  $u$ .

$$\Delta E = JC - JD = \sum_{k=1}^{N+M} (E_{k,u} - E_{k,t})$$

*Definition 4* (Gross) job reallocation at year  $u$  is the sum of all firm-level employment gains and losses that occur between year  $t$  and year  $u$ .

$$JR = JC + JD = \sum_{k=1}^{N+M} |E_{k,u} - E_{k,t}|$$

*Definition 5* Excess job reallocation at year  $u$  equals the difference between (gross) job reallocation and the absolute value of net employment change.

$$JR_{ex} = JR - |\Delta E| = (JC + JD) - |JC - JD| = 2 \times \text{Min}(JC, JD)$$

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<sup>4</sup> Note that if a firm exists between year  $t$  and  $u$ , but does not exist in either year  $t$  or  $u$ , this firm is not considered in the  $N+M$  sample when calculating gross job flows between year  $t$  and  $u$ .

### 3.2 Enter, exit, and continuing firms

Job creation consists of job creation by entrants (*CE*) and expanding continuing firms. Furthermore, expanding continuing firms can be distinguished by whether they remain in the same sector (*CC*), or are reclassified to a different sector (*GC*). Similarly, job destruction is comprised of job loss from exits (*DE*), contracting continuers that remain in the same sector (*DC*), and reclassified contracting continuers (*LC*). We know the number of employees in year *t* and year *u*. The following basic equation links the employees or jobs at year *u* to the jobs at year *t*.

$$\text{Employees } (t) + CC + CE + GC - DC - DE - LC = \text{Employees } (u)$$

This identity also holds for *each aggregate sector* (ownership, industry, or jurisdiction), as well as for the entire sample. The Appendix provides a more detailed explanation.

## 4. Characteristics of job creation and job destruction

### 4.1 Basic facts of job creation and job destruction

We first look at the gross job flows for the whole industrial sector in China. Figure 5 shows the relationship between total employment and the contribution of job creation and job destruction to China's industrial sector. Job creation and job destruction correspond to the left axis, and employment corresponds to the right axis.

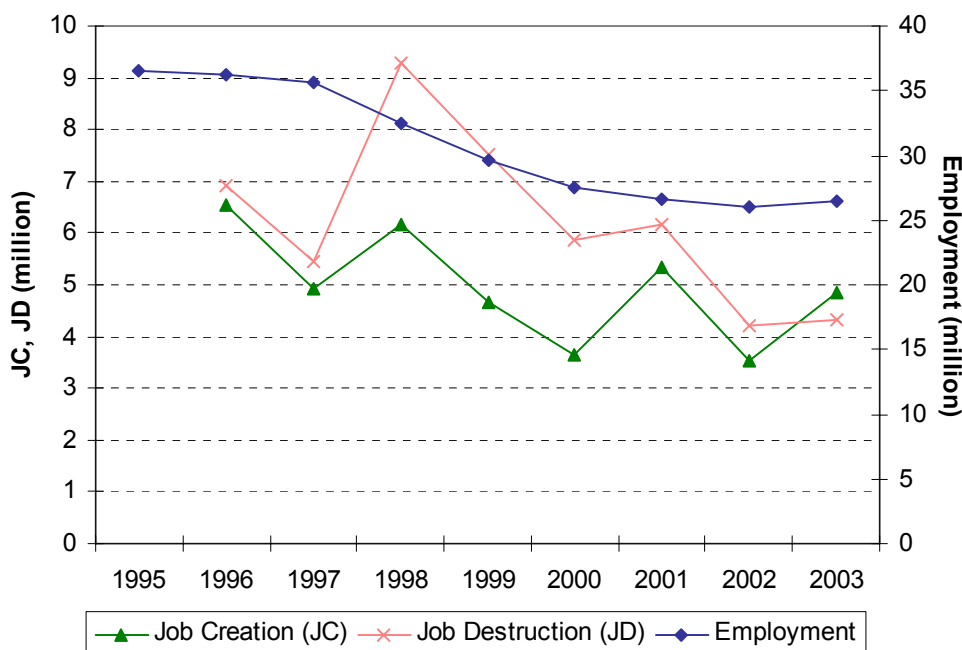
For all years, job creation and job destruction rise and fall together. The correlation coefficient of the job creation rate and job destruction rate is 0.37. A similar relationship has been found in many studies of firm entry and exit, which are correlated across industries. Thus, changes involve shifting or reorganizing as well as greater declines. China's job flow co-movement suggests that high creation is associated with destruction, and vice versa. However, in most cases, job destruction exceeds job creation except for year 2003.<sup>5</sup> Consequently, total employment keeps declining until year 2003. The aggregate job flow statistics suggest that the structural adjustments in China's industrial sector resulted in continuous employment loss, and this process came to an end in year 2003.

There is an obvious turning point for the performance of labor market. In 1998, job destruction increased dramatically (from 15.1 percent in 1997 to 27.3 percent in 1998). Statistics in 1998 showed the highest net job loss of 9.2 percent, the largest net job loss during the period 1995-2003. The dramatic change of job flows suggests, consistent with other evidence, that the restructuring and privatization process accelerated after 1998 and continued until year 2003.

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<sup>5</sup> To be more accurate, the notation should be job flows from 2002-2003. Since we are dealing with annual data, the notation year 2003 is used instead for simplicity.

**Figure 5: Gross job flows for China's large and medium industrial firms, 1995-2003**

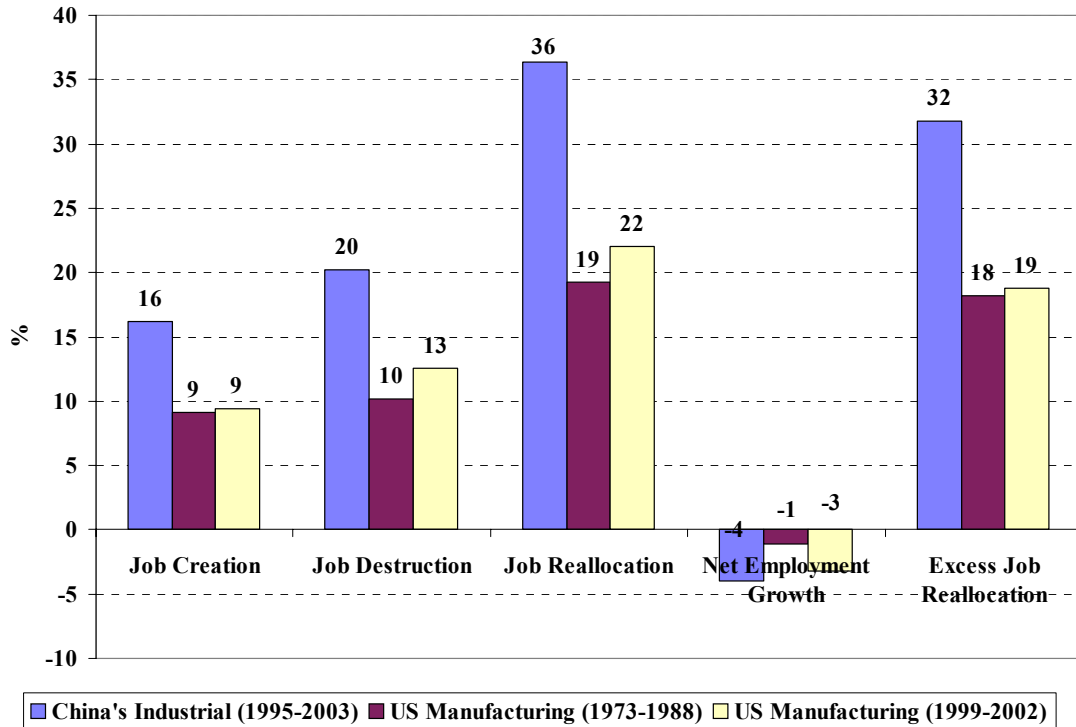


#### 4.2 Magnitude: Comparisons with the U.S.

In this section, we compare our job flow calculations for China (1995-2003) with that of the US in the periods of 1973-1988 and 1999-2002. Other than comparable data availability, we chose these two periods for the U.S. for a couple important reasons. China's industrial sector underwent major restructuring during the study period (1995-2003). Similarly, manufacturing underwent major restructuring due to the energy crisis and the deregulation movement in the U.S during 1973-1988. The late 1990's in US was a period of great transition time with accelerated productivity linked to reorganization and the ICT revolution. In addition, the U.S. experienced a recession in 2001.

Figure 6 gives the comparison of gross job flows statistics for China and the U.S. The average yearly job creation and job destruction rate for China is 16.2 percent and 20.2 percent, respectively. These rates are much higher than almost all countries for which such data is available (Davis et al. 1995). In particular, the magnitudes are much larger than that of the U.S. manufacturing sector (9.1 and 10.2 percent respectively during the period 1973-1988; 9.4 and 12.6 percent in 1999-2002). The large magnitude of China's gross job flows highlights the remarkable fluidity in the distribution of job opportunities across locations in China. It also confirms the huge impact of reform on the labor market through the restructuring of enterprises.

**Figure 6: Gross job flows of China vs. US**



The sum of job creation and destruction rates is the job reallocation rate (shown as the third set of bars in Figure 6). By construction, the magnitude of China’s industrial job reallocation is also much higher than that of the U.S. manufacturing job reallocation (36.3 percent vs. 19.3 percent in 1973-1988 and 22 percent in 1999-2002). In other words, more than one in three industrial jobs are either destroyed or created over an average one year interval for China, while only roughly one in five manufacturing jobs was reallocated in the U.S. This simple fact again indicates enormous job shuffling associated with China’s reform process.

The fourth set of bars in Figure 6 shows the net changes in employment, obtained by subtracting job destruction from job creation. Both China’s industrial sector and the U.S. manufacturing sector lost jobs. In terms of percentage rate, China’s average annual job loss is 4 percent, higher than that of the U.S during both periods (1.1 percent for the years 1973-1988 and 3.2 percent during 1999-2002). Considering its larger labor market, China’s annual job loss, in terms of absolute numbers, is even more pronounced than that of the U.S. in both periods.

In order to better understand the percentage numbers, and given the different time span, we interpret them on an annual average basis. For the U.S., its manufacturing sector lost 45.5 thousand manufacturing jobs (out of 18 million workers) each year during 1973-1988; while for China’s industrial sector, 1.3 million jobs out of 30.8 million workers were lost each year during the period of 1995-2003—an employee loss of more than 27 times the US.

**Table 2: Gross job flows in China's industrial sector, 1995-2003**  
(%)

Year	Job creation	Job destruction	Job reallocation	Net employment growth	Excess job reallocation
1996	18.0	19.0	37.0	-1.1	35.9
1997	13.7	15.1	28.9	-1.4	27.5
1998	18.0	27.3	45.3	-9.2	36.1
1999	15.0	24.2	39.2	-9.1	30.1
2000	12.8	20.5	33.3	-7.7	25.6
2001	19.7	22.8	42.6	-3.1	39.5
2002	13.5	15.9	29.4	-2.5	26.9
2003	18.5	16.5	35.0	2.0	33.0
Average	16.2	20.2	36.3	-4.0	31.8
Std. Dev.	2.7	4.3	5.9	4.2	5.1
Maximum	19.7	27.3	45.3	2.0	39.5
Minimum	12.8	15.1	28.9	-9.2	25.6

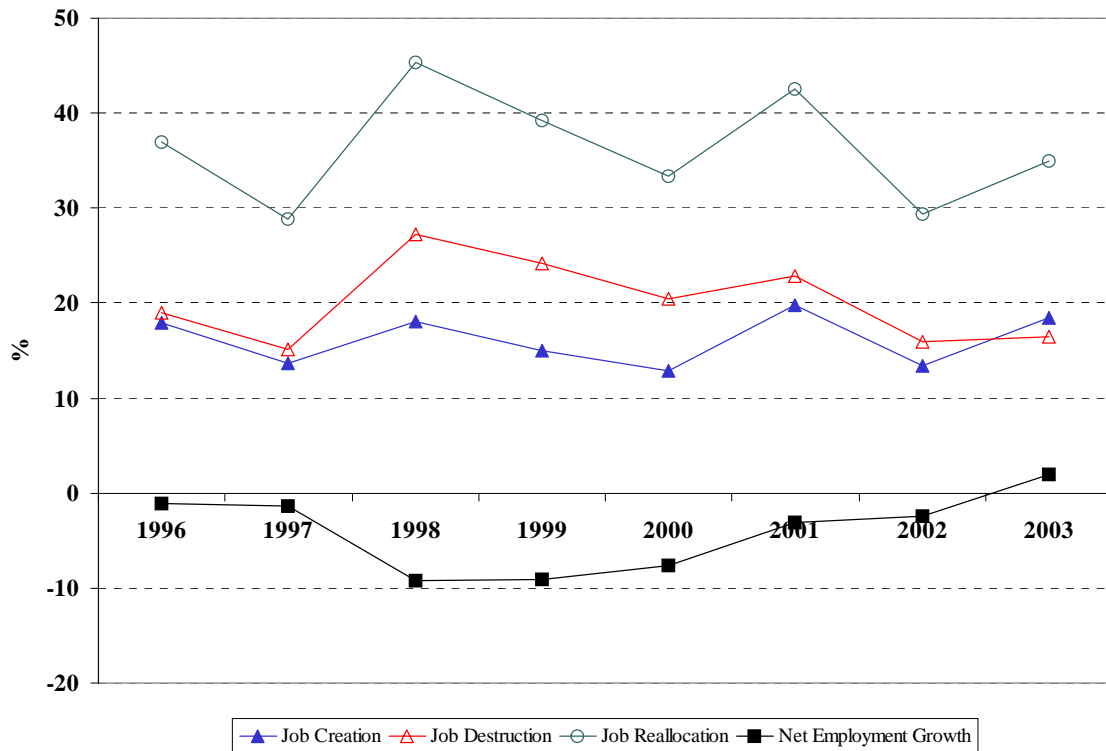
The gap narrows down when compared to the U.S. manufacturing job losses for the later period (1998-2002)—China's industrial sector lost almost twice as many jobs as the U.S. manufacturing sector on an average annual basis.

It is also sensible to compare net employment changes for the same period (1995-2003). During this period, the annual job loss rate for the U.S. manufacturing is 2.1 percent. In other words, about 341.3 thousand manufacturing jobs were lost (out of 16.7 million workers) each year for the U.S.

Excess job reallocation measures the extent of simultaneous job creation and destruction. To take the figure for year 2003 as an example, China's excess job reallocation rate of 33 percent tells that for the net employment change of negative 2 percent in that year, an extra 33 percent of jobs were reallocated in addition to this 2 percent job reallocation. The last set of bars in Figure 6 gives the comparison of average excess job reallocation for China and the U.S. Similarly to the other comparisons discussed earlier, China's industrial sector has had much more excess job reallocation activity than the U.S. manufacturing industry. This again indicates that job shifting and reorganization went deeper in China than in the U.S. Also consistent with the observation in Figure 5, the large magnitude of co-movement between job creation and job destruction points to large scale restructuring undertaken in China's industrial sector.

Table 2 gives China's detailed yearly job flow statistics and average rates from 1995-2003. Job destruction rates exceeded job creation rates except for the year 2003. The pattern is more clearly shown in Figure 7, where the job destruction line is almost always on top of the job creation line except for the last year. The resulting negative employment growth rates in 1995-2002 also suggest extensive economic restructuring during this period.

**Figure 7: Gross job flows for China's large and medium industrial firms, 1995-2003**

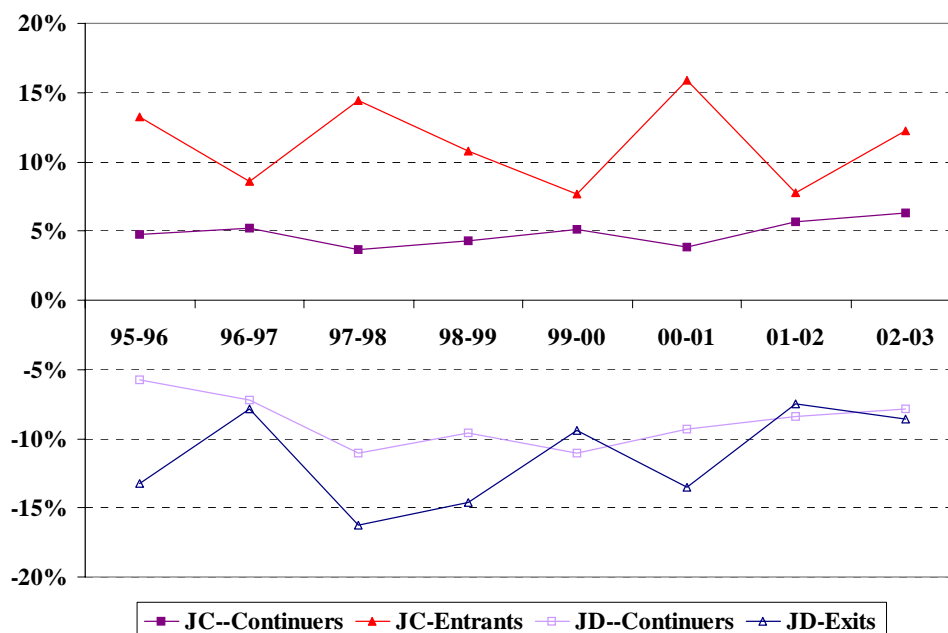


### 4.3 Decomposition

Figure 8 breaks down the sources for creation and destruction rates: job creation consists of entrants and continuers; similarly, job destruction consists of exits and continuers.<sup>6</sup> The outer lines indicate that entrants and exits contribute to job creation and job destruction the most. About 69 percent of jobs created during 1995-2003 were from entrants, the other one third comes from expanding continuers. Exits contribute to 55.8 percent of all jobs lost. The time trend of the composition contribution shows that the impact of entrants on job creation slightly decreased over time—the average contribution is 72 percent vs. 67 percent before and after 1998 respectively—while the impact of exits on job destruction declined from 60 percent before 1998 to 53 percent afterwards.

<sup>6</sup> From the point of view of the whole industrial sector, employment gain or loss from reclassification is limited.

**Figure 8: Decomposition of job creation and job destruction for China's large and medium industrial firms, 1995-2003**



While the role of entry and exit clearly dominates the job flows, we need to be a bit cautious in interpreting these figures. There is a linkage problem as some continuing firms may be treated as exits because they are not recognized as being the same firm in each year. Missed linkage will tend to overestimate the contribution from entrants and exits and underestimate the contribution from continuers. The decreasing impact from entry/exit may suggest that the linkage problem is likely to be largest in the earlier years of the sample.

Another way to show the impact of entry/exit and continuing firms on net employment is to plot the net effects of job creation and destruction for the two types (Figure 9)—the joint effect from entering and exiting firms, and the net effect from continuers. The net employment from the continuers' line never rises above zero, while the joint result from entry/exit firms consistently did less damage to the net employment changes than the continuers—it even contributes to net job gains from year 2001 on.

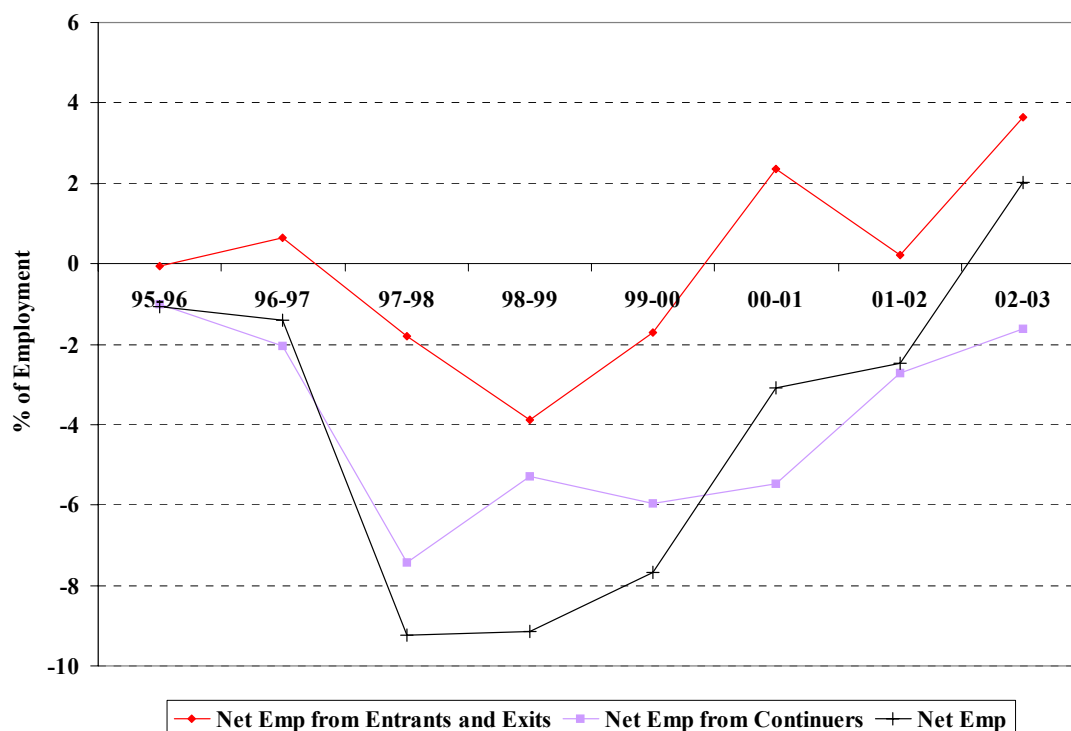
## 5. Variations by sectors

### 5.1 Job flows by ownership type

In this section we turn to examine job flows by firm ownership type. The data were classified into eight ownership classes by the NBS. These are described in some detail in McGuckin and Spiegelman (2004b). Table 3 provides the average job flow statistics for each ownership type.<sup>7</sup>

<sup>7</sup> SOE joint ventures are categorized into SOEs; and collective joint ventures are grouped into collective firms. Since the residual joint venture firms had negligible impact -- less than one percent of total

**Figure 9: Net employment changes from entrants/exits and continuers for China's large and medium industrial firms, 1995-2003**



Job flow calculations done on an annual basis are summarized in Table 3 by the simple average of job flow statistics for the year 1995-2003. It is apparent that in terms of net employment growth, the ownership types fall into two groups: State-Owned enterprises (SOEs) and collective enterprises in one group, and the rest in another group. For simplicity, we refer to firms in the former group as government firms and firms in the latter group as private firms. The net employment growth rates are negative for the government firms and positive for the private firms. This is not surprising in light of the privatization and downsizing reflected in the earlier work on this issue.

Creation, destruction, and total reallocation figures reveals some striking differences between the government and more private firms. The biggest difference is in the job creation rates, which are very small for government firms (12.2 percent and 24.4 percent for SOE and collectives, respectively) versus 102 percent for domestic private firms. Other private firms also show higher job creation rates, ranging from 30.9 percent to 45.9 percent. In contrast, the job destruction rates show much lower variation among the ownership types, with only collectives above 30 percent. So the limited jobs created by government firms are simply not enough to offset the job losses sustained in these firms, and the total job reallocation rate is very small for SOEs compared to private firms.

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total gross output—Table 3 does not list them. The last catch-all category “others” is also ignored in what follows since it is very small and mixed.



**Table 3: China's industrial job flows by ownership type, 1995-2003 (%)**

<i>Ownership</i>	<i>Job creation</i>	<i>Job destruction</i>	<i>Job reallocation</i>	<i>Net employment growth</i>	<i>Excess job reallocation</i>
SOEs	12.2	23.5	36.4	-12.0	24.4
Collective	24.4	34.4	59.1	-10.4	47.4
Joint stock	42.3	23.8	66.6	18.0	48.6
Domestic private	102.0	25.9	128.0	76.0	52.0
HK/TW/MA joint ventures	36.2	22.3	58.8	13.7	45.1
FDI joint ventures	30.9	21.1	52.4	9.5	41.8
Pure foreign	45.9	10.0	55.6	36.3	19.3

One category of firms, joint stock firms, is of particular interest, because most of these firms have been formed by reorganizing former SOEs.<sup>8</sup> This type of firm shows relatively high job losses (23.8 percent), which are slightly higher than SOEs (23.5 percent). Since most of these joint stock enterprises were reclassified from SOEs, a substantial portion may still reflect the relatively poor performance of their predecessors and be in the midst of shedding jobs, restructuring or even exiting completely from operations.

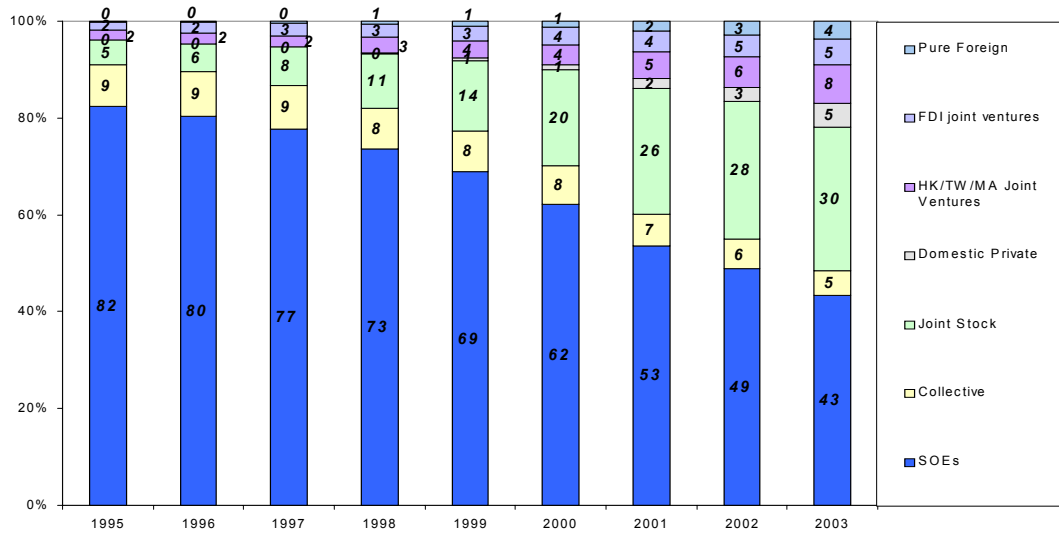
But the high level of job creation for joint stock firms is even more noticeable—the rate is 42.3 percent. While much less than domestic private firms (102 percent), it is nearly as high as pure foreign firms (45.9 percent). Moreover, since the converted SOEs are relatively large in size, these converted companies contribute more than four million jobs during 1995-2003, most of which were added toward the end of the period.

### *5.2 Government controlled enterprises declining in importance*

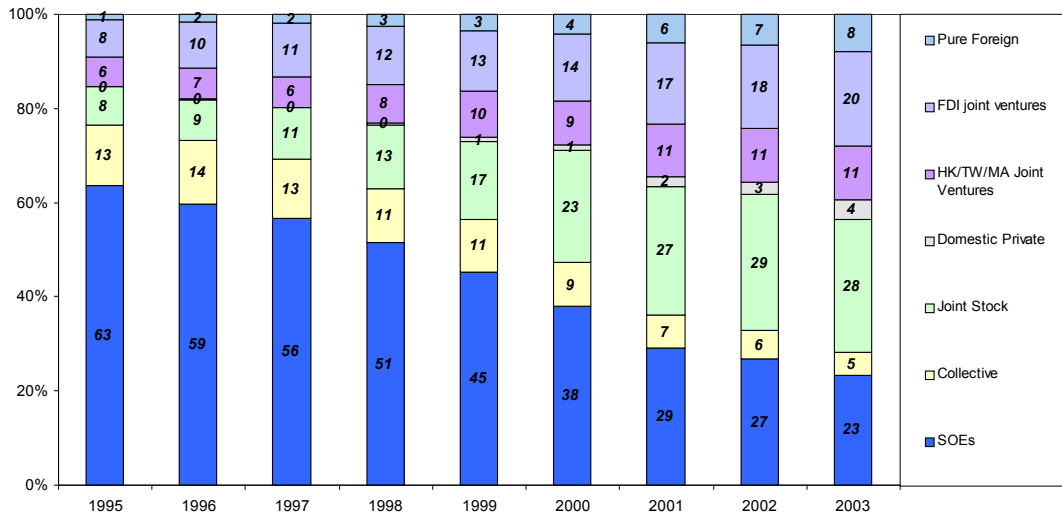
The extensive restructuring of SOEs and collectives has been accomplished through downsizing and job losses. In turn, the impact of these changes is reflected by the drop in the share of these firms' employment and output. Figures 10-12 give the percentage of workers and gross output (both constant and current price levels) associated with each ownership type. (These figures are based on the firm sample discussed above.)

<sup>8</sup> While we classify these firms as "private", they are for the most part still government controlled. (Roughly 80 percent of these firms are majority controlled by the government when both state-owned and "legal" shares--controlled by SASAC--are accounted for.)

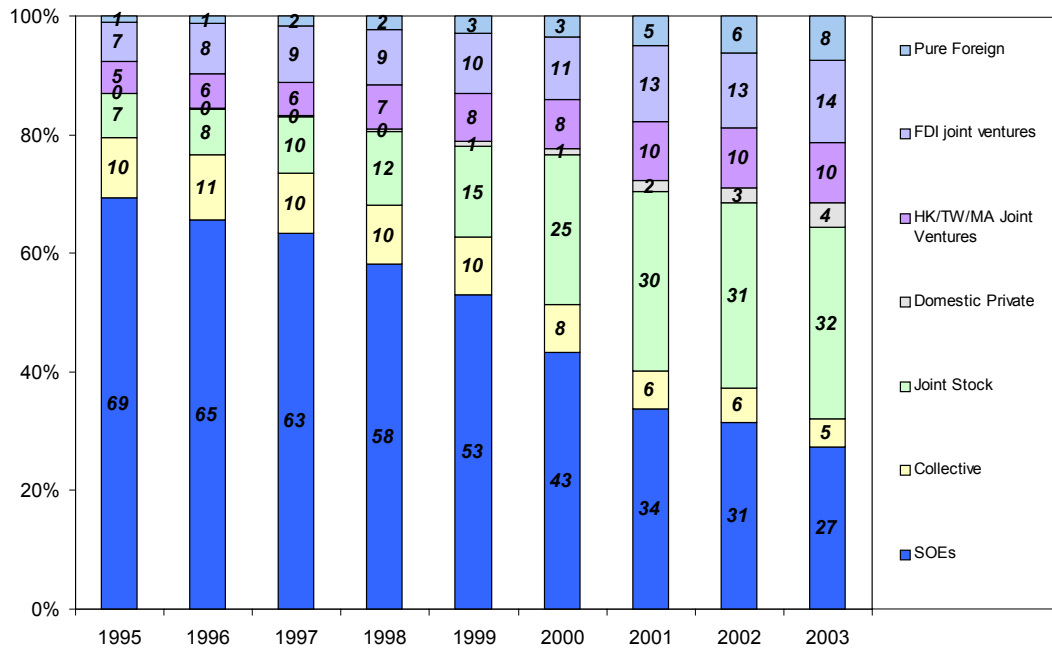
**Figure10: Worker percentage by ownership**



**Figure 11: Gross output (1990 price) percentage by ownership**



**Figure 12: Gross output (current price) percentage by ownership**



The SOEs and collectives have lost their dominant place in the industrial sector. In 1995, 81.9 percent of workers in the industrial sector were employed by an SOE, plus another 8.5 percent worked for a collective firm. Thus government controlled over 90 percent of industrial employment in 1995. These firms also contributed 75.7 percent of total industrial output.<sup>9</sup>

SOEs' shares continuously dropped from 1995 to 2003: employment share fell 38.6 percentage points to 43.3 percent; gross output share decreased 52.3 percentages to 23.4 percent. So did the shares for collective enterprises. Altogether, SOEs and collective firms lost 20.2 million workers; their output contribution to industrial sector dropped 48 percentage points in the 9 years to 28.2 percent in 2003.

In contrast, the employment share of joint stock enterprises' increased nearly six-fold (from 5.1 percent in 1995 to 29.5 percent in 2003), which corresponds to 6 million new jobs. Gross output increased 20.1 percentage points, a 35.4 percent annual growth rate, much higher than the annual growth rate for the entire industrial sector (15.7 percent). As discussed above, the rapid growth of joint stock enterprises is a reflection of the SOEs' restructuring process. The consistent pattern of opposite evolution for these two types of firms confirms that the privatization process has been undertaken as part of China's

<sup>9</sup> Although the government controlled firms were the largest both in terms of employment and gross output, the employment share exceeds gross output's share by 14.7 percentage—a clear indication of lower productivity than other types of firms in year 1995.

enterprises reform. Additionally, the continuous growth of joint stock enterprises is a positive indicator of the effects of the reform.

In the earlier years of the study period, large and medium sized domestic private firms were virtually non-existent. Even as late as 1999 both employment and gross output of these enterprises was still less than one percent. By 2003, they accounted for 4.9 percent of employment and 4.1 percent of gross output. This reflected astounding average annual growth rates for employment and gross output, respectively—135.3 percent and 163.2 percent—the highest among all types of firms. The fast growth of this group is partially due to its low starting base, nonetheless it reflects the prosperous development of private enterprises induced by a more market-driven economy.

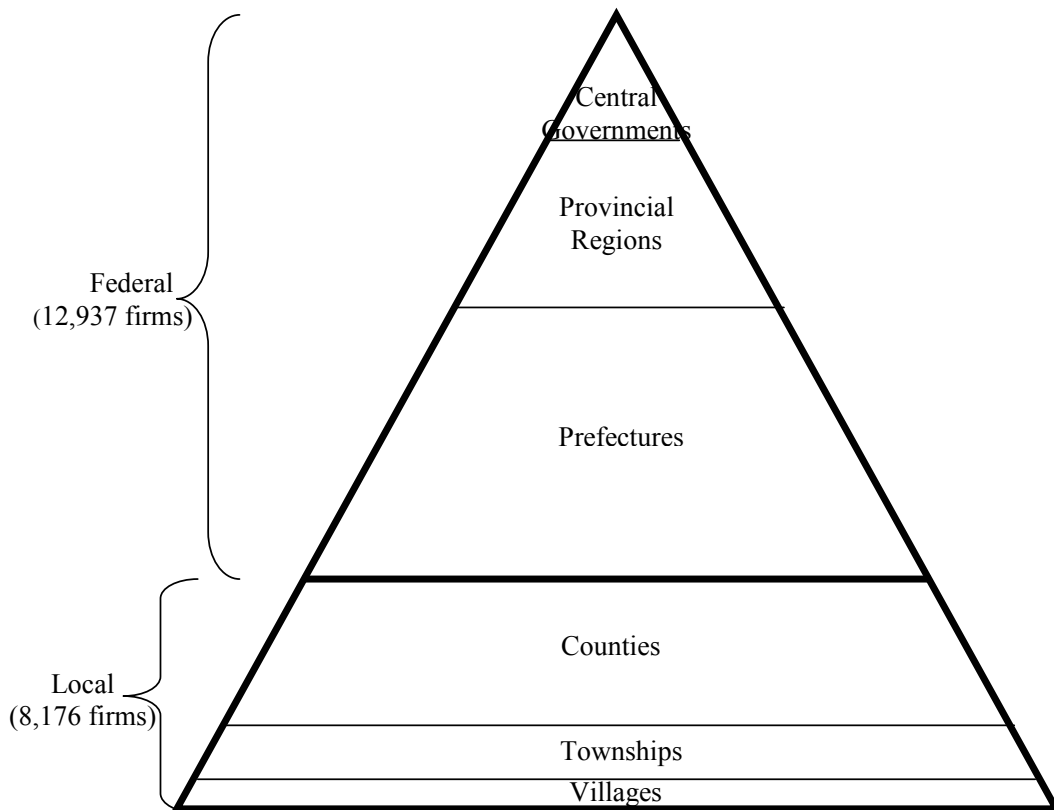
Firms with foreign ownership (including HK/TW/MA invested, foreign invested, and pure foreign invested firms) also grew. More than 3.1 million new jobs were created by them during 1995-2003 and their share of output more than doubled from only 15.2 percent in 1995 to 39.4 percent in 2003.

### *5.3 Variations across jurisdiction*

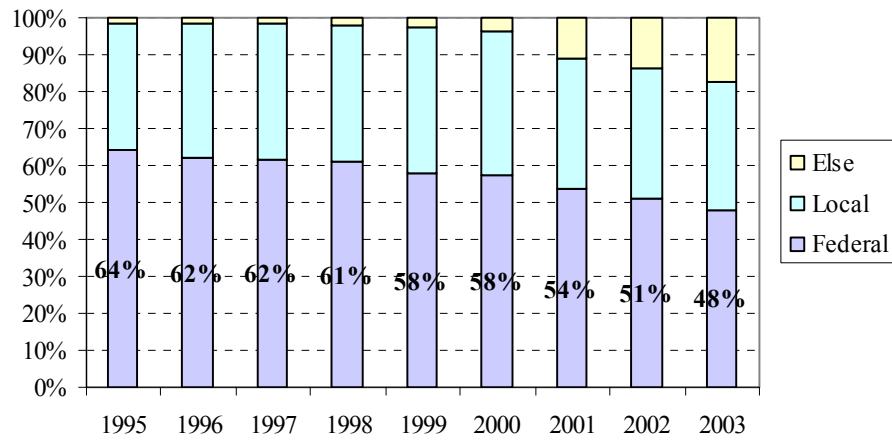
We follow the definition of jurisdiction for China outlined in McGuckin and Dougherty (2002), which group China's enterprises into federal and local enterprises. Figure 13 below demonstrates how Chinese jurisdictions are defined. On average during the period of 1995-2003, about three fifths of large and medium firms administered by federal governments (hereafter federal firms), while less than two fifths are constituted by firms administered by local governments (hereafter local firms). However, the number of federal firms kept falling especially after 1997. Consequently, their dominant role declined from 64.2 percent in 1995 to 47.8 percent in 2003, less than half of the large and medium firms. Figure 14 details the declining trend of federal firms.

The size of China's industrial firms shrank from 1995-2002, but picked up slightly in the year 2003. This is especially true more for federal firms than for local firms (Figure 15). The average size of federal firms shrank nearly one quarter from 2080 to 1555 workers. Therefore, the weakening impact of federally administered firms on the entire industrial sector is further emphasized by the decreasing total number of workers employed by these firms. In fact, federal firms lost a total of 11.8 million workers over nine years during the study period; its employment share dropped from 80.6 percent in year 1995 to 60.8 percent in year 2003. While for the local firms, although their size slightly contracted (from 879 workers per firm in year 1995 to 816 workers in year 2003), the new jobs created by entering local firms more than compensated the job losses from shrinking firms. Therefore, the net employment effect for local firms was positive.

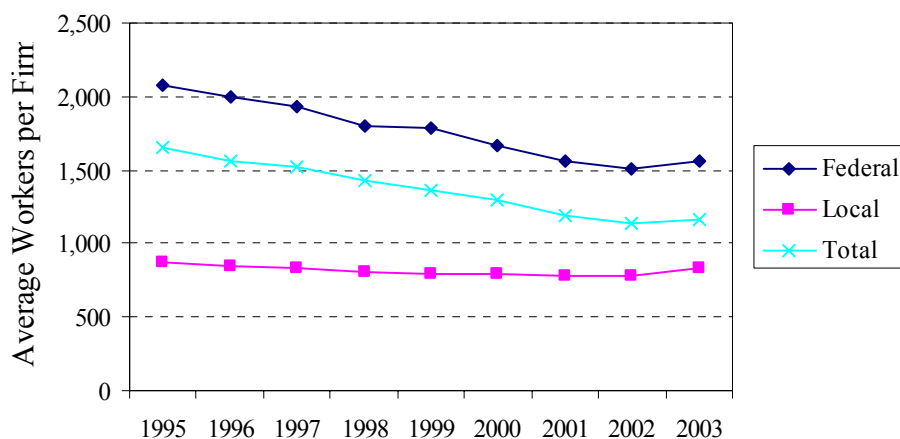
**Figure 13: China's jurisdiction pyramid**



**Figure 14: Federal administered firms decreased over 1995-2003**



**Figure 15: Average size of firms by jurisdiction, 1995-2003**



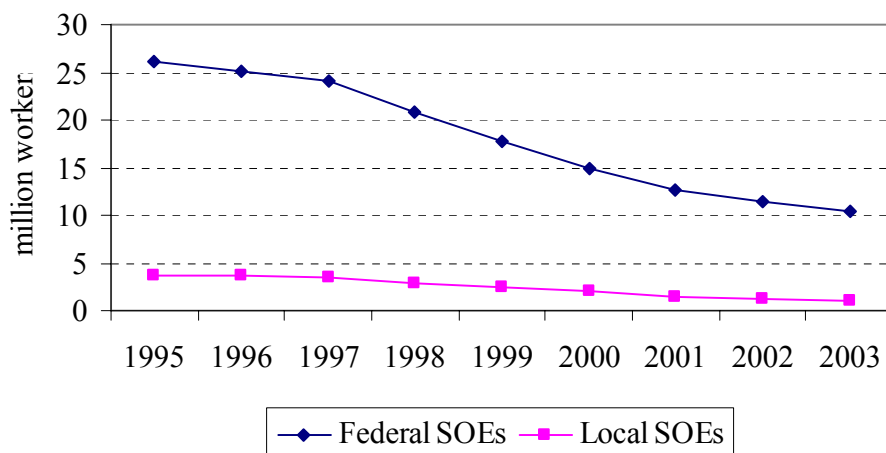
**Table 4: China's industrial job flows by jurisdiction, 1995-2003 (%)**

Jurisdiction	Job creation	Job destruction	Job reallocation	Net employment growth	Excess job reallocation
<i>Federal</i>	16	23	39	-7	31
Central Province and prefecture	15	24	39	-9	29
<i>Local</i>	27	23	50	4	45

To determine the sources of job losses or job gains for firms at different jurisdiction, we conducted the job flow analysis by jurisdiction. Table 4 gives the decomposition of employment changes for federal and local firms. Similar to Table 3, it gives the simple average of each job flows statistics over the study period (1995-2003).

Apparently, federal firms experienced more job losses than local firms because not enough new jobs were created to make up for the destructed positions. The job destruction rates are about the same across different jurisdictions. However, job creation rates vary a lot. In particular, the higher the level of government administered firms, the fewer the job creation activities. This is clearly demonstrated by the job creation differences between firms administered by the central governments and firms administered by provinces and prefectures. Furthermore, central firms also have the highest job destruction rate. Consequently, central firms experienced the largest net employment losses.

**Figure 16: Job losses for SOEs are more pronounced for federal than for local**



This is consistent with our observation in the previous section on job flows analysis by ownership type. Since most SOEs are administered by federal governments, especially in the early years (only one fourth of SOEs were local firms in 1995), the substantial downsizing of SOEs and lack of entrants led to job losses for the federal group. Comparatively, employment for local SOEs has been fairly stable over the study period (Figure 16). The results are consistent with McGuckin and Dougherty's (2002) federalism argument where industries witness shifts from governmental administration and regulation to more local areas.

On the other hand, although job destruction rate for local firms is at similar level as federal firms, there are considerable more activities in job creation. As discussed before, entrants contribute the most to new jobs in local firms. In fact, among all jobs created by firms administered by governments below the federal levels, about two thirds of them were created by entrants. Since local SOEs and collective firms both experience job losses, it is clear that many of the new jobs created in the local firms were from these with more private ownership shares.

Not only does job creation rate exceeds job destruction rate for local firms resulting in net employment gain, but also the large magnitudes of both lead to a much higher excess job reallocation rate for the local firms (45.1 percent) than for the federal firms (31.4 percent). It indicates that there is higher job fluidity among local firms, most probably due to the privatization process among China's industrial enterprises. Firms with more private shares had active job shuffling and reallocation, and also led to net employment gains. In this sense, privatization of China's industrial enterprises has been fairly successful as part of China's enterprises reform. We will discuss more of this when analyzing the productivity gains associated with it.

#### 5.4 Variations across industries

Figure 17 shows the job flow analysis across industries for the US (1973-1988) and China (1995-2003).<sup>10</sup> For each industry shown in Figure 17, the upper bar represents US and the lower bar represents China. For each bar, the left box refers to job creation and the right one refers to job destruction. Each bar indicates the job reallocation rate as percent of employment. While there is substantial diversity in job creation and destruction rates across industries, reallocation is very high in all industries for China. As discussed earlier, these aggregate figures are not the result of major restructuring in just a few large industries. Similar to the comparison of aggregate job flow statistics, the magnitude of China's job flows are much higher than that of the US across all industries. Figure 17 clearly demonstrates that this is the case throughout all industries. The variance of the scale of job loss/gain across industries is much higher for China than for the U.S. (32.9 percent vs. 1.7 percent), which shows that the impact of restructuring on industries was more diverse and of a much larger scale in China.

Closer inspection reveals more differences in the restructuring effects on labor markets in the two countries. For the U.S. manufacturing sector (1973-1988), almost all industries experienced job losses, except rubber and printing (both merely gaining 0.6 percent employment) and electric machinery (barely gaining 0.1 percent). While for China's industrial sectors, although the majority of industries experienced job losses, a few industries such as apparel, leather, furniture, communication equipment still stood to gain. As discussed in McGuckin and Spiegelman (2004b), this is due to the offshoring effect—many developed countries like the U.S. outsourced low paid jobs to developing countries like China. However, we also noticed that although these industries are at the heart of the offshoring trend, the net job gains did not come from low job destruction. In fact, the job destruction rates for these industries were, like all the other industries, also high compared to that of the U.S. High job destruction rates together with high job creation rates generate high excess job reallocation rates. This fact is consistent with our earlier observations that, during the restructuring period, there were more job shuffling activities for almost every industry in China, even though net employment in some industries rose.

### 6. Job flows and productivity

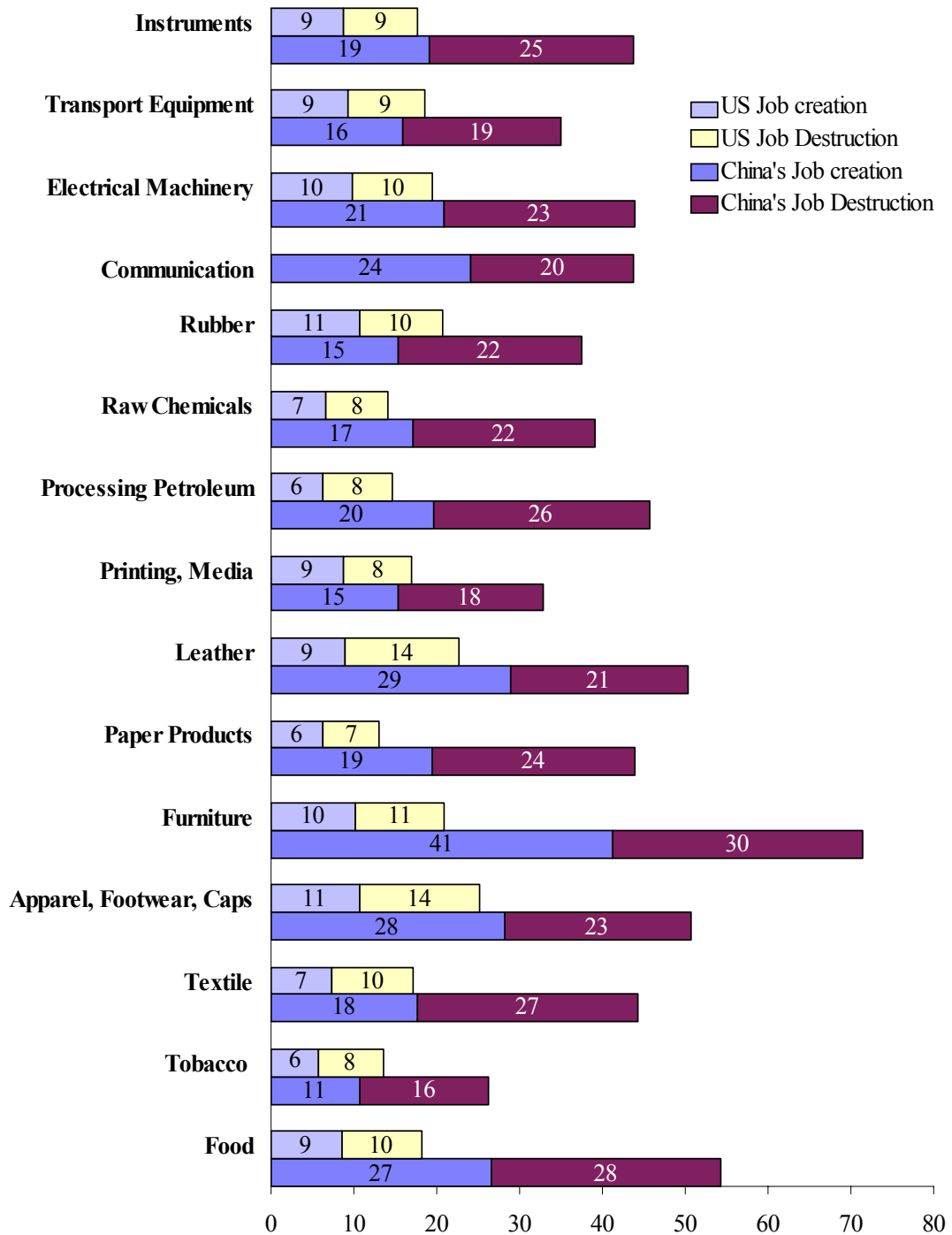
In this section we begin the process of linking performance measurement to job flows. Basic economic reasoning, going back at least to Schumpeter's argument, suggests that the reallocation of economic resources from lower to higher value activities is essential to improving productivity and living standards. Creative destruction involves the decline and exit of less productive enterprises and their replacement by more productive entrants and the expansion of better performers. These reallocations take place across and within enterprises, industries, regions, and countries. Here we focus on China and our classification of firms according to entrant, exits and continuers, as well as ownership types and jurisdictions.

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<sup>10</sup> The US job flows calculation is done by SIC code two-digit industry. It may not match the China's industrial classification exactly. However, as shown in McGuckin and Spiegelman (2004), many industries of the two countries have roughly the same coverage.



**Figure 17: Job flows for China (1995-2003) and the US (1973-1988)**  
(% of employment)



**Table 5: Productivity decomposition for China's large and medium industrial firms (1995-2003)**

	<i>Simple average 1000 Yuan per worker</i>	<i>Annual growth rates %</i>
Industrial total	153	20.4
Continuers (including reclassification)	149	22.5
Reclassified expanding continuers	165	14.6
Reclassified contracting continuers	146	13.8
Entrants	177	15.2
Exits	109	14.5

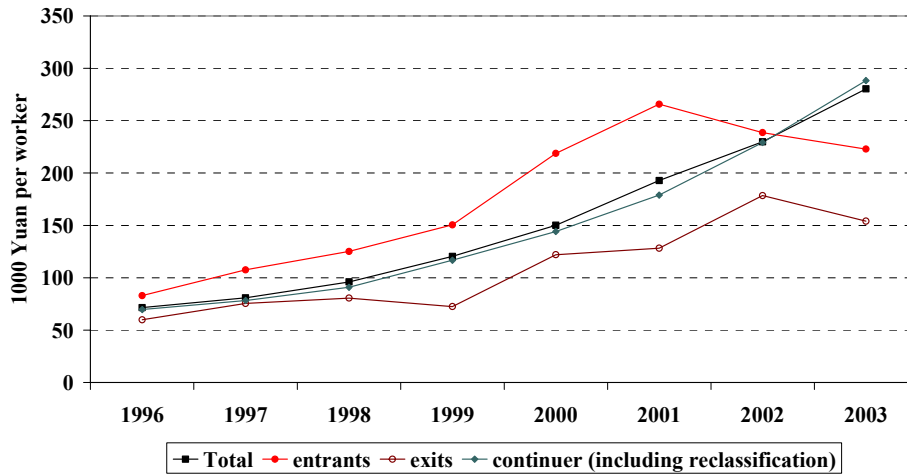
Table 5 shows the different productivity levels and growth rates for entrants, exits, and continuing firms based on the entire large and medium sized samples. We further decompose continuing firms according to whether they remain in the same ownership type or not. We also differentiate between reclassified expanding and contracting firms. Consistent with the TCB report on China's jobs and productivity (2004) which contained data through 2002, the extended data set shows China's industrial sector productivity growing at an astounding rate of 20.4 percent annually from 1995 to 2003.

Firms in all classes experienced productivity growth, even exiting firms. Figure 18 shows that the average firm exiting in 2002 had far higher productivity level than an exiting firm in, say 1998. While exiting firms showed far lower productivity levels than either continuing or entering firms in any year, the standards were advancing and the performance required to remain competitive has been progressing rapidly in China.

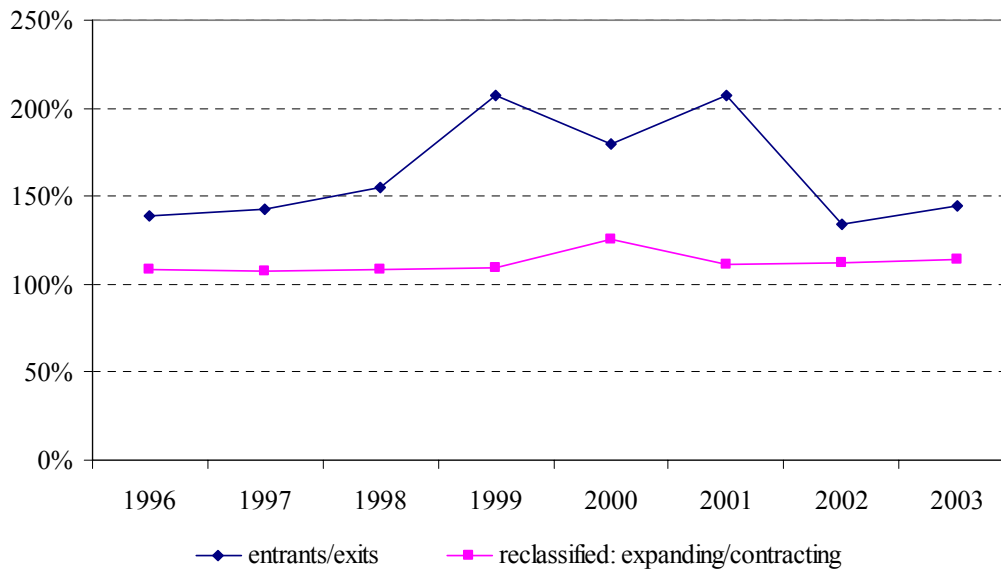
For example, the average productivity levels for entrants and reclassified expanding continuers were 177 and 165 thousand Yuan per worker per year, higher than the average industrial level (153 thousand Yuan per worker). The exits were at the bottom of the productivity rankings, at just 109 thousand Yuan per worker (Table 6). China's industrial productivity grew at a rapid pace because low productivity firms were not able to sustain intense competition and exit while higher productivity firms entered, grew, and survived.

The growth rate of productivity in China's industrial sector was relatively flat in the early years of the sample period, 1995-1998, but it accelerated after 1999. In studies by McGuckin and Stiroh (TCB 2002 and RES 1999) on the productivity performance of U.S. manufacturing plants, new plants consistently had a lower productivity level than the average manufacturing sector plant. However, those cohorts of new plants that survived increased to industry averages and above in later years. This is consistent with the learning by doing argument as new firms get experience operating in the industry and scale economies as they survive and grow.

**Figure 18: Productivity levels for entrants, exits, and continuers, China's large and medium industrial firms, 1995-2003**



**Figure 19: Productivity comparison: Entrants vs. exits, reclassified expanding vs. reclassified contracting firms (1995-2003)**



Thus, the fact that entrants' productivity levels are higher than of continuing firms is mildly surprising. There are various possible explanations for our observation of China's industrial sector that presents a different pattern (except for 2002-2003). What could account for the higher average for entrants? It is possible that this is coming from poor linkages for firms over time, particularly since we think the linkages are far better in the

later years, for which the data shows that the entrants were not above industry averages. The problem is that productive continuing firms are missed, counted as exits because of reclassification, and then “entered” at high productivity levels. This same problem would tend to overstate exits productivity levels.

Figure 19 provides another look at this issue of entrants and exits as well as reclassified firms moving from one ownership class to another. The top line on the graph gives the productivity ratio of entrants to exits, while the lower line shows the productivity ratio of reclassified expanding firms to reclassified shrinking firms. On average, entering firms were 63.6 percent more productive than firms exiting China’s industrial sector; the expanding reclassified firms were 12.1 percent more productive than shrinking reclassified firms. Recall that the majority of job creations and job destructions came from entrants and exits. This implies, as expected, that entering and exiting firms had a larger impact than the reclassified continuers on the evolution of industrial productivity.

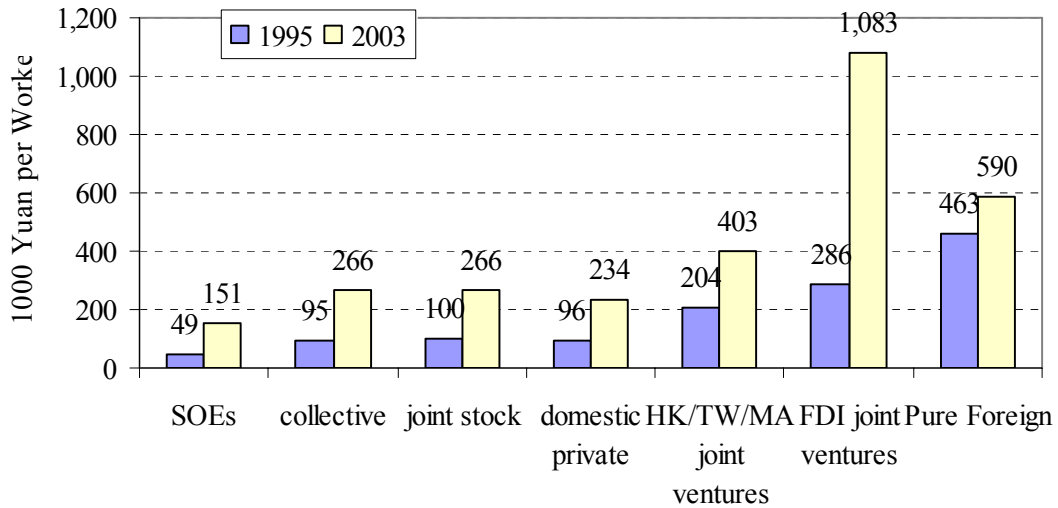
### *6.1. Productivity and ownership type*

In this section we provide a simple comparison of productivity levels and growth rates by ownership type. In Figures 20-21, domestic firms are listed towards the left axis, while firms with foreign ownership are listed towards the right, with pure foreign enterprises listed at the right end. Furthermore, firms are listed in order of decreasing government involvement, with firms having the most government involvement listed on the left and private firms on the right.

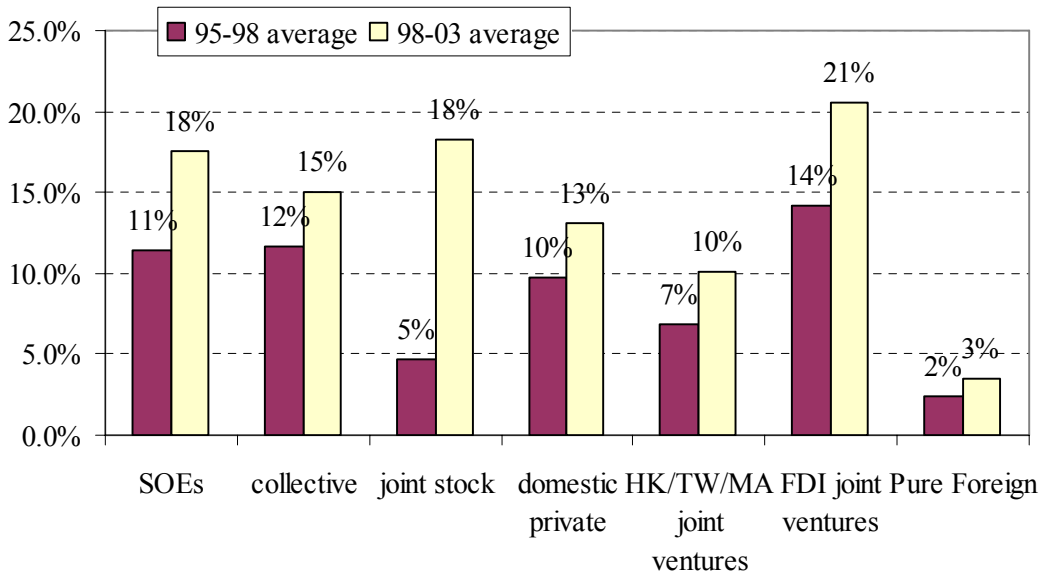
It was shown in Table 5 that all types of firms increased productivity during the period 1995-2003. In this regard firms with foreign ownership led the way in 1995 and further expanded their advantage by 2003. Domestic enterprises showed lower productivity levels than firms with foreign ownership. The SOEs remained at the low end of the productivity ladder, gaining most of their improvements from downsizing and job loss. This is especially true in terms of the labor productivity levels. However, the restructuring of SOEs generates enormous productivity gains to both SOEs and joint stock enterprises. In fact, their labor productivity growth ranks second and third for the period 1998-2003 (17.6 percent and 18.3 percent respectively), following foreign invested enterprises (excluding pure foreign and HK/TW/MA invested foreign firms).

It is worth mentioning the exceptional productivity performance of the foreign invested joint ventures (excluding pure foreign and HK/TW/MA invested foreign firms). Although their productivity levels were only about 61.8 percent of pure foreign firms in 1995, they grew at an annual rate of 18.1 percent during 1995-2003, reaching 1083 Yuan per work per year in 2003—83.6 percent more productive than pure foreign firms. On the one hand, it shows that foreign direct investment (FDI) still brings better productivity performance to Chinese enterprises because of high technology and advanced management. On the other hand, although consistent steady growth of foreign owned firms reflects the stability of the Chinese government’s supportive policy to FDI, the priority still extends more towards enterprises with domestic ownership share.

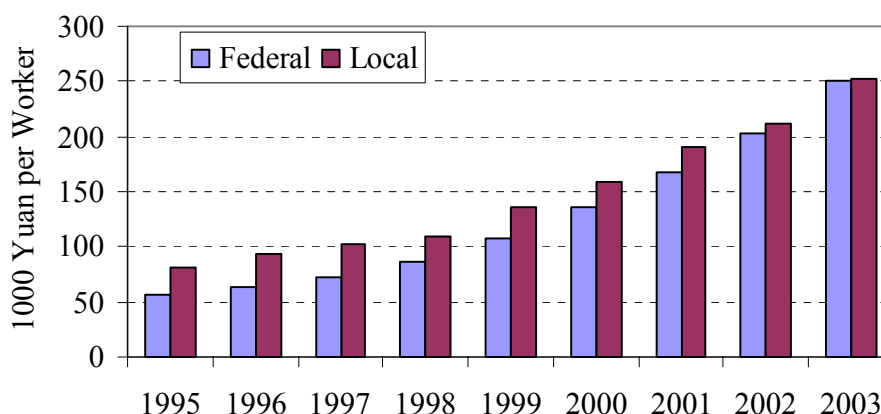
**Figure 20: Comparison of productivity levels by ownership type**



**Figure 21: Comparison of productivity growth by ownership type**



**Figure 22: Productivity levels by jurisdiction (excluding pure foreign) for China's large and medium industrial firms, 1995-2003**



### 6.2 Productivity and jurisdiction

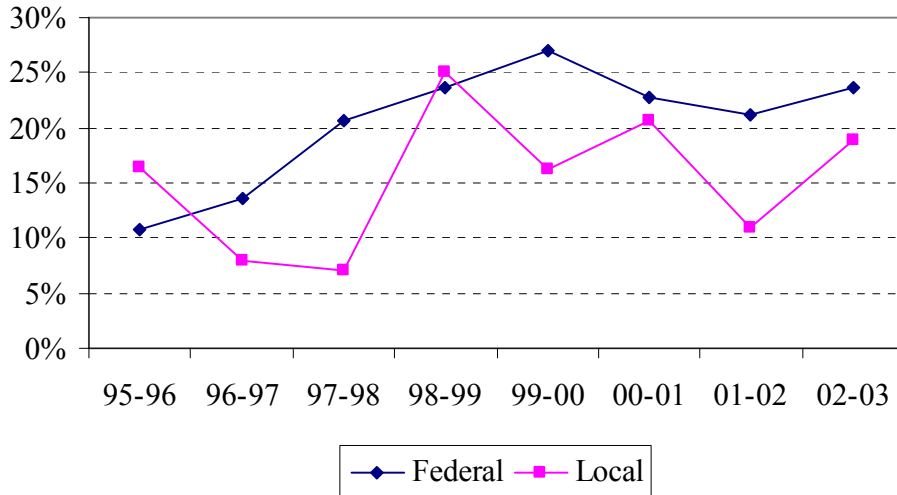
As found in other studies, the “soft budget” leads to low efficiency in federally administered firms. Our calculations confirm the same.<sup>11</sup> On average, local firms are 24 percent more productive than federal firms during the period 1995-2003. In Figure 22, each left bar (federal) is always lower than the right one (local). However, the productivity gap between federal firms and local firms has been closing up over time. In 2003, the federal firms’ productivity performance was almost the same as that of local firms.

The catching up of federal firms already indicates that their productivity grew at a faster pace than the local firms. Figure 23 gives the evidence by illustrating the annual productivity growth rates by jurisdictions. Except for year 1996 and year 1999, federal firms always grew at a higher rate than local firms. In fact, federal firms grew 5 percentage points faster than local firms on an annual average base during the study period (20.3 percent vs. 15.3 percent).

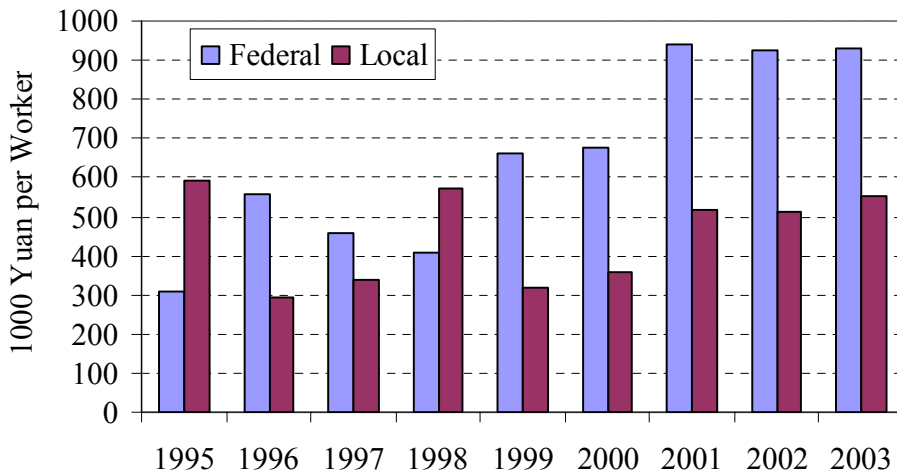
As discussed earlier, most of the fast growth was driven by federalization and privatization process. Many SOEs improved efficiency by shedding off redundant employees, especially non-production workers. Many more SOEs converted to joint stock firms and took in private shares. Since the majority of SOEs are administered at the federal level, the restructuring of SOEs led to productivity gains over the reform period.

<sup>11</sup> Since pure foreign enterprises are a special group which follows different regulations, we will study this group separately.

**Figure 23: Productivity growth by jurisdiction (excluding pure foreign) for China's large and medium industrial firms, 1995-2003**

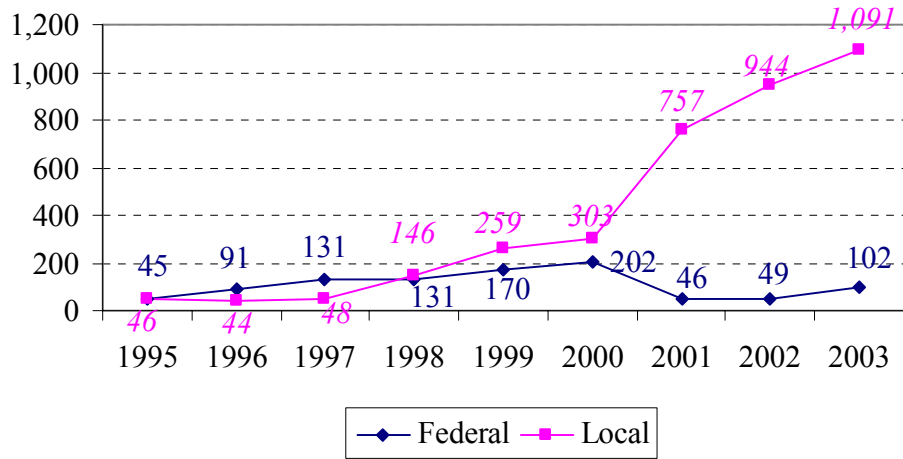


**Figure 24: Productivity levels for China's large and medium pure foreign enterprises by jurisdiction, 1995-2003**

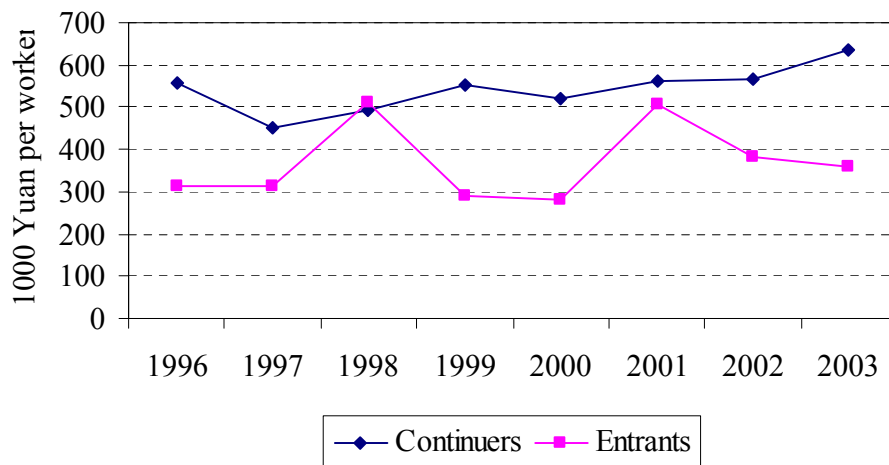


The pure foreign enterprises started from a high level in terms of productivity performance. Therefore, they were growing at a relatively low annual growth rate of 3.1 percent. However, when breaking this group by jurisdictions, federally administered pure foreign firms grew at 14.7 percent, while locally administered pure foreign firms even had a -0.8 percent productivity growth rate.

**Figure 25: Number of China's large and medium pure foreign enterprises by jurisdiction, 1995-2003**



**Figure 26: Productivity levels of China's large and medium pure foreign firms for continuers and entrants, 1995-2003**



In order to further investigate the sources of the different productivity growth, we study the evolution of pure foreign firms by jurisdictions. It turns out that the total number of pure foreign firms slowly increased but stayed fairly flat until year 2000 at both federal level and local level (Figure 25). However, from year 2001 onward the difference has been dramatic. While for locally administered pure foreign firms, the total numbers shoot up every year after 2001, the total numbers of federally administered pure foreign firms



dropped and stayed small.<sup>12</sup> In year 2003, the number of locally administered pure foreign firms was ten times the number of federally administered pure foreign firms. This indicates that most of the new pure foreign firms, at least for the years 2000-2003, entered at the local level. While many of the federally administered firms probably were continuers.

Therefore, we deduce that the productivity growth for locally administered pure foreign firms was probably dragged down by lower productivity levels for entrants (Figure 26). Meanwhile, a small notable portion of continuers administered at the federal level increased their productivity over time. Although this is not the case for China's large and medium industrial firms at the aggregate level as discussed earlier, it is consistent with other literatures on the learning by doing argument.

## **7. Concluding remarks**

China's economic reforms, especially the SOE restructuring, has had a huge impact on China's economy. TCB did a series of reports focusing on the performance of the labor market and productivity for the industrial sector. This report is a more in-depth effort on this topic, focusing on the evolution of the labor market. This study also features the first research conducted on firm level data aiming at understanding the dynamics of China's labor market.

By identifying the gross job flows for China's industrial sector and analyzing the underlying forces, this report uncovers the evolution of the reform process and its impact on the whole industrial sector. The job creation and job destruction rates for China is higher than almost all countries for which such data is available—nearly double the magnitudes of that of the U.S. Moreover, job destruction dominates job creation during this period, which leads to net employment loss annually especially after 1998, with the exception of 2003. The dynamics of China's industrial employment implies large scale restructuring of enterprises, which displays greater effect on the labor market from year 1998 on.

Because of the dramatic changes in the labor market, China's labor productivity performance reached an astounding annual rate of 20.4 percent. Particularly because of the downsizing of the government-controlled enterprises, labor productivity accelerated after 1998. In general, enterprises with foreign ownership performed better than domestic firms. However, China's enterprises' restructuring also stimulated productivity growth of domestic firms, and the productivity gains increased over time. Shifts of governmental regulation to more local areas have also created a productivity stimulus for federally administered firms to catch up with firms at the local government level.

In sum, China has made substantial progress in its transition to a market-driven economy, and privatization and federalization have been very important factors in improved business efficiency. In closing, we expect that the competition and privatization, along with China's reform process, will continue to play an ever more positive role in China's economy.

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<sup>12</sup> The reason that the total number for pure foreign firms soared up after 2001 is due to the WTO effect. In order to comply with WTO's regulation, China modified related laws and regulations to improve the environment for foreign direct investment.

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## Appendix

### Empirical Application—Calculating Gross Job Flows

#### 1. Observed sample

To date, we have not dealt with a universe of all firms, but instead a sample of roughly 22,500 firms each year. The sample was defined as follows:

“Any firm that is large or medium in one of the 9 years studied was included in the sample. However, when a firm is not large or medium, it was considered to *not exist* in that year.”

This sample was used for several reasons. First, sample of large and medium firms was the most likely to contain firms for which year-to-year linkages could be found, it conformed to the sample in the original project with the 1995 data and work had already been undertaken by NBS. As stated previously, a larger, more complete set of firms that also contains small industrial firms would be ideal. However, data quality and inconsistency issues associated with small firms would obstruct accurate calculation of gross job flows. For a job flows calculation between year  $t$  and year  $u$  the following table shows how firms should be classified:

	Status in year $t$	Status in year $u$
<i>Continuer</i>	Large or Medium	Large or Medium
<i>Entrant</i>	Small or Does not exist	Large or Medium
<i>Exit</i>	Large or Medium	Small or Does not exist
<i>Not Included</i>	Small or Does not exist	Small or Does not exist

#### 2. Calculating job flows by sectors

How does job creation and job destruction vary among ownership, industry and jurisdiction? Here we follow the concept of “sectors” by Davis *et. al*: sectors are groups of firms defined by observable characteristics. In the context of our study, it refers to ownership, jurisdiction, and industry. We elaborate on the job flow calculation method for ownership types. The scheme can also be applied to industry and jurisdiction.

The following table defines how ownerships should be categorized ( $X$  is a variable representing a specific ownership type. There are 9 such ownership types or classifications.) In all these cases when the variable of a continuer changes from year  $t$  to year  $u$ , it is labeled as a hybrid value  $XY$ , which corresponds to reclassified firms. There are some special issues associated with these reclassified firms when calculating job flows by groups; it is further discussed below.

Type	Status in year $t$	Status in year $u$	Ownership Classification
<i>Continuer</i>	Ownership = $X$	Ownership = $X$	$X$
<i>Continuer</i>	Ownership = unknown	Ownership = $X$	$X$
<i>Continuer</i>	Ownership = $X$	Ownership = unknown	$X$
<i>Continuer</i>	Ownership = unknown	Ownership = unknown	Unknown
<i>Continuer</i>	Ownership = $X$	Ownership = $Y$	$XY$
<i>Entrant</i>		Ownership = $X$	$X$
<i>Entrant</i>		Ownership = unknown	unknown
<i>Exit</i>	Ownership = $X$		$X$
<i>Exit</i>	Ownership = unknown		Unknown

### 3. Calculating the job flows

The calculation of job flows is then done for each ownership, jurisdiction, and industry. Job flows represent a change in the number of jobs from year  $t$  to year  $u$ . The flows are based on the number of workers in year  $t$  and in year  $u$ . The following table summarizes the six types of flows:

Flow Type	Firm Type	Criteria (year $t$ and $u$ )	Calculation of flow
$CC$ = Creation from continuer	Continuer	$workers(u) > workers(t)$	$Workers(u) - workers(t)$
$DC$ = Destruction from continuer	Continuer	$Workers(u) < workers(t)$	$Workers(t) - workers(u)$
$CE$ = Creation from entry	Entrant	All entrants will be $CE$	$Workers(u)$
$DE$ = Destruction from exit	Exit	All exits	$Workers(t)$
$LC$ = Loss from reclassification of a firm to a new category	Continuer	The firm is in group $X$ in year $t$ , but not in year $u$ .	$Workers(t)$
$GC$ = Gain from reclassification of a firm to a new category	Continuer	The firm is in group $X$ in year $u$ , but not in year $t$ .	$Workers(u)$

The last two rows deal with firms changing classifications. When a firm changes its industry, ownership or jurisdiction, jobs will move from one category to another. For example, if a firm moves from the textile industry to the garment industry, jobs will be lost in textiles and gained in garments. We have two types of flows, one to account for losses through reclassification and one to account for gains through reclassification. Note that  $LC$  and  $GC$  are recorded simultaneously because each  $LC$  in a given category is associated with  $GC$  in another category.