Creating a Longitudinal Panel to Study China's Job Flows: Research Issues and Preliminary Results

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Working Paper Series Vol. 2004-14
July 2004

The International Centre for the Study of East Asian Development, Kitakyushu

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About This Note

This research note is a supplement to The Conference Board's report to the International Center for East Asian Development (ICSEAD). It describes our efforts in developing an assessing a longitudinal panel of data on China's industrial firms. The National Bureau of Statistics China and The Conference Board are working towards this goal for China. In this project the team of researchers made considerable progress in setting up such a database. We document both our progress and also the challenges that lie ahead. We also offer some very preliminary results on economy-wide job flows in China.

This work is of great importance. Recent research has used longitudinal microdata to significantly enhance our understanding of how labor markets function in the developed world. However, the creation of a longitudinal microdata panel takes considerable amount of time and resources. In the United States, the Center for Economic Studies spent about 15 years developing the Longitudinal Research Database (LRD). The U.S. effort required recreating history from records that had not been created with the possibilities of panels in mind.

For China the possibilities are very exciting because they are essentially starting from scratch and it is important to get the process started correctly from the beginning. We thank ICSEAD for its funding of our research project with the National Bureau of Statistics of China.

The main report, "Job Loss and Productivity Gains in China's Industrial Sector" provides detailed analysis of trends in employment, output, and productivity in China's industrial sector between 1995 and 2002. That report is based on an annual sample of China's 23,000 largest industrial firms 1995 and 2002. These same microdata were used to construct a longitudinal panel for the study documented in this note. It is one of the best sources of data on Chinese industry to study employment changes – the "large and medium firm sample" provided by China's National Bureau of Statistics, Department of Industry and Transport Statistics. We constructed a 5-year longitudinal panel between 1998 and 2002 and apply the methods of Davis et al. (1996).

We report the work in two parts. The first part details the methodological considerations in constructing a longitudinal panel of employment microdata. We describe the method we used and document its advantages and shortcomings. We also present ideas for future improvements, which we are now discussing with NBS.

The second part presents some preliminary economy-wide results, and compares them to those found in other economies, both developed and transition. We observe very rapid change in China's labor market, and creation and destruction rates that are far above those of the developed world, and even of most transition economies. The pace of losses and gains in the industrial sector, as well as the net job loss, slows slightly over the 1995-2002 period. This suggests that China may be entering a phase of more moderate restructuring.

Progress Report on Job Creation and Destruction Work

I. INTRODUCTION

Recent academic work has underscored the value of longitudinal microdata in understanding macroeconomic trends in employment and productivity. Longitudinal microdata is unique in that it tracks the progress of individual firms as they are born, grow, contract, and die. The U.S. Census Bureau's Center for Economic Studies (CES) created the first large high-quality longitudinal database in 1980s – the Longitudinal Research Database. It contains rich plant-level data for all but the smallest manufacturing firms in the United States.[1] Davis et al. (1996) used the LRD to find that in the U.S. roughly 1 in 10 manufacturing jobs is created and another 1 in 10 is destroyed each year. They also report that job destruction rates are much more linked to the economic cycle than creation rates, i.e. during recessions job destruction soars, while creation only slightly slows down. Davis and Haltiwanger (1999) expand these findings to most developed economies.

More recently, many researchers have applied the job creation and destruction model to transition economies. As an economy undergoes transition from a centrally planned structure to a market-based system, there are substantial employment reallocations. Large state-owned enterprises that employ the majority of the population are often no longer viable once market mechanisms are in place. While these operations

are dismantled, private firms begin to increase their employment. However, the process is often very tumultuous leading to high unemployment rates, if only temporarily. The literature on job creation and destruction in transition economies suggests two key basic facts: 1) during rapid restructuring job destruction will rapidly outpace creation, and 2) as the reallocations slow the rates will converge towards the 10 percent level seen in developed economies. This holds true both for countries that restructure rapidly, such as Estonia, and those that take a more gradual approach, such as the Czech Republic and Slovenia. Haltiwanger and Vodopivec (2000) report destruction rates as high as 14% during the height of Estonia's reforms in 1993, but these converged to the 10 percent level by the late 1990s. Jurajda and Terrell (2002) compare Estonia with the Czech Republic, and find that while the Czech Republic's more gradual approach led to lower intervening unemployment, both countries achieved the same result – convergence of destruction and creation levels toward comparable magnitudes for developed economies.

China is currently going through a period of very rapid economic reform as the government attempts to modernize the large, ailing state-owned enterprises. The state has pursued privatization policies, as well as aggressive courting of foreign direct investment. The result has been some of the most large-scale employment reallocations in world history. However, it has previously not been possible to calculate China's gross job flows because of data availability problems. Building longitudinal panels requires substantial work on the part of the statistical agencies, as firms must be tracked over time through name changes, location changes, mergers, acquisitions, and divestitures. This is especially difficult for Chinese firms, due to the rapid evolution of business ownership types and transformations.

II. METHODOLOGY

The goal of this project is to create a longitudinal sample of China's large and medium industrial firms. The concept of a "large and medium" firm in China is based on

[1] See Jensen and McGuckin (1997) for a review of the findings and an assessment of the value of the Longitudinal Research Database. Also see Bartlesman and Doms (2000). Ownership changes are particularly difficult to track. See McGuckin, Ngyuen, and Resnik and McGuckin (1998).

industrial output criteria, such as tons of steel or kilowatt-hours of power.[2] The precise standards differ from industry to industry, but these firms are generally among the largest in terms of output and employment. They account for roughly 55% of gross output and 31% of employment in the industrial sector.

Data quality is a main reason we focus on the large and medium firms – their statistics are of substantially higher quality than those for small firms. For the Chinese statistical agencies, the accurate collection and reporting of data on its hundreds of thousands of industrial enterprises is a very imposing task.

The sample covers a substantial portion of the Chinese industrial sector, but is not designed to be a statistically representative one. Indications are that the sample gives a good picture of the broader Chinese industrial sector. For example, the overall industrial sector shows a 15 percent net job loss between 1995-2002, which is virtually identical to that found in the large and medium firm sample. This suggests a similar pace of restructuring. The broader sector sees comparable, but slightly slower output growth (12% annually vs. 14% in the large and medium). Additionally, the share of total government-run enterprises in the broad sector is similar to the share observed in our sample.

The sample differs from the rest of industrial sector in some important ways. First the small firms have 25 percent fewer employees than the average large and medium sized firm. Second the large and medium firms are 2.7 times as productive on average. The sector-wide employment share of smaller firms is much larger than their output share. Third, medium and large firms traditionally received preferential treatment from banks. This supported their growth and, in some cases, placed the larger firms among the group of firms in greatest need of restructuring. Finally, although the government presence is similar in each, the medium and large firms tend to be dominated by SOEs, while smaller firms are more frequently classified as collectives.

The Chinese National Bureau of Statistics identifies each medium or large firm with a unique firm identification (ID) code. In theory this ID code will stay with the firm through name, ownership, and location changes. However, this does not always take

[2] See Appendix A for complete documentation of the large and medium criteria. We had this documentation translated into English from an NBS source.

place in practice, largely because identifying new firms and name changes requires information from various agencies outside NBS. Still, ID codes remain the most reliable way to track firms from year to year.

There are strong indications that the match rates are somewhat lower than they should be and that entrants and exits are too high. The long-term solution to this problem is two-pronged: 1) the statistical agencies need to develop better procedures to track firms through ownership and related changes as well as identify true entrants and exits, and 2) the creation of methods to match firms with the help of variables beyond ID code. Attempts to work with historical data will benefit from the second strategy, but there are limits on how successful it can be.

There are several variables that can be considered to increase the match rate, such as name, address, industry, and location code. For Chinese firms, name is not an ideal matching criterion because many firms have similar names. Address and industry offer a higher potential for improved matches, but algorithms would need to be developed to match Chinese addresses. These exist currently in the U.S., but only for English text. These techniques are well beyond the scope of our initial study, but will be useful for moving forward.

In the current project, firms were linked over time by NBS based on their ID code on a year to year basis. One issue is that it is possible for firms to change their size classification midway through the panel (e.g. a small firm may be re-classified as medium). Indeed this occurs frequently in our sample. It would be incorrect to classify these firms as true entrants and exits for the purposes of a job flow analysis. At the same time, we do not want to include small firms for data quality reasons. The approach that we take is midway. We include all firms that were large or medium in at least one of the years studied – a total of approximately 51,000 firms. For example, if a firm was small in 1998, but large in 1999-2002, we will include it in the sample for all years. We will not classify it as an entrant in 1999, which would happen if we simply ignored small firms. This has the effect of enlarging our sample to the greatest extent possible while maintaining accuracy. Firm's whose size category is reclassified will not be artificially labeled as entrants.

III. PRELIMINARY RESULTS

We find 16 million jobs created and 24.5 million jobs destroyed between 1998 and 2002, for a net of 8.4 million jobs lost (Exhibit 1). The creation and destruction rates were 12.1% and 18.4% respectively (Exhibit 2). The creation rate is slightly higher than that for developed economies (around 10%), but the destruction rate is substantially above both developed economies (also around 10%) and even some of the most rapid transition economies (i.e. Estonia at 14% in 1993). For created jobs, 62 percent were from entering firms while 38 percent were from continuing firms. For destroyed jobs, 55 percent were from exiting firms, and 45 percent from contracting firms. However, when we look at the number of firms creating and destroying jobs the numbers reverse. Only 21 percent of the firms that created jobs were entrants, with 79 percent being expanding firms. Similarly, just 17 percent of firms destroying jobs were exits, and 83 percent were contracting firms (Exhibit 3).

These numbers show that a relatively small number of very large firms accounted for more of the jobs created and destroyed by entering and exiting firms. This is strongly indicative that the statistics are being driven by ID changes, rather than true greenfield entry and exit. It is likely that many of these firms were those changing their ownership structure in the privatization process. For this reason they are not yet comparable to existing job flow studies, but they do offer insight into the rapid pace and magnitude of the change. Our numbers also show some signs of convergence towards the end of the period. By 2002 job creation rates slow to 9 percent and job destruction rates to 13%. Part of this may be better tracking toward the end of the period. While the time series is too short to define a trend, these numbers suggest that the reform may be slowing and convergence towards the 10 percent level beginning (Exhibit 4).

IV. FUTURE STEPS

The National Bureau of Statistics China and The Conference Board continue to work on building a longitudinal panel of jobs data for China. Our next step is to resolve the issues surrounding ID-changes, and better distinguish between greenfield entry and ownership conversion. From the analytic perspective, we are currently focusing on programs to

create decompositions by ownership and industry type. These will provide some useful results as well as help resolve these issues. Secondly, we are working on ways to achieve a better match rate between firms through address and industry code algorithms. Finally, we are doing a detailed study of the sampling issues surrounding the selection of medium and large firms. This will be important in extended our results to the broader industrial sector.

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Exhibit 1: Job Creation and Destruction (levels): China, Industrial Sector, 1998-2002 **[unit = 1 million jobs]**

Year	Net Employment Change	Job Creation			Job Destruction		
		Total	Expanding Firms	Entering Firms	Total	Contracting Firms	Exiting Firms
Total	-8.4	16.0	6.8	9.3	-24.5	-13.4	-11.1
1998-1999	-2.6	4.3	1.8	2.5	-6.9	-3.9	-3.0
1999-2000	-2.4	4.0	1.9	2.2	-6.4	-3.8	-2.6
2000-2001	-2.2	4.5	1.4	3.1	-6.7	-3.1	-3.6
2001-2002	-1.3	3.2	1.7	1.5	-4.5	-2.6	-1.9

Source: Tabulations by NBS China and The Conference Board on microdata for all large and medium firms in China's industrial sector. The industrial sector includes manufacturing, mining, and the production of utilities.

Exhibit 2: Job Creation and Destruction (growth rates): China, Industrial Sector, 1998-2002 **[unit = % change]**

Year	Net Employment Change	Job Creation Rate			Job Destruction Rate		
		Total	Expansion Rate	Entry Rate	Total	Contraction Rate	Exit Rate
Total	-27%	50%	21%	29%	-77%	-42%	-35%
1998-1999	-8%	13%	5%	8%	-21%	-12%	-9%
1999-2000	-7%	12%	6%	7%	-20%	-12%	-8%
2000-2001	-7%	14%	4%	10%	-21%	-10%	-11%
2001-2002	-4%	9%	5%	4%	-13%	-8%	-6%

Note: The rate of job creation or destruction is defined as the number of jobs created or destroyed between periods t and t-1, divided by the average of the total number of jobs in period t-1 and t. The sum of the creation rate plus the destruction rate in any period will equal the net percent change in employment.

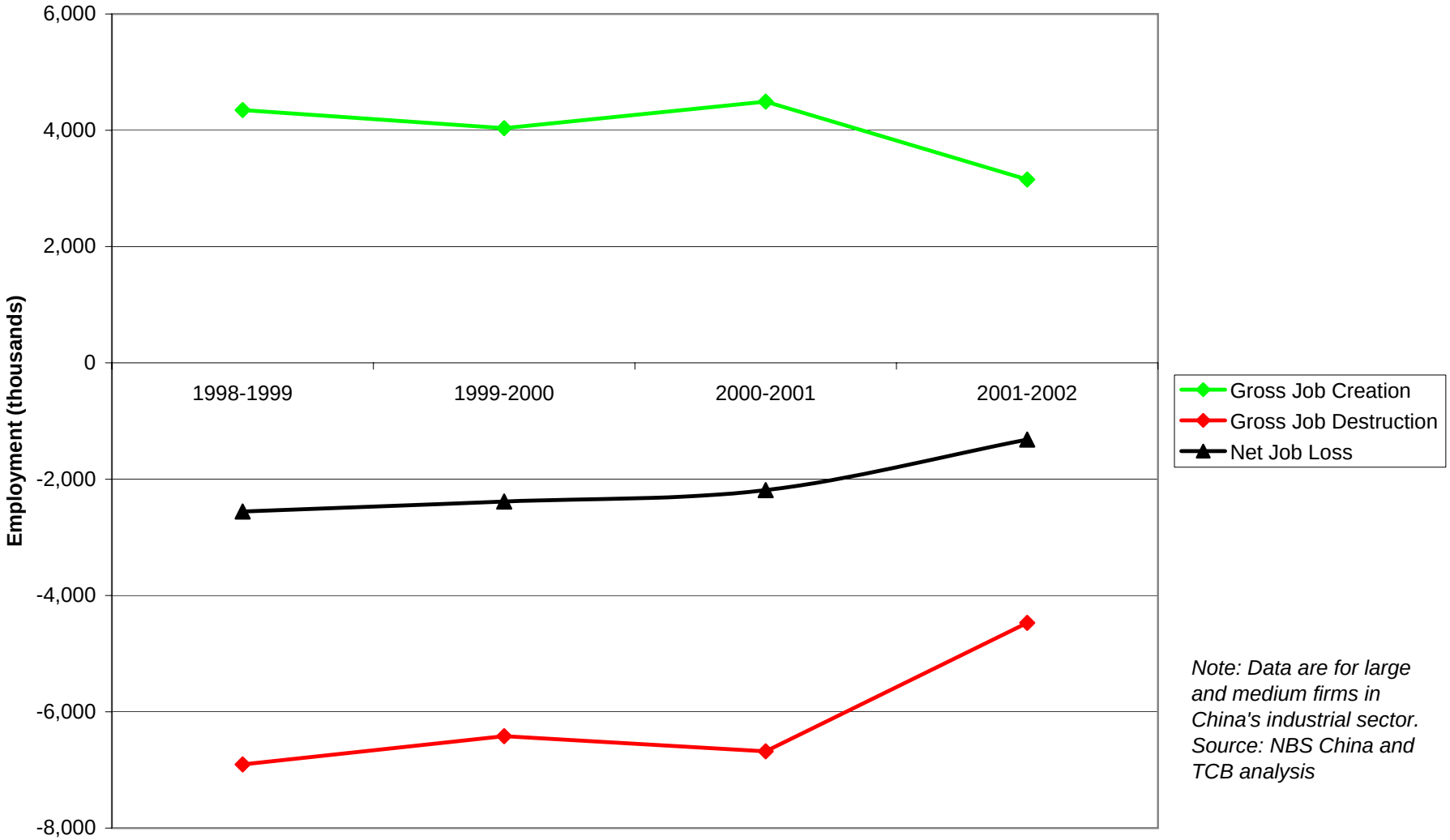
Source: Tabulations by NBS China and The Conference Board on microdata for all large and medium firms in China's industrial sector. The industrial sector includes manufacturing, mining, and the production of utilities.

Exhibit 3: Components of Job Creation and Destruction: China, Industrial Sector, 1998-2002

	Creation		Destruction	
	Share of Expansions	Share of Entrants	Share of Contractions	Share of Exits
Jobs	38%	**62%**	45%	**55%**
Firms	**79%**	21%	**83%**	17%

Source: Tabulations by NBS China and The Conference Board on microdata for all large and medium firms in China's industrial sector. The industrial sector includes manufacturing, mining, and the production of utilities.

Exhibit 4: China is Destroying Industrial Jobs, But Also Creating New Ones



Note: Data are for large and medium firms in China's industrial sector.
Source: NBS China and TCB analysis