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Chinese Manufacturing Performance in Comparative Perspective, 1980-2002

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Abstract

This paper uses the detailed information in the 1995 Census of Industrial Production as a benchmark for analysing the coverage, concepts and consistency of published statistical series. On the basis of the analysis, the paper proposes a series of adjustments which result in more consistent long-run series of labour productivity for 21 manufacturing sectors from 1980-2002.

For purposes of international comparisons with the USA, the paper subsequently presents industry of origin unit value ratios for the benchmark year 1995. These are used to convert Chinese value added into US dollars. In 2002, value added for the statistically well-covered sectors of Chinese manufacturing was 43 per cent of US value added, against 12 per cent in 1980.

The comparative analysis of labour productivity points to a long period of Chinese growth without catch up from 1980-1992. After 1992, there was a rapid and accelerating process of catch up. In comparative terms labour productivity increased from 5.3 per cent of the US level in 1995 to 13.7 per cent in 2002.

Key words: China, manufacturing, productivity growth, catch up, unit value ratios, international comparisons

JEL codes: O14, O40, O47

1 Introduction

China has emerged as a major global player in world manufacturing, but our statistical knowledge and understanding of this phenomenon lag behind the speed of real world economic developments. This paper aims to contribute to our knowledge of real levels of output and productivity in Chinese manufacturing branches, in order to be able to better assess the position and role of Chinese manufacturing in the wider structure of world manufacturing. To this end, we will use branch specific unit value ratios to convert sectoral GDP series into current US dollars.

This paper is part of a larger project in which branch GDP figures for 35 important industrial producers of manufactured goods are converted into US dollars, resulting in new insights concerning the relative size of branches within world manufacturing, and the changing role of developing countries in this structure. The paper is a revision, update and extension of Ren, Szirmai and Bai (2002).

This paper addresses four related issues. First, it presents an in depth analysis of concepts, coverage and consistency of different time series of employment and output in industry and manufacturing (section 2). This paper will be unashamedly empirical. The quality and accessibility of Chinese statistics are improving very rapidly. The statistical agencies have made considerable progress in shifting to the System of National Accounts and more and more statistics are becoming available for research and scrutiny (see e.g. Hsueh and Li, 1999; NBS, 1997; NBS/Hitotsubashi, 1997; OECD 2000). However, the numerous changes in concepts, approaches and coverage in combination with rapid changes in economic structures and patterns of ownership in a liberalising economy create major problems for the consistency of time series. Without time series which are consistent in concepts and coverage, any attempt to analyse the Chinese industrial growth experience using sophisticated economic techniques becomes meaningless.

Our method is to use the very detailed information in the 1995 census of industrial production, as a benchmark for assessing the coverage, concepts and consistency of commonly used statistical series published in the China Statistical Yearbooks, the Industrial Statistical yearbooks and the input-output tables. On the basis of this analysis, we make a series of adjustments to published series, arriving at consistent time series for 21 sectors of manufacturing, presented at the end of this section.

The second part of the paper focuses on the calculation of unit value ratios which can be used as converters for real output and productivity comparisons relative to the USA (section 3). These comparisons are based on very detailed information in the 1995 census. This results in benchmark productivity comparisons with the US for 1995. This comparison has previously been discussed in detail in Ren et al (2002). Here only a summary will be presented focusing on new elements and the final results. New elements include the extrapolation of the 1995 unit value ratios forward and backward in time, using US and Chinese deflators, and the use of a more detailed sectoral classification based on ISIC3.1.

The third element of the paper is a discussion of the size of Chinese manufacturing (section 4). Here, we will discuss Chinese real output in current US dollars, as a percentage of US output. Shifts in the shares of China relative to the USA are

indications of the changing structure of world manufacturing, which will be studied further in the wider project.

Finally, we will present evidence of accelerating catch up in Chinese manufacturing relative to the US, on the basis of an extrapolation of our benchmark productivity comparison for 1995. This results in detailed series of comparative productivity for the period 1980-2002.

2 Coverage and consistency in time series of output and employment in Chinese Manufacturing

2.1 Introduction. Discussion of some of the main problems

2.1.1 Coverage of output

The coverage of the most frequently used longer time series is declining, as a result of the rise of new types of enterprises in China. This is illustrated in Table 1, which compares coverage of enterprises in the 1985 and 1995 industrial censuses. The enterprises in the bottom panel of the table are not or not well covered.

Detailed information on a larger set of variables broken down by sector of manufacturing is primarily collected only from 'enterprises with independent accounting systems at township level and above'.[1] These include the great majority of state-owned enterprises, urban collectives, joint ventures and large foreign owned enterprises. The most detailed information is collected about the state-owned sector, of which the importance in the industrial economy has been declining. For the enterprises in the bottom panel of table 1 – sole proprietorships, private enterprises, village collectives, rural cooperatives, etc - information is scarce and incomplete. No sectoral breakdown is available. The problems of coverage are getting worse over time, as China progresses towards a market economy and the structure of ownership is changing.

In 1978, independent accounting enterprises at township level and above accounted for most of output and employment in the industrial sector, but every year this becomes less the less and less true. In 1985, detailed information was available for a subset of 358,701 enterprises accounting for 87 percent of total gross output in industry. By 1995, the percentage of industrial output covered had dropped to 67 per cent. Since then it has declined further. The situation is getting worse and worse from year to year as the importance of the statistically well-covered sectors in the economy declines.

[1] After 1998, the size criterion has replaced the administrative criterion. Since then detailed information is collected on enterprises with more than 5 million Yuan in sales.

Table 1: What Is In and What Is Out?
Number of Enterprises in Industry, 1985-1995

	1985	1995
Enterprises with IAS, township level and above	**358,701**	**510,381**
of which:		
State-owned enterprises	70,342	87,905
Collective enterprises at township level and above	286,570	363,840
Private enterprises	-	2,708
Joint ventures of state and collective enterprises	1,126	5,493
incorporated enterprises	-	5,559
Foreign funded enterprises	516	44,293
Other	147	583
Other enterprises	**4,826,599**	**6,831,136**
of which		
State-owned enterprises, non IAS	23,358	30,095
Collectives		
Rural township collectives, non IAS	46,636	15,642
Village collectives	632,601	680,686
Rural cooperatives	741,664	324,922
Other collectives	33,468	80,538
Private enterprises	-	284,775
Individual enterprises/sole proprietorships	3,347,804	5,403,643
Other	1,068	10,835
Grand total	**5,185,300**	**7,341,517**

Source: 1985 census, 1995 census
IAS: Enterprises with independent accounting systems

2.1.2 Changing coverage of the employment series

In Table 1 the establishments covered accounted for 68 per cent of industrial employment in 1985, dropping top 58 per cent in 1995 (Census, 1985, 1995). The coverage of employment in frequently used time series is even more limited than in the industrial census (see section 2.4.2). If one wants to study trends at sectoral level, the overwhelming bulk of industrial employment is left out of consideration. For instance, in the published 1993-99 time series on employment, sectoral detail is only provided for 52.1 million of the total of 147.4 million persons engaged in industry in the year 1995. For output, coverage is slightly higher as the covered enterprises tend to have higher productivity per worker than the non-covered enterprises. But incomplete and changing coverage will affect all productivity estimates. At the minimum, researchers should carefully specify what subset of enterprises they are referring to.

A major and disturbing discovery of this research project is that recent time series of employment by sector of industry have more limited coverage than the time series for gross output and value added. This is discussed in more detail in section 2.4.2.

2.1.3 Changes in output concepts

The consistency of time series of output is affected by changes in output concepts, often without an overlapping year which would allow linking of series. These changes include the shift from Net Industrial Output (NIO) to the SNA concept of Gross Value

Added in 1993, and a change from an 'old' to a 'new' concept of gross output in 1993, the introduction of value added taxes which increase the gap between market prices and factor costs in 1994, and the change in coverage in 1998.

2.1.4 Changes in employment concepts

There is a variety of employment concepts, including the social labour force, the staff and worker concept, the on-post staff and worker concept, and urban and rural variants of the above. Successive tables in official statistics tend use different concepts and the use of the different concepts has major implications for productivity analysis.

Employment concepts used in time series change over time. A special problem for the continuity of time series is caused by the switch from the staff and workers concept to the on-post staff and workers in 1998 and the creation of a new category of not-on post staff and workers. This is discussed in more detail in section 2.6.3.

2.1.5 Other issues

Other well-known issues include the lack of appropriate price deflators and the overstatement of output by reporting units. This tends to result in overstatement of growth of output and productivity.

2.2 How to tackle these problems?

There are two main alternatives in dealing with the problems with existing time series. The more radical alternative is found in a series of papers by Harry X. Wu, who has stepped outside the framework of official time series and has constructed his own time series of manufacturing GDP by sector using weighted quantity relatives, with the weights coming from the 1987 IO table (see Wu 1997, 1998, 2000a, 2000b). This approach is valuable, though not without some of its own problems. The problems include: using fixed 1987 weights for the period 1952-1997, quality change, accounting for new products and the assumption that 1987 value added-output ratios from the IO table are applicable for the period since 1949, .

From the perspective of sectoral productivity trends, the most important problem with this approach is that employment and output derive from different sources and may not be consistent, in particular at sectoral levels. If we do not know enough about the precise coverage (and changes in coverage over time) of the sectoral employment series, the sectoral productivity outcomes may be very problematic. The Wu approach may be most useful for the study of long-run output trends and for productivity trends at aggregate levels such as total industry or total manufacturing (see section 2.7.2). Also, the Wu approach allows one to make estimates for earlier periods where data are scarce or very unreliable.

The second alternative is to stay closer to existing statistical sources, but to scrutinise their coverage and concepts and make a series of adjustments where possible. This is the approach taken in this paper.

2.3 Using the 1995 Industrial Census as a benchmark for output

The most complete and detailed picture of the industrial sector is provided in the *1985 Industrial Census* (Census, 1985) and the *1995 Industrial Census* (Census, 1995). Especially the 1995 census has far better coverage of output and employment, than

the available time series for industry and manufacturing. It provides a wealth of information for different levels of coverage and allows one to identify the coverage of different time series. From the perspective of productivity, the census has the major advantage that the data on employment and output derive from one and the same source, the reporting enterprises. As we will see in section 2.4.2 the 1995 census registers a figure for persons engaged in industry, which is no less than 37.4 million higher than figures in all other available sources. Similar discrepancies are found for 1985. It is obvious that such discrepancies have an import effect on aggregate labour productivity estimates.

2.3.1 Census coverage in 1995

In the 1995 census, all enterprises at township level and above and all other enterprises with annual sales of more than one million Yuan are surveyed in full. Estimates for other categories of enterprises are based on sample surveys.

The census is structured primarily on the basis of administrative levels and ownership categories. Most detail (in terms of both variables and sectors) is provided for state-owned enterprises, collective-owned enterprises at township level and above and large foreign-financed enterprises, joint ventures, shareholding enterprises and private enterprises. Least detail is provided about the millions of sole-proprietorship enterprises. The following three tables chart the coverage of different types of enterprises in terms of numbers of enterprises, gross output/value added and employment. These tables can be compared with corresponding data from time series for 1995, in order to assess the coverage of these series. Where variables such as value added or indirect taxes are lacking, proportions from other categories can be applied to make estimates.

Table 2 summarises the census information on numbers of enterprises at different levels of coverage. The percentage of total enterprises covered decreases as one goes from left to right, the degree of sectoral breakdown increases. For the total industrial sector (columns I and II), no sectoral breakdown is available. For the sample of enterprises at village level and above, and/or enterprises with more than 1 million in annual sales breakdown is available for 37 industrial sectors, of which 28 manufacturing sectors.[2] For township enterprises at township level and above, sectoral breakdown is presented for no less than 549 subsectors of which 486 in manufacturing.

The term ‘and more than one million Yuan in sales in column IV of Table 2 implies that some smaller enterprises at village level are left out, as can be seen from the comparison of the columns I, II and IV. The small difference between columns I and II consists of affiliated units. They are industrial establishments run by enterprises from outside the industrial sector. These establishments do not have independent accounting systems. The difference between column I and II turns out to be identical to the difference between columns VII and VIII at township level and above.

This means that the 1995 census provides sectoral breakdown for 1.3 million of the in total 7.3 million industrial enterprises. The enterprises left out are small sole proprietorships, private enterprises and small collectives.

The number of variables on which information is presented also increases from left to right in the table. Thus, for columns I and II, the census only provides

[2] The total number of village enterprises in Col. V does not tally with the figure from Col. I. Col. V includes some enterprises which are financed from sources outside the village.

information on gross output and year-end employment. Col. IV provides gross output and employment plus information on equity and total taxes. Below township level with independent accounting systems (Col VIII) no direct information on value added is available.

For independent accounting enterprises at township level and above (col. VIII) information is provided on a wide range of variables including gross output (new concept) gross output (old concept), gross value added, employment, sales tax, value added tax, total tax and several financial variables (profit, wages, interest and so forth). This detailed information is not available for columns to the left of col. VIII. (After 1998, similar detailed information is collected only for state enterprises and all enterprises with more than 5 million Yuan in sales).

As we shall show later in section 2.6.2, the enterprises in column VIII have the same coverage as the time series for industrial output. Therefore, it is important to know what col. VIII exactly includes and excludes. It includes most but not all of the state enterprises (excluded are the affiliates). It includes all county and township collectives with independent accounting systems, including a large unspecified residual category.

Tables 3 and 4 present similar information for output and employment as table 2, but only for the columns I, II, IV and VIII (to keep the size of the tables manageable). Table 3 shows that a limited number of enterprises at township level and above account for 67 of gross output.[3] Column 3 (village and above) accounts for 85 per cent of gross output.

Since Chinese statistical practice follows the SNA guidelines, value added excludes all intermediate inputs, whether or not they derive from manufacturing or services. This makes the value added concept consistent with the national accounts concept of value added.

The concept of value added in census (and the time series) includes sales and other taxes and excludes value added taxes. By deducting sales taxes from column VI we get value added at factor cost, by adding the VAT, we get value added at market prices. These concepts can be used for comparison of the census with other sources and for international comparisons.

[3] The short hand reference to these enterprises in the rest of this paper is 'township + enterprises'.

Table 2: Numbers of Enterprises in the 1995 Census

	I *Total incl. affiliated* p. 1	II *Total excl. affiliated* p. 2	III *Affiliated Units calculate* p. 1 - p.2	IV *Village collectives, and village & above with > mill. yuan sales, excl. affil.(a)* p. 3	V *Village Enterprises (b)* p. 5	VI *Township and above and/or enterprises > mill. yuan* p. 6	VII *IA enterprises at township and above plus Affil.* p. 30	VIII *IA at township level and above* p. 46
Total Industry	**7,341,517**	**7,259,822**	**81,695**	**1,286,134**	**689,666**	**754,864**	**592,076**	**510,381**
						754,864	592,076	510,381
State owned	**118,000**	**87,905**	**30,095**	**87,905**		87,905	118,000	87,905
central government owned	7,275	4,738	2,537	4,738		4,738	7,275	4,738
provincial, district and county	110,725	83,167	27,558	83,167		83,167	110,725	83,167
county	*67,686*	*50,123*	*17,563*	*50,123*		*50,123*	*67,686*	*50,123*
residual	*43,039*	*33,044*	*9,995*	*33,044*			43,039	33,044
Collective	**1,465,628**	**1,415,910**	**49,718**	**1,068,171**		**536,901**	**413,558**	**363,840**
county	75,014	58,897	16,117	58,897		58,897	75,014	58,897
rural township	228,830	213,188	15,642	213,188		213,188	228,830	213,188
village collective	680,686	680,686		680,686	680,686	149,416		
rural urban cooperative	46,666	46,666		7,935		7,935		
rural cooperative	324,922	324,922		15,914		15,914		
other collectives, residual	109,510	91,551	17,959	91,551		91,551	109,714	91,755
Private	287,483	287,252	231	31,913		31,913	2,939	2,708
Sole proprietorship	5,403,643	5,403,643		33,033		33,033		
Joint ventures (Chinese)	5,903	5,493	410	5,493		5,493	5,903	5,493
Incorporated Enterprise	5,873	5,559	314	5,559		5,559	5,873	5,559
Foreign owned	54,045	53,477	568	53,477		53,477	44,861	44,293
Other	942	583	359	583		583	942	583
Total Mining	na	na	na	103,396	67,511	47,381	36,288	31,059
Total Manufacturing	na	na	na	1,119,397	599,823	664,557	514,190	444,026
Total Utilities	na	na	na	26,910	8,742	18,312	21,419	18,119
unallocated				36,431	13,590	24,614	20,179	17,177
Sectoral detail (number of sectors)	no	no	no	37	37	192	549	549
Percentage of enterprises	100	99	1.1	18	9	10	8	7

Source: Census 1995.

Notes (a) All village collectives and all other enterprises at village level and above with more than one million Yuan in annual sales, excl. affiliates. (b) The total number of village enterprises is some 9000 higher than the summary figure in col. I. The discrepancy is probably due to village enterprises financed by units from outside villages.

Table 3: Gross Output and Gross Value Added in the 1995 Industrial Census (100 mill. Yuan)

	I **Gross output** *Total incl. affiliated units* p. 1	II **Gross output** *Total excl. affiliated units* p. 2	III **Gross output** *village collectives, or sales > 1 mill. excl. affil. (a)* p. 3	IV **Gross Output new concept** *IAS, township and above* p. 46	V **Gross Output Old concept** *IAS, township and above* p. 46	VI **Value Added** *IAS, township and above as published* p. 46	VII **Value Added at factor cost** *IAS, township and above* calculated	VIII **Value Added at market prices** *IAS, township and above* calculated
Total Industry	**82,297**	**80,520**	**69,631**	**54,947**	**64,247**	**15,446**	**14,389**	**17,777**
State owned	**26,841**	**25,890**	**25,890**	**25,890**	30,087	8,307	7,522	9,730
central government owned	9,131	9,001	9,001	9,001	10,446	3,832	3,309	4,462
provincial, district & county owned	17,709	16,889	16,889	16,889	19,641	4,475	4,213	5,267
county	*5,592*	*5,137*	*5,137*	*5,137*	*5,943*	*1,307*	*1,225*	*1,511*
other collectives, residual	*12,118*	*11,752*	*11,386*	*11,752*	13,698	3,169	2,988	3,757
Collective	**29,253**	**28,543**	**27,334**	**15,839**	**19,059**	**3,866**	**3,705**	**4,347**
county	3,019	2,742	2,742	2,742	3,294	640	618	732
rural township	9,807	9,590	9,590	9,590	11,676	2,310	2,209	2,567
village	10,798	10,798	10,798					
rural urban cooperative	503	503	322					
rural cooperative	1,631	1,631	604					
other collectives, residual	3,495	3,279	3,279	3,508	4,089	917	878	1,048
Private	2,339	2,335	1,311	147	162	40	39	44
Sole proprietorship	9,633	9,633	976					
Joint ventures (Chinese)	667	653	653	653	785	157	152	179
Incorporated Enterprise	2,750	2,727	2,727	2,727	3,159	776	740	903.80
Foreign owned	10,722	10,661	10,661	9,613	10,904	2,282	2,214	2,554
Other	92	79	79	79	91.77	18	17.33	19.87
Total Mining	na	na	4,457	3,548	3,984	1,917	1,819	2,148
Total Manufacturing	na	na	61,055	47,722	56,107	11,980	11,061	13,768
Total Utilities	na	na	2,723	2,699	3,030	1,308	1,284	1,590
unallocated	na	na	1,396	979	1,125	241	226	271
Percentage of output covered	100	98	85	67				

Source: Census 1995

Note: (a) All village collectives and all other enterprises at village level and above with more than one million Yuan in annual sales, excl. affiliates.

Table 4: Employment in the 1995 Industrial Census

(year end)

	I	II	III	IV	V	VI
	|---------- Social Labour Force ----------|				**Employment**	**Staff and workers** [b]
	Total incl. affiliated (10.000) p. 1	*Total excl. affiliated (10.000)* p. 2	*=>village > 1.000, 000 excl. affil.*[a] *(10.000)* p. 3	*Village Enterprises (10.000)* p. 5	*IAS, township and above (10.000)* p. 198	*IAS, township and above (10.000)* p. 198
Total Industry	**14,735.51**	**14,367.24**	**11,124.61**	**2,230.31**	**8,575.58**	**8,501.18**
State owned	**4,652**	**4,465**	**4,465**		**4,465**	**4,434**
central government owned	1,119	1,092	1,092		1,092	
provincial, district and county owned	3,533	3,373	3,373		3,373	
county	*1,198*	*1,129*	*1,129*		*1,129*	
other collectives, residual	*2,335*	*2,244*	*2,153*		2,244	
Collective	**5,858**	**5,688**	**5,287**		**3,089**	**3,059**
county	685	627	627		627	622
rural township	1,566	1,521	1,521		1,521	1,515
village	2,100	2,100	2,100	2,100		
rural urban cooperative	87	87	36			
rural cooperative	424	424	75			
other collectives, residual	996	928	928		941	
Private	491	490	142		17	16
Sole proprietorship	2,576	2,576	83			
Joint ventures (Chinese)	87	85	85		85	84
Incorporated Enterprise	255	253	253		253	251
Foreign owned	808	803	803		661	650
Other	8	7	7		7	6
unallocated residual				130		
Total Mining			1,371	234	1,113	1,105
Total Manufacturing			9,134	1,901	6,957	6,892
Total Utilities			277	5	272	271
unallocated			343	90	234	233

Source: Census, 1995

Notes: a. All village collectives and all other enterprises at village level and above with more than one million Yuan in annual sales, excl. affiliates;
b. Including not-on-post staff and workers

Table 4 gives an overview of employment by category of ownership and by sector, for different levels of coverage. In the census one can distinguish three concepts of employment. The first is often referred to in Chinese statistical practice as the *Social Labour Force*. It includes all persons engaged in industry, including persons with a second job and including self employed persons, persons working in village enterprises, private enterprises and sole proprietorships (columns I, II and III). Most likely it also includes casual workers. The census estimate of the social labour force in Industry is 147.4 million persons (col. I).

The most restricted concept of the labour force is the so-called *staff and worker concept* (also referred to as *formal employment*). This concept refers to workers with a formal employment status at township level and above. Since 1998, the staff and worker concept has been redefined in a more restrictive sense and renamed "*on-post staff and worker*". This concept excludes people who have some kind of contractual relation with the enterprise but are no longer actually working.[4] It is important to note that the concept of staff and workers includes part-time workers. The total number of staff and workers in the census in 1995 is 85 million, representing 58 per cent of the social labour force.

In column V of table 4, one finds a concept of employment which is marginally wider than the staff and workers concept of column VI. The Chinese heading is the same as that for the 'social labour force' in Col. I, but in fact it excludes the workers in village, rural, sole proprietorship and most private enterprises. One may assume it includes workers in affiliated enterprises and perhaps also a small number of self-employed workers and workers with casual informal contracts. In the text below we will use the following concepts: a. social labour force, b. employment and c staff and workers. After 1997, the staff and worker concept is replaced by the more restrictive on-post staff and worker concept.

2.3.2 Reconciliation of output from different sources for 1995

The industrial census is an enormous exercise, undertaken every ten years. It is probably the best and most reliable source of data on the industrial sector. However, it is imperfectly integrated into ongoing statistics collection and time series. In this section, we try to make a systematic comparison between the census data introduced above and other sources of data such as the IO tables, the yearbooks of industrial statistics and the China Statistical Yearbooks. Table 5 provides a comparison and reconciliation of data from different sources for 1995.

The census gross output data for census p. 1 and census p. 3 (Census 1995) have been adjusted to factor cost and market prices as follows. For page 3, the census provides figures for total taxes. We used proportions of sales tax to total tax, and VAT to total tax from the data at township level and above to get estimates of sales taxes and value added tax for the coverage of p. 3. [5] For page 1, we simply used the estimates of page 3 to adjust the total. We assume most of the tiny enterprises that make up the difference between page 1 and page 3, do not yet pay much in the way of sales and value added taxes. Thus, the sole proprietorship enterprises primarily pay income tax.

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[4] The not-on-post staff and worker category which has simultaneously been created refers to the millions of persons who have been laid off since 1995, but who still have some kind of claim for remuneration or support either from the enterprise or from the state.

[5] There are no great risks in this procedure. The total tax for p. 3 coverage is only 9 percent higher than for township and above, census p. 46.

Basically, table 5 consists of two sets of data in addition to the census data: the Input-Output data and the national accounts data. Major IO tables are published every five years since 1987. Conceptually, they are closest to the system of national accounts. IO tables are based on independent and detailed national surveys.

For intervening years such as 1995, the IO tables are updated and published in reduced format (e.g. IO 1995). The national accounts data are published every year in the China Statistical Yearbook (CSY). For industrial output, the national accounts data, the data in the China Industrial Economic Yearbooks (CSIEY) and data in the summary publication *Statistics for Industry and Transport, 1949-99* (SCIT, 2000) are identical. This is clearly illustrated by the figures in table 5. In following discussion, we will use the *Statistics for Industry and Transport, 1949-99* (SCIT, 2000) as our primary reference, when referring to the national accounts data.

Table 5 provides several important insights concerning comparative coverage of industry and manufacturing in different sources for the year 1995:

1. The total number of industrial enterprises listed in the 1995 Census, CSIEY and CSY is identical (7.34 million).
2. The number of enterprises at township and above (including affiliates) in Census and SCIT is identical (592,100).
3. The number of enterprises with independent accounting systems at township and above in Census and SCIT is identical for total industry. The published figures for gross output and gross value added are identical. Exactly the same is true for manufacturing. Figures for total manufacturing are not published as such, but can be calculated by adding all the manufacturing subsectors in the two sources. This means that without a shadow of doubt the output data in SCIT are consistent with those in the census. **As the SCIT data for 1995 are part of a short time series 1993-99, we may conclude that these time series are consistent with the census data. This is our most important finding.**
4. In a comparison between national accounts and IO, we find that the figure for gross output at market prices from the 1995 IO table is reproduced in the CSY, the SCIT and CSIEY. The IO results have clearly been incorporated in the national accounts series.
5. A comparison between Census and IO is difficult for a number of reasons. First, the concept of gross output in the census is neither at factor cost, nor at market prices. Next, the census only presents gross value added data for the more limited coverage of the 510,381 enterprises with independent accounting systems at township level and above (Census, p. 46 ff.). We have discussed above how we have adjusted the gross output and value added concepts to factor cost, respectively market prices. The IO tables have a separate row for net taxes, which allow one to construct both a factor costs and a market price figure for purposes of comparison (see table 5). The comparison is most conveniently made at factor cost. We see that 1995 gross output at factor cost from the census is only 5.5 per cent lower than gross output from the IO table. Though this is not a negligible discrepancy the two estimates of gross output are clearly in the same ball park.
6. We will argue below that where value added data are lacking in the census (in tables with more complete coverage), it is justifiable to use value added output proportions from the IO table to estimate census value added figures. In table 5 the estimates of value added in rows 1 (census p.1), 2 (census p. 3) and XI (census p. 3 ff.) have been calculated in this fashion. The more detailed comparison of census and IO underlying these calculations is presented in the following paragraph and in Annex table A.1.

Table 5: Reconciliation of Gross Output and Value Added Estimates for 1995

		Number of Enterprises	Gross Output as published (100 mill.)	Gross output at factor costs (b) (100 mill.)	Gross Output at market Prices (c) (100 mill.)	GVA as published (100 mill.)	GVA at factor cost (b) (100 mill.)	GVA at market prices (c) (100 mill.)
	Total Industry							
I	Total Industry, Census, p. 1 (a)	7,341,517	82,297	81,148	84,832		19,226	24,328
II	Total Industry, Census, p. 3 (a)	1,286,134	69,631	68,482	72,166		16,225	20,696
III	Total industry, census p. 30	592,076						
IV	Total industry, Census p. 46 and 198	510,381	54,947	53,890	57,278	15,446	14,389	17,777
V	Total Industry, CSIEY, 1998, p. 17,p. 21	7,341,500			91,894			
VI	Total Industry, IO 95			85,891	91,894		20,350	26,353
VII	Total industry, CSY 2000, p. 53, 122, 407	7,341,500			91,894			24,718
VIII	SCIT, 2000, p. 19, p. 3				91,894			24,718
IX	SCIT, 2000, township and above, p. 16	592,100						
X	SCIT, 2000, IAS, township and above, p. 94 ff.	510,381	54,947			15,446		15,446
	Row 1 (Census) as % of Row VI (IO)			94.5%	92.3%		94.5%	92.3%
	Manufacturing							
XI	Census p. 3 (a)	1,155,828	62,451	61,431	64,481		13,412	17,677
XII	Census, p. 46	461,203	48,700	47,766	50,518	12,221	11,287	14,039
XIII	IO, 1995			80,647	86,270		18,027	23,650
XIV	SCIT, 2000, township and above, p. 94 ff.	461,203	48,700			12,221		

Sources: Industrial Census, 1995; CSIEY, 1998, SCIT, 2000, IO 1995.
Notes: (a) value added calculated using proportions from the 1995 IO table.
(b) Census gross output (new concept) and gross value added adjusted to factor costs by deducting sales taxes.
(c) Census gross output (new concept) and gross value added adjusted to market prices by adding value added taxes.

In annex table A.1 we have made a comparison of the sectoral composition of gross output at factor costs from the census and the 1995 IO table. It turns out that the sector shares from the two different sources are remarkably similar. On the basis of the reconciliation of aggregates and the similarity of the sector structure, we feel justified in applying sectoral value add gross output proportions at factor cost from the 1995 IO table to the census data at village level and above. This allows us to derive gross value added estimates by sector of manufacturing for a set of enterprises accounting for 84.6 per cent of total gross value of output in the census. The census data refer to village enterprises and above (p. 3), the widest coverage for which sectoral breakdown is available. The census contains an allocated residual (difference between summed sectors and total) which we have allocated to manufacturing, not elsewhere specified.

2.4 Using the Labour Force Statistics Yearbooks as benchmarks for Coverage of Employment

2.4.1 Coverage in 1999

For employment in the industrial sector the primary source, apart from the census, is the *China Labour Statistics Yearbook* (CLSY). This source publishes a wide range of labour statistics, broken down in different ways, of which the coverage is not always clear. The data published in recent editions of the *China Statistical Yearbook* all derive from the CLSY.

In order to clarify coverage and conceptual issues, we have put together Table 6, showing employment at different levels of coverage in 1999. In this case we chose 1999 rather than 1995 as benchmark year, in order to be able to include important recent changes in employment concepts in the discussion. In table, we reconcile employment estimates from different sources for the output benchmark year 1995.

Columns I-III of table 7 provide information about the social labour force. The *social labour force* includes all persons engaged in all sectors and ownership categories of the economy (total formal employees, reemployed retirees, urban private employers, urban individual labourers, employment in urban private enterprises and individual households, employment in township and village enterprises, rural labourers and other (CLSY, 2000, p. 625). It is the most comprehensive employment concept.

It is important to note that printed totals for the social labour force in CLSY are systematically higher then the summed subtotals, at all levels (manufacturing, industry, secondary sector, tertiary sector, total economy). The reason for this is that totals are being revised upwards in line with new information from the population censuses, while the subtotals usually belong to time series which are not being revised. For the total economy the discrepancy in 1999 was no less than 81 million persons. For the secondary sector (industry and construction) the discrepancy was 37.6 million persons, for industry alone it was 24.6 million persons (this figure not reproduced in the table).

Table 6 helps us understand the difference between social labour force and the so-called staff and worker concept. The precise definitions vary from publication to

Table 6: Employment, Concepts and Coverage, 1999 (000,000 year end)

	I Social Labour Force p. 3 & 7	II Social Labour Force urban p. 7	III Social Labour Force rural p. 7	IV Employ-ment in urban units p. 105/152ff	V On-post staff and workers urban p. 107	VI Other employ-ment urban p. 183	VII Employment Private and individual (urban& rural) p. 399	VIII Employ-ment TVEs (b) p. 404
Total economy (sum of primary, secondary, tertiary)	***705.9***	***210.1***	***495.7***	***121.3***	***117.7***	***3.6***	***82.6***	***127.04***
Summed total of subsectors	624.9	155.9	469.0	121.3	117.7	3.6	82.6	127.04
Discrepancy between summed subsectors and grand total (a)	*81.0*	*54.2*	*26.8*					
Urban state enterprises, p. 205/p. 256 ff				85.7	83.4	2.4		
Urban collective enterprises, p. 305 ff				17.1	16.5	0.6		
Urban other ownership , p. 353 ff.				18.5	17.9	0.6		
Breakdown by employee status								
Total economy	***705.9***	***210.2***	***495.7***					
Employment in urban units (other than private and individual)	121.3	121.3						
Private enterprises and individuals (b)	82.6	34.7	48.0					
private							20.2	
individual							62.4	
TVE employment	127.0		127.0					
Rural labour force	320.7		320.7					
Other not specified (c)	54.2	54.2	0.0					
Breakdown by sector								
Total primary sector	353.6	5.8	329.1	5.4	5.2	0.2	4.2	2.5
Statistical discrepancy primary sector (a)	*18.7*							
Total secondary sector	162.4	59.9	64.9	53.1	52.1	1.0	21.4	90.1
Total industry	90.6	51.1	39.5	44.9	44.3	0.7	20.1	74.0
Mining and quarrying	6.7	6.7		6.6	6.5	0.1	0.8	
Manufacturing	81.1	41.6	39.5	35.5	35.0	0.6	19.3	(d)
statistical discrepancy manufacturing (a)				*0.4*				
Utilities (Electricity, gas and water supply)	2.9	2.9		2.8	2.8	0.02		
Construction	34.1	8.8	25.3	8.1	7.8	0.4	1.3	16.1
Statistical discrepancy secondary sector (a)	*37.6*							
Total tertiary sector	189.9	90.3	75.0	62.8	60.5	2.4	57.1	34.5
Statistical discrepancy tertiary sector (a)	*24.6*							

Source, CLSY, 2000. Notes: (a) Printed total minus summed subtotals. The sum of primary subsectors is less than the total for the primary sector. The same holds for the secondary sector, the tertiary sector and the manufacturing sector. (b) incl. employers and self-employed persons; (c) printed figure. This figure equals the discrepancy found between summed categories by ownership and total employment. This breakdown not reproduced here. (d) No breakdown for manufacturing. Sectoral detail in manufacturing only available for employment in urban units, and subcategories of urban units (state, urban collective, urban other).

publication and from year to year.[6] The CLSY 2000 provides the following definition of the staff and worker concept: "those who are working in (and receive income there from) units with state ownership, urban collective ownership, joint ownership, shareholding stock ownership, limited liability corporations, foreign and Hong Kong, Macao and Taiwan Chinese funded or other ownership and their affiliated units" (CLSY 2000, p. 625). This definition is primarily based on ownership categories and on the distinction between rural and urban employment. But it is only Table 6 (and the underlying detailed analysis of the CLSY data) that can clarify what is exactly covered.

One version of the staff and worker concept corresponds to column IV: Employment in urban units (121 million persons, out of a total social labour force of 706 million). In the table and elsewhere in this paper we will refer to this concept as "*employment*" to distinguish it from a narrower staff and worker concept.

The narrowest concept is that of "*on-post staff and workers*". This is a new concept introduced in 1998. It is defined as follows "On-post staff and workers refer to those who are practically working in a certain urban unit, including those who are temporarily absent because of study, disease, vocational training or other reasons" (CLSY, 2000, p. 625). This definition is not very precise, but Table 6 shows that the total of column 4 (employment in urban units) is the sum of on-post-staff and workers (column V) and a modest category of other urban staff and workers (column VI). Col. VI includes workers in affiliated enterprises and probably some self-employed persons, owners and people with informal labour contracts. What is important to note is that it is the 1999 on-post-staff and worker figure, which is also included in the time series, which are denoted time series of "staff and workers". Both concepts refer to the coverage of Column V of Table 6 and exclude the "other employment" of col. VI. All published time series on staff and workers in industry and manufacturing that are broken down by sector are consistent in coverage with Column V.

A very important finding deriving from Table 6 is that the employment concepts in cols. IV and V only include urban workers. These data are further broken down into urban state enterprises, urban collective enterprises and other urban enterprises. It is only for these categories (urban total, urban state – all state enterprises are urban - , urban collective and urban other) that time series with sectoral detail are provided. This means that time series of employment by sector in manufacturing published in the CSY and CLSY exclude all employees in rural collectives, even if they are at township level and above. **The employment concept is therefore not consistent in coverage with the output concept of township enterprises and above, discussed in sections 2.3.1and 2.3.2.**

Not reproduced in table 7 for reasons of space is an important new category: "not-on-post staff and workers", which indicates a revolution taking place in Chinese labour relations. Since 1995, millions of employees of state and collective enterprises have been laid off. From 1998 onwards these employees are excluded from the concept of on-post staff and workers. Nevertheless, these workers do still have some contractual relations with their former employers. Not-on-post-staff and workers are defined as: "those who have left his/her post and are not engaged in other works in the same unit, but still keep the labour relationships with the units which he/she worked for" (CLSY 2000, p. 625). In 1999, the number of not-on-post staff and workers was 21.5 million, not much less than the published decline in total urban employment due to lay-offs since 1995. It is not clear whether it is the former employer or the state

[6] Sometimes the same Chinese heading is given varying English translations.

which is responsible for paying these laid-off workers some kind of income. The concept indicates an in-between stage in the construction of an urban social security system, where the ties between a worker and an employer are severed once the worker is laid off. The issue of change in concepts in 1998 will be taken up in the discussion of the employment time series in section 2.6.

Structure of employment in 1999

Summarising the information from Table 6 and the CLSY, 2000, we find the following estimates of the structure of national employment in 1999. The total number of persons engaged in China in 1999 is given as 706 million. Of these, 121.3 people are engaged in the formal urban sector (state owned: 85.7 million, collective owned 17.1 million and other urban ownership 18.5 million). Another 34.7 million workers are engaged in urban individual and private enterprises. All other persons engaged are classified as rural. Rural workers consist of 48 million persons engaged in rural individual and private enterprises, 127 million persons working in township and village enterprises, a rural labour force of 321 million and an unclassified residual of 54.2 million workers, most likely also rural workers.

2.4.2 Reconciliation of employment figures for 1995

Table 7 provides a reconciliation of employment figures from different sources for our benchmark year 1995. The following insights can be derived from Table 7.

1. In the first place, there is no difference at all between the figures published in the *China Statistical Yearbooks* and the *China Labour Statistical Yearbooks*. They represent the same data set.
2. An important conclusion is that the census covers much more employment than the CSY and CLSY. For the social labour force in industry the difference is no less than 37.4 million persons (147.4 million versus 109.9 million, see columns III and I of table 7). Productivity estimates based on the CSY figures will overestimate labour productivity.

   There are a number of reasons to conclude that the census figures are the more appropriate ones and that employment is underestimated in the other sources. The census collects data on both output and employment from the same source: the productive unit or enterprise, based on a comprehensive system of data collection. Also the census is the most comprehensive source of data collection on the industrial sector. The data from the CLSY come from a variety of sources including state and department reporting systems, administrative records and sample surveys. In the second place, we see that the CSY and CLSY data are continuously being revised upwards in line with new information from the population census. Unfortunately only the totals are revised, so that there is an increasing gap between summed subtotals of time series and aggregate figures. But this indicates that the sectoral figures are believed to be too low by their compilers. A third explanation has to do with sources of information. The census surveys units of industrial production and inquires how many persons are working in a unit. It does not matter whether a person has a primary job outside industry. As long as he/she is actually working in the enterprise, he/she is counted as a person engaged, which is correct from a productivity perspective. Labour force, household and population surveys collect data from households and tend to classify a person by his main sector of occupation or job, leaving out second jobs. This would explain part of the discrepancy. We know that large numbers of workers in agriculture do

Table 7: Reconciliation of Employment Estimates in Industry for 1995
(1000.000 year end)

	I **CSY, 2000** **Persons engaged** p. 115	II **CLSY, 2000** **Social Labour Force (a)** p. 8-10	III **Census** **Social Labour Force** p. 1	IV **Census** **Social Labour Force** **village, > I mill** p. 3	V **CSY, 2000** **Staff and workers** **CSY, 2000** p. 408	VI **CLSY, 1996** **Staff and workers** Totals p. 19 details p. 185 ff CLSY, 2000, p. 20	VII **Census,** **Township** **and above** **Staff & Workers** p. 198 ff (b)
Total Economy	679.5	679.5			149.1	149.1	
Primary Sector	354.7	354.7					
of which farming/forestry etc.		330.2				6.6	
Secondary Sector	156.3	156.3				76.6	
of which total industry						66.1	
of which construction						10.5	
Tertiary Sector	168.5	168.5				65.9	
Total Industry	109.9	109.9	147.4	111.2	66.1	66.1	85.0
State owned			46.5	44.6	44.0		44.3
Collective			58.6	52.9	15.0		30.6
Other			42.3	13.7	7.1		10.1
of which: private			4.9	0.8			
sole proprietorships			25.8	0.9			
sectoral breakdown					yes	yes	yes
Mining	9.3	9.3	na	13.7	9.1	9.1	11.0
Manufacturing	98.0	98.0	na	94.8	54.4	54.4	71.3
Utilities	2.6	2.6	na	2.8	2.6	2.6	2.7

Sources: CSY, 2000; CLSY, 1996, 2000; Census, 1995
(a) Compared to CLSY, 1996 the totals in CLSY, 2000 are revised downwards somewhat, but the subtotals by sector are unchanged.
(b) The more limited of the two employment concepts in the census, see table 4.

in fact have a second job in industry. Finally, households are more difficult to get hold of than productive units in survey research.

A similar discrepancy between census and CSY was found when comparing the 1985 employment figures (see Szirmai and Ren, 2000, table 4). In that year the census figure for the social labour force in industry was 10.5 million higher than in the CSY. **Our conclusion is that labour productivity estimates should preferably be based on the census estimates.**

3. Table 7 also allows for a comparison of p.3 of the census (which covers village enterprises and above) with the CSY data. Interestingly enough, the totals in col. IV are quite close to those of Col. I (111.3 million persons versus 110 million for total industry, 95 versus 98 million for manufacturing).[7] Our working hypothesis is that this similarity is not accidental and that the CSY data have approximately the same coverage as the census data of page 3: village enterprises and above. The difference between p. 3 and p. 1 of the census consists precisely of the multitude of workers in tiny private enterprises and sole proprietorships, which are so hard to trace in labour market surveys and administrative data (compare columns III and IV of table 7). We conclude that figures for the industrial social labour force published in the CLSY and CSY most probably represent the coverage of village enterprises and above (see point 2) and exclude private enterprises and sole proprietorships.
4. The last important finding is the great discrepancy between staff and worker employment figures in the CLSY and the Census. The census records 85 million persons for total industry in 1995, the CLSY only 66.1, a gap of 19 million. The reason for this discrepancy follows from our previous analysis of coverage of output and employment. The employment figure from the census is consistent with the census gross output and value added figure for all independent accounting enterprises at township level and above. A proportion of these enterprises are rural enterprises (rural township enterprises). We just saw that the coverage of employment in CLSY is limited to urban employment (state, urban township and urban other), excluding rural township enterprises. The missing 19 million refer to employment at township level and above in rural areas. This interpretation is reinforced by a comparison of the numbers of enterprises in industry listed in the census and the CLSY for township and above in 1995 (510,381 [Census 1995, p. 3] versus 169,200 [CLSY, 1996, p. 146/7]

   We concluded in section 2.3.2 that the output figures in the CSY are consistent with the census for 1995. The employment figures are not. **The disturbing conclusion is that the output and employment series published in the China Statistical Yearbooks are not consistent in coverage with each other.** This creates a major problem for productivity analysis.

2.5 Conclusion: Coverage and productivity in the benchmark year 1995

Summing up the discussion on coverage in the previous sections, this section discusses two tables with detailed information of census output and employment at different levels of coverage for the benchmark year 1995. These tables allow us to make rough estimates about what we do not know and illustrate the gaps in our knowledge. Table 8 refers to output and employment in all village collectives plus all enterprises at village level and above with annual sales of more than one million

[7] The reversal of the order for manufacturing may be due to differences in classification.

Yuan. Affiliated units of enterprises outside the industrial sector are excluded (see discussion of table 2). Table 9 provides information about enterprises with independent accounting systems at township level and above.

Both tables present estimates of gross output (new concept) and value added. Some conceptual discussion is in order here. The new concept of gross output is neither at factor cost, nor at market prices, but somewhere in between. It includes sales and other taxes, but excludes value added taxes. For purposes of international comparison and comparison with other sources, the output figures have to be adjusted to factor cost and or to market prices. For enterprises at township level and above (Table 9) the census provides full detail on gross output, value added, total taxes, sales and other taxes and value added taxes (and a multitude of other variables). By deducting sales taxes we arrive at factor cost concepts, by adding value added taxes we arrive at market price concepts.

Less information is available for the wider coverage of enterprises at village level and above (Table 8). Here only gross output and total taxes are given in the census. First, we adjusted gross output figures to factor cost. For this we applied the proportion of sales and other taxes to total taxes from township level and above to the total tax figures for village level and above. This gave us an estimate of sales taxes. As total taxes for village and above (Table 8) are only 9 per cent higher than in township and above (Table 9), the assumption that the same ratio can be applied is a fairly safe assumption. A similar procedure was used to estimate value added taxes. The final step was to apply value added/gross output ratios (at factor cost) from the 1995 IO table to get estimates of gross value added at village level and above).

To illustrate the coverage of both tables, the bottom panel of each of the tables provides the data for total industry from p. 1 of the census volume. Page 1 only contains gross output figures. We made the assumption that the total of sales taxes and value added taxes for total industry would not be very different from that paid at village level and above. The reasoning was that most of the small individual and private enterprises – which make up the bulk of the difference between page 1 and page 3 of the census - would not pay much in the way of sales or value added taxes. For instance, sole proprietorship enterprises pay income taxes rather than business taxes. So, we used the unchanged absolute value of sales taxes from village level and above to adjust the total gross output figure to factor cost. We did the same for value added taxes in adjusting the totals to market prices. As a final step, we used the ratio of value added to gross output for total industry at village level and above to get a rough estimate for total census industry value added.

Unfortunately, we cannot compare coverage for manufacturing directly on the basis of published statistics, as the first page of the census does not distinguish manufacturing from industry. We did make a rough estimate based on the assumption that all of the non-covered part of industry in the table on village level and above (table 8) refers only to manufacturing activities. As mining and utilities are large scale activities. It is safe to assume that all these enterprises will have more than 1 million Yuan in sales. At township level and above, we also added the difference between village and above manufacturing and township and above manufacturing.

Table 8 provides the widest coverage for which any sectoral detail is available in the census. Though table 8 does not have complete coverage it accounts for a very substantial proportion of total output in the census: 89.6 per cent of value added in

Table 8: Basic Data on Output, Employment and Productivity for China, 1995
Industrial Census, Village Collectives and above

(All village collectives, plus state, collective, private and other enterprises at village level and above, with more than one million in annual sales, excl. affiliates)

		Number of Enterprises	Gross Value of Output new concept (as published	Gross Value of Output adjusted to factor cost	Gross Value Added at factor cost	Gross Value Added at market prices	Gross Value Added at factor cost by Branch % of Total	Employment (year end) persons	Gross value added at factor cost per person (year end)
			|----------(100 mill.Yuan)----------|					(10,000)	
	Panel A: village +	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	Food Manufacturing (a)	209,099	5,529	5,504	1,037		7.4	596	17,415
2	Beverages	29,348	1,260	1,169	300		2.1	172	17,456
3	Tobacco Products	11,745	1,036	645	229		1.6	39	59,497
4	Textile Mill Products	58,988	5,578	5,557	932		6.7	1,014	9,190
5	Wearing Apparel	46,513	2,242	2,233	504		3.6	419	12,034
6	Leather Products and Footwear	23,150	1,415	1,408	284		2.0	237	12,021
7	Wood Products	39,447	705	699	179		1.3	162	11,009
8	Paper Products,	31,287	1,450	1,442	298		2.1	266	11,224
9	Printing and publishing	34,858	1,090	1,084	224		1.6	262	8,554
10	Petroleum and coking	6,892	2,167	2,053	480		3.4	95	50,621
11	Chemicals Products	59,291	6,390	6,336	1,407		10.1	753	18,696
12	Rubber and Plastic Products	54,488	2,539	2,508	497		3.6	385	12,909
13	Non-metallic Mineral Products	204,336	5,009	4,966	1,402		10.0	1,385	10,125
14	Basic metals	26,491	5,825	5,787	1,526		10.9	582	26,211
15	Fabricated metal products	73,591	2,739	2,723	577		4.1	434	13,301
16	Machinery	95,957	5,433	5,404	1,273		9.1	1,025	12,420
17	Transport equipment	36,259	3,755	3,702	858		6.1	479	17,900
18	Electronic Machinery, incl. computers	10,245	2,702	2,694	672		4.8	229	29,296
19	Electrical Machinery & Equipment	35,168	3,222	3,208	702		5.0	394	17,793
20	instruments	8,263	504	502	137		1.0	112	12,155
21	Furniture	23,981	466	463	118		0.8	95	12,424
22	Miscellaneous Manufacturing (b)	36,431	1,396	1,344	349		2.5	343	10,181
	Total Manufacturing	1,155,828	62,451	61,431	13,986		100	9,477	14,758
	Total Mining	103,396	4,457	4,352	1,944			1,371	14,177
	Total Utilities	26,910	2,723	2,698	1,295			277	46,776
	Total Industry (village +)	1,286,134	69,631	68,482	17,224	20696		11,125	15,483

Table 8: continued

	Number of Enterprises	Gross Value of Output new concept (as published	Gross Value of Output adjusted to factor cost	Gross Value Added at factor cost	Gross Value Added at market prices	Gross Added at factor cost by Branch % of Total	Employment (year end) persons	Gross value added at factor cost per person (year end)
		(100 mill.Yuan)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel B: Coverage								
Non-covered part of industry	6,055,383	12,666	12,666	2,002	3632		3,611	5,544
Grand total in census (c)	7,341,517	82,297	81,148	19,226	24328		14,736	13,047
Coverage for total industry	17.5%	84.6%	84.4%	89.6%	85.1%		75.5%	
Non covered part of manufacturing				2002			3,611	
Total manufacturing				15987			13,088	12,216
Coverage for manufacturing				87.5%			72.4%	

Sources:
Col. 1: Number of enterprises from Industrial Census, 1995 p. 3 ff.
Col. 2: Gross value of output (new concept) Industrial Census, 1995 p. 3 ff. The new concept is net of value added tax, but gross of sales and other taxes
Col. 3. GVO adjusted to factor cost by deducting estimates of sales and other taxes. These taxes are estimated using the proportions of sales taxes to total taxes at township level and above (census p. 46), where more detail on taxes is provided. For page 3 of the census, only total taxes are given.
Col. 4: Value added at factor cost calculated by applying gross value added/gross output ratios from the 1995 IO table, p. 82 ff. and 1997 IOT table.
For five sectors italicised, we used proportions from table 9
Col. 7: Employment (year end from Industrial Census, 1995, p. 3 ff.

Notes
(a) Tea making reclassified from beverages to food manufacturing.
(b) Other manufacturing includes the unallocated residual for total industry. It is assumed that this residual is primarily included in manufacturing.
(c) For the census total the adjustment to factor cost and market prices was done by deducting and adding the same absolute amount of taxes as for total industry at village level and above. The small individual enterprises pay income taxes. We assume they do not pay much sales and vat. We used the proportions of value added to gross output as the total of village level and above.
(d) Assuming that the non-covered part of industry consists for 100 per cent out of manufacturing enterprises. Mining and utilities are large scale activities.

Table 9: Basic Data on Output, Employment and Productivity for China, 1995
Industrial Census, Township level and above
(Independent accounting enterprises at township level and above)

	Number of Enterprises	Gross Value of Output new concept (as published)	Gross Value added (as published)	Gross Value Added at factor cost	Gross Value Added at market prices	Gross Value Added at factor cost by Branch as % of Total	Employment (year end) persons	Gross value added at factor cost per person (year end)
		100 mill. Yuan					(10,000)	
Panel A: IAS	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Food, beverages and tobacco	61,983	6,200	1,674	1,174	1,909		604	
Food Manufacturing (a)	49,724	4,095	717	698	807	6.2	430	16,243
Beverages	11,836	1,101	345	254	403	2.2	141	17,989
Tobacco Products	423	1,004	613	222	699	2.0	33	67,446
Textile Mill Products	25,686	4,604	898	880	1,027	7.8	882	9,970
Wearing Apparel	20,007	1,470	347	340	378	3.0	276	12,342
Leather Products and Footwear	10,468	974	201	196	220	1.7	155	12,608
Wood Products	15,480	406	95	91	109	0.8	109	8,321
Paper Products,	13,890	1,014	232	225	276	2.0	186	12,087
Printing and publishing	21,000	783	214	209	241	1.9	184	11,390
Petroleum and coking	2,734	2,028	561	450	659	4.0	80	55,961
Chemicals Products	35,092	5,591	1,410	1,359	1,633	12.0	667	20,385
Rubber and Plastic Products	23,918	1,748	363	337	415	3.0	263	12,818
Non-metallic Mineral Products	61,278	3,018	900	865	1,046	7.7	808	10,698
Basic metals	11,920	5,033	1,355	1,319	1,611	11.7	515	25,596
Fabricated metal products	30,728	1,651	384	372	435	3.3	287	12,987
Machinery	48,332	4,122	1,120	1,095	1,287	9.7	852	12,846
Transport equipment	19,445	3,303	805	755	932	6.7	425	17,739
Electrical Machinery & Equipment	19,671	2,594	604	592	692	5.2	316	18,729
Electronic Machinery, incl. computers	7,997	2,530	635	628	696	5.6	198	31,734
Instruments			123	121	139	1.1	97	12,429
Furniture	8,760	226	56	54	63	0.5	52	10,534
Other Manufacturing Industries (b)	22,814	1,404	241	226	271	2.0	234	9,650
Total Manufacturing (IAS)	461,203	48,700	12,221	11,287	14,039	100	7,191	15,696
Total Mining	31,059	3,548	1,917	1,819	2,148		1,113	16,342
Total Utilities	18,119	2,699	1,308	1,284	1,590		272	47,235
Total Industry (IAS)	510,381	54,947	15,446	14,389	17,777		8,576	16,780

Table 9 continued:

	Number of Enterprises	Gross Value of Output new concept (as published)	Gross Value added (as published)	Gross Value Added at factor cost	Gross Value Added at market prices	Gross Value Added at factor cost by Branch as % of Total	Employment (year end) persons	Gross value added at factor cost per person (year end)
			----------100 mill. Yuan)----------				(10,000)	
Panel B: Coverage	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Non-covered part of industry	6,831,136	27,350		4,837	6,551		6,160	7,852
Grand total industry in census	7,341,517	82,297	na	19,226	24,328		14,736	13,047
Coverage for industry	7.0%	66.8%		74.8%	73.1%		58.2%	
village+ manufacturing minus township+ manufacturing (c)				2,699			2,286	
Non-covered part of manufacturing (c)				2,002			3,611	5,544
Total manufacturing				15,987			13,088	12,216
Coverage for manufacturing				70.6%			54.9%	

Sources:
Col. 1 Number of enterprises, gross output and value added, Industrial Census, 1995, p. 46 ff. Employment, census, p. 198 ff.
Col. 2: Gross output new concept, net of value added tax, gross of sales and other taxes. This same concept is used for the time series of gross output at township level and above in the China Statistical Yearbook, 2000 and SCIT 1949-1999, 2000.
Col 3: Gross value added as published. This concept is consistent with the value added time series in CSY, 2000 and SCIT, 1949-99 for 1993-99
Col. 4: Col 3 adjusted to factor cost, by deducting sales and other costs
Col. 5: Col 3 adjusted to market prices by including value added taxes

Notes
(a) Tea making reclassified from beverages to food manufacturing.
(b) Other manufacturing includes the unallocated residual for total industry. It is assumed that this residual refers to manufacturing enterprises. There are 17177 residual enterprises in the census. Thus the total number of enterprises in manufacturing (461203) consists of the printed total (444026) plus the residual (17177).
(c) The non-covered parts of manufacturing were calculated by taking the difference between manufacturing village plus and manufacturing township plus. Next, we added the difference between total census industry figures and village plus figures for industry, assuming non-covered enterprises referred to manufacturing only.

industry and 75.5 per cent of employment in industry.[8] Excluded are primarily the smallest enterprises: small private enterprises, small sole proprietorships and small collectives. For manufacturing the rough coverage figures are 87.5 per cent of manufacturing and 72.4 per cent of employment.

. The second table (Table 9) has more limited coverage. It refers to output and employment in enterprises with independent accounting systems at township level and above. This table, however, has the advantage that it is consistent in coverage with the published time series of output and with our previous 1985 benchmark (Szirmai and Ren, 2000). Therefore, this is the table which will be used for international comparisons of productivity.

In the bottom panel of table 9, one finds a rough estimate of the non-covered part of Chinese manufacturing and thus also of GDP in total manufacturing. This estimate is based on the assumption that the non-covered part of industry in table 8 consists exclusively of manufacturing enterprises, as utilities and mining enterprises will have at least one million Yuan in sales. To the non-covered part of industry in table, we add the difference between manufacturing village + and manufacturing township +.

The enterprises in the top panel of table 9 account for approximately 70.6 per cent of manufacturing output and 54.9 per cent of total manufacturing employment.

Value added per worker in manufacturing in this table is 15,700 Yuan per year. For this table productivity in total manufacturing including non-covered activities is 22 per cent lower than in the covered part of industry. Productivity in the non-covered sector is about one third of that in the covered sector.

2.6 Time series of value added and employment, 1980-2002

2.6.1 Available statistical series for output

After our detailed discussion of issues of coverage and concepts, we are now in a position to make an informed assessment of the available time series on industrial output and employment. Our main source is the volume *Statistics of China's Industry and Transport, 1949-1999* (SCIT, 2000), which summarises all the available time series for the industrial sector. Many of these statistics are also to be found in the China Statistical Yearbooks. In addition, the 1993 industrial yearbook (CIEYS, 1993) contains a longer time series of gross output, net industrial output (net material product) and year end employment, broken down by sector of industry, for the period 1980-92. (These were the series we used in Szirmai and Ren (2000).

We have the following published series for output:

A. SCIT, 2000, p. 56 ff: 1949-84, gross value of output by industry in constant comparable prices
B. CSIEY 1993, pp. 142-54:1980-1992 series of gross output and net industrial output by industry (current prices).
C. SCIT, 2000, p. 74 ff: 1985-92, number of enterprises, gross value of output and net industrial output by industry (current prices)
D. SCIT, 2000, p. 94 ff 1993-99 Number of enterprises, gross value of output and gross value added by industry (current prices).

[8] A downward adjustment of the employment figures still needs to be made for persons providing services (housing, education, health) rather than producing industrial output (see Szirmai and Ren, 2000). The average adjustment is around 9 per cent of employment.

E. CSY, 1998-2004: 1998-2002, gross value of output and gross value added by industry current prices

We discuss them in chronological order, focusing on issues of coverage, concepts and industrial classification. Unless there is a specific reason, we will not discuss the series reproduced in the annual issues of the CSY separately. They are derived from – and are identical to – the data in the sources discussed here.

Series A: 1949-1984:

These series provide information on gross output in comparable prices by sector. There are four sub series, in comparable prices of 1952, 1957, 1970 and 1980, with overlapping years so one can derive a continuous index for the whole period.

One could link these series to the later series C in terms of the overlapping year 1980, after some manipulation of the data. (The data for 1980 are in 1970 comparable prices, the data for 1981 are both in 1970 prices and 1980 prices, so one can derive a figure for 1980 in 1980 prices, which can be compared to the 1980 figure from series C). The resulting figure for total industry differs only 0.5 per cent from the 1980 figure from series C. This suggests that concept and coverage are the same.

Nevertheless, the series cannot be linked at sectoral level with the later series because the classification is very different. The earlier series are organised not by economic sector, but by the administrative organisation or ministry responsible for a given class of activities. Thus, the wood and logging contains both logging, planting and wood manufacturing activities because they are all coordinated by the same ministry, the non-metallic minerals sector contains both mining and manufacturing activities, and so forth. As a result it is not possible to distinguish manufacturing from industry. Also, it is now commonly accepted that the use of comparable prices results in a substantial overstatement of growth.

Series B: 1980-1992.

These are series of gross output (old concept) and net industrial output (net material product), at market prices, published in the China Industrial Economic Statistics Yearbook 1993 (CIESY, 1993). We used these series in Szirmai and Ren (2000). Apart from minor rounding errors, these figures turn out to be identical to the figures in series C, 1985-92 reproduced in the summary volume of industrial statistics (SCIT 2000). But the yearbook also provides information for the years 1980 and 1984, which are not reproduced in the summary volume.[9] Gross output and net industrial output figures in this series for 1985 are identical to the figures for township enterprises and above from the 1985 census (Census 1985, Vol. 3, p. 90 ff.). This means that these series are consistent with the 1985 census in concepts and coverage.

Series C: 1985-1992

As mentioned above, the data from SCIT 2000 are identical to those from series B (CSIEY, 1993) and are thus consistent with the 1985 census data for enterprises with independent accounting systems at township level and above. For instance, the total number of industrial enterprises in 1985 listed in SCIT, 2000. (p. 74) is identical to the 1985 industrial census figure: 358701.[10]

[9] In 1984, village manufacturing activities were reclassified from agriculture to industry. Some of these activities are included in the 1980 and 1984 census figures for township + enterprises.

[10] There is a mistake in the total figures for industry in SCIT 2000, p. 74. The printed gross output and gross value added figures are only about one third of the sum of subsector figures, while the figures for numbers of enterprises are correct and equal to the sums of subsector figures.

Series D: 1993-99

The figures for 1993 and onwards from the SCIT*, 1949-99* are the same as those from the CIESY 1995 for 1993 and 1994. In 1993 a new concept of gross output was introduced. Compared to the old concept, it includes a few new items: value of output produced with non-purchased intermediate inputs, revenue from processing of intermediate inputs for others and the value of semi-finished goods and goods in process. These make the new concept somewhat higher than the old one. The most important difference however is that value added taxes – introduced in 1994 – are excluded from the new concept. This makes the new concept lower than the old one.[11] The 1995 census presents both concepts, allowing for a comparison (see table 3)

For 1995, the current figures for gross output and value added in this series are identical to the census figures for township and above (see tables 3 and 5). So we may conclude with some confidence that their coverage is that of enterprises with independent accounting systems at township and above.

Series E: 1998-2002

In 1998, there was a change in the coverage of the time series of output. Prior to this year, detailed data and time series and sectoral breakdown were provided for enterprises with independent accounting systems at township level and above. In 1998, the demarcation point for detailed data collection was changed into a size criterion. Since this year, data are collected for all state-owned enterprises plus all other enterprises with more than 5 million Yuan in annual sales. The values for the final years 1998 and 1999 in series D in SCIT turn out to be identical to the values for 1998 and 1999 published in the CSY. This suggests that the change of the cut-off point was already incorporated in the series D for 1993-1999.

Holz and Lin (2001) have analysed the break in the series. The main difference with the earlier series is that smaller non-state enterprises at township level and above with less than 5 million Yuan in annual sales are dropped, while village enterprises with more than five million Yuan in sales are added. For the state-owned enterprises, our analysis indicates there is no change in coverage. In table 3, the gross output of state-owned firms at township and above is identical to gross output of state-owned firms in the total economy (col. II). So all state firms with independent accounting systems were already covered. The number of enterprises in table 2 confirms this conclusion.[12]

The new cut-off point implies in 1998 implies that there is a break in the series in 1998. We have not tried to adjust for this break. Examination of the current output series in annex table B.2 reveals no radical discontinuities in the series. For total manufacturing, value added in 1998 is only marginally higher than that in 1997, while there is very rapid growth prior in the years before and after the break. This suggests that the net effect of the changes was that in terms of GDP, the new coverage might be somewhat more limited than the old one. This issue merits further attention.

Using quantity data and weights from the 1987 input-output table, Harry Wu has constructed time series by detailed branch of manufacturing in constant 1987 prices from 1949-79. There are several versions of these series. The most recent versions are

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[11] Why the new concept in col. IV of table 3 is no less than 0.9 billion lower than the old concept is a puzzle, as total value added tax is only 0.23 billion Yuan.

[12] State owned firms without independent accounting systems continue to be excluded after 1998.

to be found in Wu (2000a, b). In consistency and coverage, these series, in our opinion, are superior to the published series for the earlier years and provide a more realistic picture of trends in long-run GDP growth in manufacturing and industry. However, there are no time series of employment which are consistent in coverage and breakdown with the Wu series on output. This makes them less suitable for productivity analysis by sector. It is for this reason that this paper tries to adjust and improve published series of input and output for the period since 1980. For aggregate productivity figures, however, we will make use of the Wu series in section 2.7.2.

2.6.2 Gross Output and Gross Value Added 1980-2002

It is not possible to derive consistent series from published data for the whole period 1949-2002. In the present section we argue that it is possible to construct such a series for 1980-1997, linking series B and D and updating these with data for 1998-2002. We cannot adjust satisfactorily for the break in coverage in 1998, but the break in the value added series does not seem to be very dramatic.

In terms of coverage, linking series B and D causes no problems. As has been demonstrated above by comparison of numbers of enterprises and output figures in the time series and the 1985 and 1995 censuses, series B and D both refer to the output of enterprises with independent accounting systems at township level, excluding so-called affiliates.

In terms of concepts, there are three major discontinuities. The first two involve the introduction of a new concept of gross output in 1993 and the shift from the concept of net industrial output (net material product) to the SNA concept of gross value added in the same year. A third discontinuity is the introduction of value added taxes in China in 1994. Linking of the two series is made difficult, because there is no overlapping year where both the old and the new concepts are presented.

The differences between the new and old concepts of GVO are the following (see also section 2.3.1):

- The new concept includes final output produced with own, not purchased, intermediate inputs, the old concept does not (Census, 1995, p. 1)
- The new concept includes revenue for work on intermediate puts done for others.
- The value of semi-finished goods and goods in process is included in new GVO, if the costs of these goods are included in the cost of production. In the old GVO this was not the case, if the production cycle is shorter than six months.
- The new concept of GVO excludes the value added tax introduced in 1994. But other taxes such as sales taxes are still included, as was the case in the old concept of GVO.

The 1995 census presents data on both old and new concepts of GVO for township enterprises and above. On balance, the new concept is much lower than the old one (15 per cent lower for manufacturing, 14.4 per cent lower for total industry).[13] The first three changes would make the new concept higher than the old one; the value added tax would make the new one lower.

[13] A major puzzle is that that value added tax in 1995 is much smaller than the gap between old and new concepts. Old: 6424.7 bill. Yuan, new 5494.7 bill. Yuan, vat only 233.1 bill. Yuan. So the discrepancy between old and new concepts is not yet satisfactorily explained.

Given the net difference, the impact of the first three upward changes has to be very modest. As the value added tax did not exist prior to 1993, the post-1993 gross output figures should therefore not be too inconsistent, when comparing 1992 from the old series and 1993 from the new series. Growth would be at most marginally overstated, as the 1993 concept includes a little more than the 1992 concept, but the bias should not be serious. The introduction of VAT in 1994 would have made a big difference, were it not that VAT is excluded from the new census concept of gross output. The conclusion is that the two gross output series are more or less consistent and no adjustments need to be made.

From 1993 onwards, the old net industrial output concept (or net material product concept) is replaced by the concept of gross value added. The census does not provide much information about this concept. We assume it is consistent with the new gross output concept, excluding value added taxes, but including sales and other taxes (putting it somewhere between value added at factor cost and at market prices).[14]

The main differences between the concepts Net Industrial Output and Gross Value added are the following:

- NIO excludes depreciation, gross value added includes it. Thus GVA will be higher than NIO. The 1992 IO table provides data on depreciation by sector. We used 1992 proportions to adjust the NIO figures upwards to make them more consistent with the gross value added series.
- Net Industrial Output (Net Material Product) is gross of so-called non-material service inputs. In this respect NIO will be higher than the corresponding GVA concept. Again the 1992 IO table makes the distinction between material inputs and non material inputs. Using proportions from the IO we were able to adjust the 1980-92 series of NIO to the gross value added concept.

For aggregate manufacturing in 1992 the two adjustments cancel out. GVA is roughly the same as NIO. But at sectoral level the adjustments can make quite a lot of difference. For instance, in food manufacturing GVA is 20 per cent higher than NIO, while in leather and shoemaking it is 13 per cent lower. Therefore, in linking our sector series, we will use the sectoral net ratios of gross value added to net material product calculated from the 1992 IO table to adjust the 1980-1992 net industrial output series to the gross value added concept, before linking them to the 1993-1996 series. The adjustment factors are reproduced in Annex table A.2.

No other adjustments are required. Both concepts include sales and other taxes. The introduction of the value added tax in 1994 does not distort the series, as these taxes are excluded from the new gross output concept and thus also from the new gross value added concept. As in the case of gross output, the inclusion of three new categories of economic activity will make gross value added somewhat higher than NIO, but the influence of these activities is modest. As we are unable to correct for them, we will disregard them. No data are available for 1981, 1982 and 1983; these data have been interpolated, using the 1980-84 sectoral compound growth rates. The resulting table of output and value added at current prices is reproduced in Annex table B.2.

[14] These assumptions – especially on the exclusion of value added tax from value added - need confirmation before our results can be finalised

Deflators

The current price indices have been deflated using the indices of ex-factory price indices, 1980-2002 from the CSY, 2000, p. 305 (see annex table B.1). These same series have been used in Szirmai and Ren (2000). The use of these indices as deflators resulted in substantially lower growth rates than those found in official statistics at constant comparable prices, especially for the late 1990s.

One drawback of these series is that they are again based on administrative organisation, rather than economic sector. Thus the index for wood products also includes logging and the index for metallurgy includes metal mining. On the other hand, one would expect prices of major inputs and of manufactured outputs to move more or less in parallel, so we feel justified in using the series in spite of their shortcomings.

Wu (2000c) has criticised our use of the ex-factory price indices, arguing that they tend to overstate inflation and thus result in too low growth rates. He argues that in the early 1980s the price statistics concentrate on the output of state enterprises, while their coverage later widens to include output sold by non-state enterprises at higher negotiated or market prices. Thus, the series would overstate inflation. As he writes himself, however, it is very difficult to check these assumptions. Between 2000 and 2002 these indicators point to price deflation rather than inflation.[15]

Given the general consensus that there is a built in tendency towards overstatement of Chinese growth rates, we prefer to err on the side of caution, choosing for the most modest estimates of growth. Also, the price indices for the nineties show little signs of overstating inflation. On the contrary between 1996 and 2003 they even indicate net deflation, showing greater declines than the CPI for those years. This deflatory trend stretches the imagination in the context of explosive growth. In any event, the deflators do definitely not seem to overstate inflation. The resulting series of output at constant prices is reproduced below. The deflators and the series in current prices are reproduced in Annex table A.2. The final adjusted series at constant 1980 prices are presented below in table 10.

[15] Young (2000) used the same deflators.

Table 10 Gross Value of Output and Gross Value Added at Constant 1980 Prices, by Branch of Manufacturing, 1980-2002

		1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Total Industry	GO	4,703	5,144	5,626	6,154	6,731	7,660	8,256	9,178	10,285	10,389	10,674	11,879	13,960	16,118	17,450	16,250	18,032	19,704	20,361	22,393	25,668	28,973	34,382
	GVA	1,641	1,779	1,928	2,090	2,265	2,552	2,676	2,904	3,114	2,993	2,986	3,266	3,850	5,215	4,995	4,568	5,233	5,718	5,838	6,642	7,608	8,599	10,241
Food manufacturing	GO	396	425	455	488	524	577	634	670	758	775	809	917	993	1,102	1,264	1,241	1,363	1,508	1,420	1,483	1,673	1,846	2,183
	GVA	67	72	78	84	91	103	120	129	143	144	150	181	179	319	316	217	298	335	302	343	405	450	539
Beverages (a)	GO	67	76	87	98	111	131	144	179	206	205	224	261	302	359	383	355	419	479	474	515	568	588	646
	GVA	23	26	29	32	36	42	43	51	63	58	64	82	93	130	125	109	136	165	163	182	201	207	230
Tobacco processing (a)	GO	86	99	115	132	153	177	192	217	247	265	298	309	343	363	367	308	354	384	413	432	470	546	659
	GVA	53	61	70	81	94	101	118	131	147	151	171	176	184	197	209	188	223	244	266	277	303	352	440
Textile industry	GO	699	767	842	924	1,014	1,157	1,241	1,353	1,392	1,388	1,407	1,494	1,722	2,022	2,078	1,648	1,761	1,811	1,770	1,908	2,072	2,291	2,742
	GVA	199	206	214	222	230	273	302	316	327	313	301	295	324	546	469	322	390	425	411	471	512	566	675
Wearing apparel	GO	107	117	128	140	154	177	193	214	232	240	259	300	387	479	598	524	585	585	655	675	763	872	992
	GVA	25	28	31	35	40	49	53	56	58	60	61	68	81	157	147	124	148	147	156	168	197	231	254
Leather and fur products	GO	50	52	55	57	60	73	86	99	109	108	115	134	153	240	290	276	283	307	314	326	365	423	488
	GVA	12	12	13	13	14	17	19	22	22	21	23	26	26	64	70	57	71	75	72	77	88	105	124
Wood products (b)	GO	31	33	35	38	40	41	43	37	39	36	36	43	52	70	86	96	123	151	125	142	168	190	215
	GVA	10	10	11	11	12	12	12	10	10	9	8	10	12	24	23	22	34	41	29	34	40	49	56
Pulp, paper and printing (c)	GO	135	146	159	172	186	206	221	249	271	261	270	299	343	397	456	387	408	449	470	522	605	696	816
	GVA	44	47	51	54	58	66	69	74	79	71	72	77	89	115	124	96	118	130	132	152	168	198	239
Oil refining & coal prod. (d)	GO	184	190	197	203	210	221	244	268	294	320	334	392	422	359	314	279	291	315	307	325	369	386	423
	GVA	83	87	90	94	98	102	112	115	117	103	96	104	119	86	72	77	74	74	70	71	66	74	89
Chemicals, excl. oil (e)	GO	459	510	566	629	699	749	842	972	1,084	1,130	1,221	1,351	1,561	1,779	2,048	1,940	2,156	2,406	1,826	2,900	3,405	3,744	4,390
	GVA	143	157	174	192	212	222	249	276	309	300	325	361	432	535	532	489	588	636	651	778	910	1,018	1,207
Rubber and plastics (f)	GO	155	170	188	207	228	254	271	303	375	364	362	407	477	471	502	517	600	641	680	740	813	920	1,103
	GVA	51	55	59	64	69	76	77	81	90	89	90	99	115	136	122	107	150	164	168	182	205	241	292
Non-metallic minerals	GO	201	222	245	271	299	337	362	394	441	422	423	473	574	659	787	744	842	909	788	852	931	1,025	1,186
	GVA	83	91	99	108	118	133	142	145	157	138	134	156	204	254	247	222	251	263	223	252	284	309	355
Basic metals (g) (h)	GO	439	462	486	511	537	598	673	734	783	813	827	846	978	1,091	1,117	993	1,044	1,105	1,229	1,371	1,557	1,845	2,128
	GVA	121	129	137	145	154	166	178	196	208	209	182	186	246	344	323	267	272	277	293	346	408	485	568
Fabricated metals (h)	GO	125	134	143	153	164	189	207	238	251	249	239	246	281	289	356	326	393	431	479	515	572	652	771
	GVA	42	45	48	50	53	60	64	70	71	68	64	63	65	89	92	76	100	107	112	126	137	163	197
Machinery (i)	GO	467	521	581	647	722	851	899	1,040	1,173	1,075	1,014	1,176	1,477	1,600	1,765	1,636	1,823	1,944	1,847	1,978	2,276	2,629	3,296
	GVA	164	180	197	217	237	281	290	317	345	313	283	321	396	484	495	444	490	533	485	533	618	722	903
Transport equipment	GO	172	194	220	248	280	346	307	359	434	417	432	575	854	1,200	1,344	1,311	1,478	1,641	1,729	1,971	2,330	2,906	3,899
	GVA	51	58	65	73	83	107	87	97	115	105	110	140	204	322	319	319	364	400	443	505	575	733	1,016
Electrical machin. & equip. (j)	GO	152	172	194	219	248	323	356	390	469	505	455	493	622	752	791	767	879	970	1,091	1,239	1,448	1,664	1,906
	GVA	47	53	59	65	72	94	97	100	114	122	110	118	133	215	198	179	213	236	264	309	369	418	492
Electronic & telecom equip.	GO	76	93	113	137	167	222	211	275	351	328	334	411	467	528	680	748	877	1,130	1,471	1,796	2,262	2,729	3,504
	GVA	24	29	36	43	52	64	55	67	83	79	77	92	96	144	165	188	207	260	337	415	547	618	782

Table 10 Continued

		1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
instruments (l)	GO	40	44	48	53	58	63	62	66	71	67	63	74	92	149	144	126	152	173	208	217	260	285	338
	GVA	16	18	19	21	23	25	24	24	25	24	22	25	28	50	44	36	41	43	51	56	64	72	83
Furniture (b)	GO	23	24	26	28	30	34	34	29	30	27	29	32	38	39	51	53	68	77	75	81	94	111	136
	GVA	8	8	9	9	10	11	11	8	8	8	8	8	9	12	14	13	19	22	19	20	24	30	36
Other manufacturing (k)	GO	70	75	81	87	93	140	171	169	191	205	214	243	300	412	471	445	492	539	1,162	606	648	730	845
	GVA	27	29	31	33	35	45	57	56	60	62	63	70	78	128	125	110	134	140	138	151	165	190	222
Total manufacturing	GO	4,134	4,038	4,412	4,824	5,977	6,864	7,393	8,256	9,200	9,201	9,365	10,473	12,438	14,357	15,891	14,719	16,392	17,958	18,530	20,593	23,649	27,075	32,668
	GVA	1,294	1,243	1,342	1,451	1,790	2,048	2,179	2,343	2,550	2,445	2,412	2,658	3,113	4,350	4,232	3,664	4,322	4,718	4,787	5,445	6,286	7,231	8,797

Source: Gross value of output at current prices from annex table B.2, deflators from table Annex table B.1
Notes: (a) Deflated with the price deflator for food products (b) Deflated with the price deflator for wood products, which we assume includes both logging and wood products proper. (c) Deflated with the price deflator for paper products (d) Deflated with the deflator for the oil industry, which, we assume, includes both crude oil production and oil refining. (e) Including medical industry and chemical fibres industry (f) No separate index for rubber and plastics. Deflated with the overall price index for industry. (g) Combining ferrous and non ferrous metals; (h) Deflated with the index for the metallurgical industry, which probably refers to metal mining. This index shows very rapid price increases. Thus the series may understate growth. (i) Deflated with the price deflator for machinery. (j) There was no separate deflator for this branch. We used the overall price index as a deflator. (k) We combined cultural products, arts and crafts, and miscellaneous manufacturing into the category other manufacturing. Cultural products was deflated with the price deflator for cultural products and miscellaneous manufacturing by the overall price deflator for industry; (l) We used the overall price deflator for instruments.

2.6.3 Available employment series

To construct a consistent employment series for Chinese manufacturing requires a veritable leap of faith. Concepts change from year to year, subtotals frequently do not sum up to totals, different figures within the same publication are inconsistent, figures from different sources for the same year differ greatly, estimates are being constantly revised and coverage is seldom clearly indicated.

For time series on employment we have the following series:

A: *Social Labour Force by primary, secondary and tertiary industry, 1952-2002* (CLSY 2000, p. 8, same figures in CSY, 2000, table 5-2, p. 116 and subsequent CSY issues)

B. *Social Labour Force by sector and region, 1978-2002*

These series include data on Mining, Manufacturing, Utilities and Construction (CLSY, 2000, p. 9; CSY, 2000, pp. 120 ff; CSY, 2004). The totals are consistent with series A, but subtotals do not sum to totals of A.

C. *Staff and Workers by Sector and Region, 1978-2002*

(CLSY, 2000, p. 20-24; CSY various issues till 2004). Though the English title of the tables does not indicate this, the analysis in section 2.4.2 of this paper has shown that the coverage of these time series is limited to urban on-post-staff and workers. These time series are available for mining, manufacturing and utilities. Separate series are available for state staff and workers (all of these are urban), urban collective workers and other urban workers. Together these three series sum up to the aggregate staff and workers series in the same source.

D. *Staff and Workers by Detailed Subsector, 1978-2002*.

In the different volumes of the CLSY, detailed sectoral breakdown is given for manufacturing employment (and for all other sectors of industry) for the specific year the publication refers to. Thus CLSY, 1996 presents the detailed sectoral breakdown for 1995 (pp. 185-198), CLSY, 2000 presents the detailed sectoral data for 1999 (pp. 152- 396).[16] The CLSY does not present these data in the form of time series. The sector by sector time series derived from these data are to be found in the CSY, as tables in the chapters on industry rather than those on employment (Thus we used CSY, 2000, table 13-2 p. 408 for 1995-99 and CSY, 1995, p. 377 for 1992-1994). But, as indicated in the CSY, the original source for the CSY series on staff and workers by subsector of industry is the CLSY, which has been published since 1989. For the updates 2000-2003, we used CSY, 2000-2004. Series D are consistent with the aggregates in series C and have the same coverage, namely urban staff and workers.

[16] Strangely enough the detailed figures for 1995 in CLSY, 1996 refer to the on-post-staff and workers concept, while the detailed figures for 1999 in CLSY, 2000 refer to the slightly wider employment concept discussed in section 3.1, which we call employment. Clearly both sets of data are available in the underlying data set, but in 1999 only the wider of the two sets has been included in the CLSY publication. The time series reproduced in the CSY refer to the more limited of the two concepts: on-post -staff and workers. The same is true for the aggregate staff and workers series C.

E. Staff and workers by Subsector of Industry, 1980-1992 (CIESY 1993, p. 90 ff). This series was discontinued after 1992. It has no data for 1981, 1982 and 1983.

F. Employment in township and village enterprises, 1978-1999.
(CLSY, 2000, p. 404). This series is only available for aggregate industry. No further breakdown by sector is available.

Ideally, we would like to achieve the fullest coverage of output and employment in manufacturing, broken down by manufacturing subsector. For value added per person engaged in total manufacturing, the most appropriate employment concept corresponding to total output would be the social labour force, rather than the staff and worker concept. However, the social labour force is not broken down by sector, so the social labour force can only be used for aggregate productivity trends. For sector by sector productivity trends, we are limited to the staff and worker concept, which means that we should use an output concept with corresponding coverage.

Employment concepts have been discussed in detail in section 2.4. Here, we only repeat the findings which inform our choice of series and which necessitate adjustments to the published figures.

Coverage of employment and output

The most important conclusions are that series E are the most appropriate series for 1980-92, and that adjustments have to be made for coverage in 1993 and changes in the employment concept in 1998.We concluded that the time series of staff and workers published in the CSY and the CLSY (series C and D) are not consistent with the time series of output and value added in enterprises with independent accounting systems at township level and above, published in the CSY, the China Industrial Economy Statistical Yearbooks and the SCIT, 2000. The coverage of the employment series is limited to urban on-post-staff and workers, while the output series refer to all enterprises at township level and above with independent accounting systems, including enterprises in rural townships.[17]

We have already shown (sections 2.3.2 and 2.6.2) that the time series of output are consistent with the data in the 1995 and the 1985 censuses of industry. The employment series C and D are not. When we compare the figures for 1985 and 1995 with the census figures, the census figures – even for staff and workers – are much higher (see section 2.4.2 and Table 8).

The only time series of employment, which is consistent with the census output data and the time series of output and value added, is series E. It is the series 1980-92 published in the Industrial Yearbook of 1993 (CIESY, 1993, p. 90 ff.). The totals and subtotals of employment from this source are identical to the census data for 1985 (The data for 1980 and 1984 also derive from the census). This series has been discontinued after 1992, probably because it was inconsistent with the longer time series from the CLSY, spanning the period 1978-present (series C and D).

Our aim is to construct a series of employment figures, consistent over time and consistent in coverage with output of enterprises at township level and above. For the period 1980-92, we used employment series E, which are consistent with the census

[17] Since 1989, there is a separate volume on township and village enterprises (TVE, various issues). We are examining whether the published time series on output and employment could be supplemented from this source, but have so far been unsuccessful, due to overlapping enterprise categories which are not mutually exclusive. Work in this area will continue.

and with the output series. For 1995, we have employment figures from the 1995 census, which are consistent in coverage with the output figures for that year. A rough comparison of the figures for 1995 and those for 1992 from series C indicates that the 1995 census employment figures are in line with the 1980-1992 figures.

Adjustments in coverage 1993-2002

For 1993, 1994 and 1996-2002 we made use of figures from 1978-99 series C and D (CSY, 2000, p. 408 for 1995-99, CSY, 2001-2004 for 2000-2002, and CSY, 1995, p. 376 for 1993-1994, original source CLSY). To make these figures consistent with the earlier 1980-1992 figures and the 1995 figures, we adjusted the whole series upwards using sector by sector ratios of Census employment figures (staff and workers) to CLSY employment figures (urban staff and workers) for 1995 (see Annex table B.3 for adjustment factors).

Adjustments for changes in employment concepts in series D, 1998-2002

In our series D, a special problem is caused by the switch from the *staff and workers concept* to the *on-post staff and workers concept* in 1998. The new concept is more restrictive than the old one, and excludes workers who have a contractual tie with an enterprise but are no longer actually working. This means that the figures for 1998-2003 are not conceptually consistent with the figures previous to 1998. From 1997 to 1998 employment suddenly drops by 14.6 million persons in industry and 13.1 million persons in manufacturing. This decline is due to a mix of real world declines of employment, as collective and state enterprises restructure and the conceptual changes mentioned here. For purposes of labour productivity analysis, we need to adjust the post 1998 figures to make them conceptually consistent with the earlier ones. If one does not do this, the productivity growth figures exceed the bounds of belief (37% in 1998).

We adjusted for this change in concept as follows. We interpolated the sector by sector growth rates for 1995-96, 1996-77 and 1998-99, to get growth rates for 1998. These growth rates were used to calculate an employment figure for 1998 according to the old concept. This gives us sector by sector ratios of old to new concept of employment. The data 1998-2002 were adjusted upwards using the ratios of 1998.[18]

The two adjustments to series D were made in reverse order. First, we adjusted the published figures 1993-2002 for the changes in concept. Subsequently, we adjusted the whole series upwards for the change in coverage after 1993.
(The original series as published, the adjusted figures for 1998 and 1999 and the Census/CSY adjustment ratios for the whole series are reproduced in Annex table B.3).

[18] The reason for the adjustment is conceptual. Before 1998, there were also workers in enterprises who were no longer working. In 1998 they are reclassified.

Table 11: Employment by Branch of Manufacturing, 1980-2002

(10,000 persons, end-of year employment, staff and workers concept)

Branch of manufacturing	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Total Industry	5028	5182	5453	5741	6157	6605	6943	7298	7518	7546	7663	7965	8008	8151	8463	8501	8295	7993	7570	7052	6535	6113	5939
Food manufacturing	217	234	252	271	295	320	336	357	365	363	368	377	378	402	408	413	407	390	366	336	303	269	261
Beverage manufacturing	53	59	67	75	84	102	112	123	130	127	128	134	137	142	147	152	152	155	151	143	135	120	117
Tobacco processing	13	15	17	19	22	24	25	27	28	29	30	31	32	33	31	33	33	33	33	32	30	27	25
Textile industry	476	516	559	606	657	721	784	853	896	914	928	958	935	893	902	878	827	778	713	640	593	546	508
Clothing industry	135	147	159	173	187	207	212	218	217	217	228	243	247	255	282	273	262	252	243	233	229	231	248
Leather and fur products	60	64	68	72	77	86	92	98	99	97	102	110	113	133	144	154	142	133	123	113	115	109	113
Wood products	53	58	64	70	77	80	82	84	85	88	91	91	91	109	115	108	107	100	92	83	73	66	61
Paper and printing products	167	176	185	194	204	220	234	250	259	259	264	275	281	278	289	293	286	274	254	230	205	186	176
Oil refining, coking and coal products	36	37	39	41	43	46	51	57	62	67	69	80	84	75	78	79	84	82	79	74	72	66	66
Chemical industry,excl. oil	341	357	373	391	410	428	455	484	516	531	557	587	604	616	644	661	657	640	608	564	522	482	457
Rubber and plastics	135	144	155	166	178	194	204	216	226	226	233	246	251	247	248	260	251	238	222	204	185	170	171
Non-metallic minerals	456	488	522	558	597	664	701	739	751	723	699	718	719	748	757	802	769	731	685	635	579	528	500
Basic metals	282	291	300	310	320	339	356	373	395	413	420	426	446	494	511	511	501	479	460	440	409	384	356
Fabricated metals	216	224	232	240	248	260	274	289	290	282	283	289	288	282	288	283	266	256	235	209	190	176	172
Machinery	784	804	824	844	865	900	927	956	980	963	964	991	999	862	877	844	836	806	754	684	615	556	516
Transport equipment	241	248	255	262	270	284	290	295	301	302	309	322	333	384	392	420	402	393	380	366	332	316	308
Electrical machinery and equipment	171	179	187	195	204	225	239	253	263	261	267	282	288	289	298	312	302	291	275	255	234	221	226
Electronic and telecom equipment	110	115	120	125	131	139	144	150	151	154	162	175	177	172	186	196	186	188	186	185	192	199	216
Instruments	65	67	70	72	74	76	77	78	78	77	77	80	78	96	101	96	92	88	82	74	71	68	68
Furniture	59	61	63	65	67	70	70	70	68	63	62	62	59	49	51	51	45	44	41	39	35	33	37
Other manufacturing (b)	116	124	132	141	150	168	194	224	221	221	230	242	239	285	351	305	314	291	264	239	233	212	196
Total manufacturing	4186	4407	4641	4891	5161	5555	5860	6192	6381	6376	6472	6720	6777	6842	7103	7126	6922	6641	6246	5778	5350	4964	4798

Sources: 1985: 1985 Industrial Census; 1980-1992, Yearbook of Industrial Statistics 1993, p. 90 ff. 1993-1994: from China Statistical Yearbook, 1996 (original source CLSY, various issues); 1995: 1995 Industrial Census; 1995-2002 China Statistical Yearbook, 2000 (original source China Labour Statistical Yearbook, various issues). The data for 1980-1992 and for 1995 refer to staff and workers in enterprises with independent accounting enterprises at township level and above. The coverage of the original series 1993-2002 is limited to staff and workers in urban enterprises excluding employment in rural enterprises at township and above. From 1998 onwards the staff and workers concept is restricted to on-post staff and workers. The data from 1998 onwards have been adjusted to the older concept of staff and workers. The data for 1993-2002 have been adjusted in coverage to township level and above (with independent accounting systems0.

Notes:

(a) The figure for total industry is the sum of sector figures, rather than the printed total.

(b) After 1995, there was a systematic difference between the summed sectors and total employment. Inspection of the census reveals that this most likely refers to weapons and explosives production. In the table the discrepancy has therefore been included in other manufacturing.

This results in a series 1980-2002 broken down by detailed sector which is internally consistent in concepts and coverage and also consistent with the time series of output. There employment series are reproduced in Table 11. Changes in the industrial classification in 1993 did not affect the time series at this level of aggregation.[19]

The most striking result in Table 11 is the decline in total industrial employment by 23.3 million persons from 1995 till 2002. This decline is due to the massive lay-offs in state-owned enterprises in this period. As noted in section 2.6.3, a new category appeared in the statistics as a result of these developments: the so-called not-on-post staff and workers (21 million in 1999). This category refers to workers who are no longer working in an enterprise, but still have some kind of contractual relationship with it. It is therefore not quite clear to what extent these workers are really laid off and to what extent they still figure on the payrolls of (state owned) enterprises.

2.7 Productivity trends and jobless growth

2.7.1 Labour productivity (IAS), 1980-2002

Indexes of labour productivity by sector in independent accounting enterprises at township level and above are reproduced in Table 12, growth rates in Table 13.

One of the interesting features of Table 12 is the striking sectoral variation in sectoral labour productivity. Labour productivity in 2002 varies from less than half the average the manufacturing sector in non-metallic minerals and wood products to almost twice the average in electronic equipment and transport equipment and an astounding nine and half times the average in tobacco processing. There is also a marked tendency for sectors with lower initial levels of labour productivity to have faster productivity growth, indicating productivity convergence between sectors.

Productivity growth rates are summarised in Table 13. After 1992 there is a dramatic acceleration in labour productivity growth in manufacturing. From 1980-1982, average productivity growth was 3.4 per cent per year. As Chinese productivity was growing at about the same rate as US productivity, we called this a period of **growth without catch-up** (Szirmai, 1994; Szirmai and Ren, 2000). Productivity growth was respectable, but the gap relative to the world leader was not diminishing and the gap with some of the Asian tigers was even increasing. This situation changes after 1992. Between 1992 and 1997 productivity increased by 9.1 per cent per year, and between 1997 and 2002 by an astonishing 20.9 per cent, by far surpassing even the impressive productivity growth in the USA in the nineties.

Further interesting features of Table 13 include the reversal of the fortunes of textiles and wood products. In the 1980s these sectors were characterised by declining labour productivity, while between 1997 and 2002 productivity is growing by 19.5 per year in textiles and 17.1 per cent in wood products. In the 1990s, explosive productivity growth is also registered in the electronics and transport equipment.

[19] There were changes in the industrial classification in 1993. After 1993 crafts and arts was included in other manufacturing, and forage in food processing. Gas production was shifted from coking, gas and coal products to a separate category within utilities, while coking was combined with petroleum refining. With the exception of the modest employment figure in gas production, these changes do not affect the fifteen main categories in our final series, because in our older 1980-92 series (Szirmai and Ren, 2000), forage had already been included in food manufacturing and arts and crafts in other manufacturing.

Table 12: Gross Value Added per Person Employed by Branch of Manufacturing, 100 mill. 1980 Yuan 1980-2002[a]

(Enterprises with independent accounting systems at township level and above, in constant 1980 Yuan, 100 mill.)

	Branch of manufacturing	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
	Total Industry	3263	3432	3536	3641	3679	3864	3854	3979	4142	3966	3897	4100	4807	6398	5903	5373	6309	7153	7712	9418	11643	14068	17243
		100	105	108	112	113	118	118	122	127	122	119	126	147	196	181	165	193	219	236	289	357	431	528
1	Food manufacturing	3094	3101	3107	3114	3082	3232	3564	3610	3925	3958	4063	4794	4750	7947	7741	5258	7312	8593	8242	10213	13394	16737	20689
		100	100	100	101	100	104	115	117	127	128	131	155	154	257	250	170	236	278	266	330	433	541	669
2	Beverage manufacturing	4356	4336	4316	4297	4277	4094	3850	4146	4856	4602	5007	6119	6826	9144	8515	7130	8933	10662	10833	12750	14898	17237	19637
		100	100	99	99	98	94	88	95	111	106	115	140	157	210	195	164	205	245	249	293	342	396	451
3	Tobacco processing	38988	39924	40882	41864	42869	41703	46462	49232	51766	51410	57635	56581	57511	58937	67855	57236	66904	72990	81056	87289	102665	128868	174932
		100	102	105	107	110	107	119	126	133	132	148	145	148	151	174	147	172	187	208	224	263	331	449
4	Textile industry	4176	3996	3823	3658	3500	3784	3847	3701	3644	3424	3242	3080	3466	6119	5202	3664	4716	5463	5770	7348	8633	10358	13297
		100	96	92	88	84	91	92	89	87	82	78	74	83	147	125	88	113	131	138	176	207	248	318
5	Clothing industry	1845	1910	1977	2046	2118	2359	2478	2565	2662	2754	2675	2794	3278	6137	5230	4530	5658	5827	6447	7190	8605	9999	10223
		100	104	107	111	115	128	134	139	144	149	145	151	178	333	283	245	307	316	349	390	466	542	554
6	Leather and fur products	1950	1903	1857	1812	1768	1945	2120	2247	2194	2126	2231	2332	2282	4798	4845	3700	4997	5662	5857	6831	7645	9682	10998
		100	98	95	93	91	100	109	115	113	109	114	120	117	246	248	190	256	290	300	350	392	497	564
7	Wood products	1799	1739	1681	1625	1570	1458	1492	1220	1194	1044	932	1084	1327	2197	2034	2072	3205	4115	3104	4078	5502	7490	9072
		100	97	93	90	87	81	83	68	66	58	52	60	74	122	113	115	178	229	173	227	306	416	504
8	Paper and printing products	2639	2694	2750	2807	2866	2985	2955	2972	3040	2754	2711	2803	3163	4126	4283	3286	4116	4756	5177	6576	8204	10624	13554
		100	102	104	106	109	113	112	113	115	104	103	106	120	156	162	125	156	180	196	249	311	403	514
9	Oil refining, coking and coal products	23345	23164	22978	22786	22589	22300	21932	20235	18761	15511	13802	13072	14231	11421	9235	9725	8779	9030	8815	9551	9126	11245	13425
		100	99	98	98	97	96	94	87	80	66	59	56	61	49	40	42	38	39	38	41	39	48	58
10	Chemical industry, excl. oil ref.	4181	4409	4649	4901	5166	5173	5479	5715	5980	5641	5831	6156	7155	8678	8264	7402	8951	9948	10713	13803	17448	21131	26393
		100	105	111	117	124	124	131	137	143	135	139	147	171	208	198	177	214	238	256	330	417	505	631
11	Rubber and plastic products	3780	3811	3841	3870	3899	3929	3773	3760	4000	3923	3877	4023	4578	5505	4936	4130	5968	6887	7549	8908	11083	14130	17005
		100	101	102	102	103	104	100	99	106	104	103	106	121	146	131	109	158	182	200	236	293	374	450
12	Non-metallic minerals	1817	1857	1897	1938	1979	2004	2030	1967	2085	1915	1921	2176	2836	3390	3265	2767	3267	3595	3260	3974	4904	5838	7114
		100	102	104	107	109	110	112	108	115	105	106	120	156	187	180	152	180	198	179	219	270	321	391
13	Basic metals	4313	4434	4558	4686	4817	4892	5003	5252	5275	5060	4331	4371	5516	6951	6329	5236	5435	5788	6372	7861	9980	12637	15930
		100	103	106	109	112	113	116	122	122	117	100	101	128	161	147	121	126	134	148	182	231	293	369
14	Fabricated metals	1962	2006	2050	2096	2143	2316	2342	2408	2450	2406	2247	2180	2251	3136	3178	2674	3749	4191	4786	6013	7245	9276	11466
		100	102	105	107	109	118	119	123	125	123	115	111	115	160	162	136	191	214	244	306	369	473	584
15	Machinery and equipment	2086	2236	2395	2565	2745	3127	3125	3314	3516	3245	2937	3244	3962	5617	5649	5260	5856	6616	6434	7792	10040	12982	17488
		100	107	115	123	132	150	150	159	169	156	141	156	190	269	271	252	281	317	309	374	481	622	839
16	Transport equipment	2122	2325	2547	2790	3057	3766	2989	3303	3811	3484	3555	4345	6141	8396	8130	7610	9061	10189	11666	13777	17299	23198	32990
		100	110	120	131	144	177	141	156	180	164	168	205	289	396	383	359	427	480	550	649	815	1093	1555
17	Electrical machinery and equipment	2760	2950	3140	3342	3543	4163	4059	3950	4342	4658	4118	4172	4614	7442	6623	5723	7061	8126	9629	12099	15754	18909	21751
		100	107	114	121	128	151	147	143	157	169	149	151	167	270	240	207	256	294	349	438	571	685	788
18	Electronic and telecom equipment	2219	2566	2968	3432	3969	4611	3808	4467	5469	5104	4791	5240	5433	8388	8867	9586	11167	13847	18086	22451	28487	31070	36307
		100	116	134	155	179	208	172	201	246	230	216	236	245	378	400	432	503	624	815	1012	1284	1400	1636
19	Instruments	2531	2655	2786	2923	3067	3293	3099	3109	3252	3129	2791	3109	3546	5161	4360	3784	4514	4848	6165	7471	9008	10589	12222
		100	105	110	115	121	130	122	123	128	124	110	123	140	204	172	150	178	192	244	295	356	418	483
20	Furniture	1339	1370	1403	1435	1469	1532	1502	1200	1234	1203	1239	1363	1550	2453	2712	2633	4226	4939	4720	5062	6985	9272	9833
		100	102	105	107	110	114	112	90	92	90	93	102	116	183	203	197	316	369	352	378	522	692	734
21	Miscellaneous	2362	2346	2330	2314	2297	2684	2962	2504	2693	2823	2715	2899	3260	4507	3560	3591	4266	4820	5239	6316	7094	9001	11314
		100	99	99	98	97	114	125	106	114	119	115	123	138	191	151	152	181	204	222	267	300	381	479
	Total manufacturing	3090	2820	2893	2967	3469	3687	3718	3784	3995	3835	3727	3956	4594	6359	5958	5142	6244	7105	7664	9423	11749	14566	18334
		100	91	94	96	112	119	120	122	129	124	121	128	149	206	193	166	202	230	248	305	380	471	593

Sources: Value added at from table 10, employment from table 11, total industry from table 14. Note: a. GVA at market prices, but excluding value added tax. Employment: staff and workers. Coverage 1980-1997: independent accounting enterprises at township level and above. 1998-2002: all state-owned enterprises and all other enterprises with annual sales of more than 5 million Yuan.

Table 13: Labour Productivity Growth Rates, 1980-2002[a]
(Compound growth rates)

Branch of Manufacturing	1980-92	1992-97	1997-02	1992-02	1980-2002
Total Industry, IAS	3.3	8.3	19.2	13.6	7.9
Food and Beverages	3.9	11.6	17.3	14.4	8.6
Food manufacturing	3.6	12.6	19.2	15.9	9.0
Beverage manufacturing	3.8	9.3	13.0	11.1	7.1
Tobacco processing	3.3	4.9	19.1	11.8	7.1
Textile industry	-1.5	9.5	19.5	14.4	5.4
Clothing industry	4.9	12.2	11.9	12.0	8.1
Leather and fur products	1.3	19.9	14.2	17.0	8.2
Wood products	-2.5	25.4	17.1	21.2	7.6
Paper and printing products	1.5	8.5	23.3	15.7	7.7
Oil refining, coking and coal products	-4.0	-8.7	8.3	-0.6	-2.5
Chemical industry, excl. oil	4.6	6.8	21.5	13.9	8.7
Rubber and plastic products	1.6	8.5	19.8	14.0	7.1
Non-metallic minerals	3.8	4.9	14.6	9.6	6.4
Basic metals	2.1	1.0	22.4	11.2	6.1
Fabricated metals	1.2	13.2	22.3	17.7	8.4
Machinery and equipment	5.5	10.8	21.5	16.0	10.1
Transport equipment	9.3	10.7	26.5	18.3	13.3
Electrical machinery and equipment	4.4	12.0	21.8	16.8	9.8
Electronic and telecom equipment	7.7	20.6	21.3	20.9	13.5
Instruments	2.8	6.5	20.3	13.2	7.4
Furniture	1.2	26.1	14.8	20.3	9.5
Other	2.7	8.1	18.6	13.2	7.4
Total manufacturing, IAS	3.4	9.1	20.9	14.8	8.4
Total manufacturing, full coverage national accounts	3.6	9.6	9.2	9.4	6.2

Source: Table 12; Total manufacturing full coverage from table 14.
Note: a. Coverage: enterprises with independent accounting systems at township level and above; 1998-2002: all state-owned enterprises with more than five million Yuan in annual sales.

The main explanation for this impressive productivity growth is not technological progress but an unprecedented shakeout of labour which was contributing little to output in the state and collective sector. This occurred since 1995, the year in which post-war manufacturing employment peaked. Even after our major upward adjustments to the employment figures, an estimated 23.3 million workers were laid off between 1995 and 2002 in the large scale manufacturing sector. (Unadjusted figures would show a decline of 38.7 million workers since 1992 and 25.3 million workers since 1995). So this is a prime example of jobless growth.

Annex Table B.4 shows that not only labour was being shed. There was also acceleration in the growth of output of the township and above sector. Growth of output increased from an average 7.6 per cent in the eighties to 10.9 per cent between 1992 and 2002.[20] One of the factors affecting rapid growth is the use of sectoral

[20] Compound Growth rates are notoriously sensitive to the choice of the beginning and ending years. In Ren et al. 2002 we chose 1993 as the beginning of the recent period. However, 1993 is an outlier year, which results in much lower growth rates for the late 1990s. We checked our present results using the

deflators which show real price declines in the late 1990s. This needs to be followed up on, because one would normally not expect deflation in the context of explosive growth.

One should note that if we had not made adjustments to the employment figures, the unadjusted productivity growth rates would have been even higher. We have illustrated this in a counterfactual table in the annex, annex table B.4.

2.7.2 Aggregate labour productivity growth in total manufacturing and industry

The productivity trends discussed in the previous sector are based on series of output and employment which are consistent in time and with each other. But, the coverage of the series remains limited to enterprises at township level and above. In Table 9 we have shown that in 1995 this sector covers only 74.8 per cent of value added and 58.2 per cent of employment in total industry. (We have made rough estimates of coverage for manufacturing assuming that the non-covered part of industry is all manufacturing, as mining and utilities are always large scale activities Than the coverage is 70.6% of value added and 54.9 per cent of employment).

Productivity in the non-covered sector

This has two consequences for productivity estimates. First, productivity in total manufacturing and industry will be lower than in the covered part of manufacturing and industry (In table 9, we estimated that productivity in the non-covered sector is one third of that in the covered sector, while productivity in total manufacturing including the non-covered sector is 22 percent lower than in the covered sector).

Next, if coverage is changing over time, the productivity trends at township level and above may not be representative for total manufacturing. In this section, we therefore present aggregate productivity trends for total manufacturing and industry. Here we have a choice between the output series for industry published in the *China Statistical Yearbook* and the series put together by Harry Wu, on the basis of weighted quantity relatives. The Wu series cover the whole period 1949-1997 for both industry and manufacturing and are broken down by sector of manufacturing. As they do not depend on comparable prices and are based on consistent information on commodity quantities for the whole time series, they are preferable to the official series. We will use these series for aggregate productivity growth estimates, combining them with adjusted social labour force series. For total manufacturing, there are no official series. Here the Wu series are the only series available.

Unfortunately, there are no detailed employment figures corresponding to the coverage of the Wu output series by sector. His series – which use the weights from the 1987 input-output tables - cover the total industrial and manufacturing sector. The staff and workers employment figures, which are the only ones broken down by sector, only cover enterprises at township level and above. Therefore, in our opinion, the social labour force is the more appropriate employment concept to combine with the aggregate output series. The social labour force includes employment categories such as individual-owned enterprises and private owned enterprises, which are

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average of annual growth rates, which gave very similar results (usually marginally higher, but the same patterns).

excluded in the staff and worker concept. The social labour force data are not broken down by sector.

The social labour force will tend to overstate employment, because it also includes workers from outside the industrial sector with a second job in industry. But the understatement of employment in the staff and worker series is far more serious than the possible overstatement of employment in the social labour force series. Also, workers with a second job are actually employed in industry, so it is justified to include them in a series of persons engaged.

In 1995, the census staff and worker employment at township level and above covered only 58 per cent of the social labour force in industry (see Table 7). There is no reason to believe that the covered non-covered proportions will remain stable over time. So, at this moment we cannot (or not yet) use the Wu series for sectoral productivity calculations in combination with staff and worker time series.

In Table 14, we combine the aggregate Wu series for 1978-1997, with adjusted social labour force series. The Wu series were extended up to 2002, using the growth of published industrial GDP from CSY, 2000 and 2003, deflated by the producer price index from the CSY 2000 (see Annex table B.1).

Two important adjustments were made to the aggregate employment data (our series B from section 2.6.3). In the first place, we made an adjustment for the change to the concept of on-post staff and workers in 1998. We added the absolute difference between the adjusted and non-adjusted staff and workers figures at township level and above from Annex table B.3 to the published social labour force figures for 1998 and 1999. Next, we made an adjustment for undercoverage relative to the census of the 1978-1999 social labour force series in total manufacturing published in the CSY and CLSY.

As argued in section 2.4, the census provides more reliable estimates of employment than the series from CSY and CLSY. The discrepancy between the census figure and the corresponding figure from the published CSY time series increased between 1985 and 1995, indicating increasing undercoverage. Therefore, we interpolated the undercoverage rates, using the growth rate of undercoverage from 1985 to 1995. We also assume that undercoverage continued to increase at the same rate from 1995-99, because many of the laid-off workers would tend to move to the individual-owned and small-scale sectors which are more difficult to capture in ongoing statistical data collection. After 1999, we assumed the level of undercoverage remained unchanged.

The resulting productivity trends are reproduced in table 14Table 16.[21] After adjustment the aggregate figures are consistent with the findings for the township sector and above. They also confirm the rapid acceleration of productivity growth in the nineties. Productivity growth, though very high, is lower than at township level and above. Productivity levels are also lower. The aggregate series show a modest increase in employment till 1997 and a stabilisation after that year. The dramatic decline in employment seen at township level and above is not visible in total figures. It seems that some of the shock of the lay-offs is absorbed in the total economy.

[21] As an alternative to the Wu series for total industry, we also used the value added series for total industry from CSY, deflated by the same wholesale price index. As the Wu series usually show slower growth than published series, it was interesting to note that the long-run growth rate of the two series was almost identical. Setting 1980 at hundred, the Wu index for 2002 was 356, the CSY index was 377.

Table 14: **GDP per person engaged in Industry and Manufacturing, 1978-2002**

(GDP in constant 1980 prices; social labour force concept of employment)

	1978	**1980**	**1982**	**1985**	**1987**	**1990**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
Total Industry GDP/person	2,830	2,827	2,843	3,346	3,433	3,569	4,146	4,585	5,164	6,358	5,991	6,323	6,870	7,513	8,244	9,094	10,068
Total manufacturing GDP/person	2,568	2,590	2,636	3,140	3,220	3,357	3,975	4,469	5,073	6,368	5,932	6,274	6,819	7,448	8,122	8,891	9,741

Source: GDP in constant 1987 Yuan from Wu 2000b, adjusted to 1980 prices using price indexes for industry and manufacturing; social labour force: CLSY 2000, pp. 8-10, CSY 2000, p. 120, CSY 1996, p. 13, CSY, 2003. Published social labour force figures have been adjusted for the introduction of the new on-post staff and worker concept in 1998 and for increasing undercoverage, as indicated by comparison with the 1985 and 1995 census figures (see text).

2.7.3 The acceleration of productivity growth since 1982: An assessment

The figures discussed above indicate that there is a rapid acceleration of productivity growth in the 1990s. In our estimates, the growth rate for manufacturing at township level and above is more than four times as high as in the1980s. At the aggregate level, productivity growth in the 1990s is almost 3 times as high as in the 1980s. But we should note that the precise extent of the productivity acceleration is still hard to determine. It is important to note that these stellar productivity growth rates are found in spite of a series of adjustments which result in substantially lower growth rates than those calculated from the unadjusted figures.

Without our adjustments to employment, the growth rate of productivity at township level and above would be 5.8 per cent higher between 1997 and 2002 and 3.5 per cent higher for the period from 1992 to 2002 (seen Annex table B.5). At the aggregate level (table 14), using official figures productivity growth would be 3 per cent higher between 1997 and 2 per cent higher for the period from 1992 to 2002. In this case, the difference between the adjusted and unadjusted figures is due to the following factors. First, the use of wholesale price deflators results in slower growth of GDP than published GDP figures at constant prices. Next, we have corrected for the change in employment coverage after 1993 and the decline in employment due to the change of employment concept in 1998 (see Annex table B.3).

There is no denying the massive lay-offs in urban state-owned and collective enterprises, but a considerable part of the registered decline in employment in 1998 has to do with changes in the statistical registration of reality. The fact that many people registered as employees of an enterprise may not be actually working, dates back further than 1998. In the long run, the whole employment series will be have to adjusted in a smoothed fashion, resulting in higher productivity growth in the earlier period and lower growth rates in the later years. When the 2005 census data are available, this will allow us to check the assumptions we have made.

A related issue refers to the recategorisation of employment from the industrial to the service sector. In 1985 around 9 per cent of the industrial employment figures at township level and above actually referred to persons providing education, housing, health and other services to the employees of the enterprise. In recent years, these activities are increasingly outsourced to independent service units or treated in a different statistical fashion. Part of the decline in published industrial employment statistics may be due to this phenomenon.

Finally, at aggregate level of industry and manufacturing, we have made upward adjustments in employment to account for the increasing undercoverage in the social labour force time series published in CSY/CLSY. This adjustment is based on the increasing discrepancies we found between Census and CSY/CLSY between 1985 and 1995.

What needs to be assessed urgently in future research are the wholesale price deflators, which are pointing to price deflation in recent years. Is it plausible that prices are declining, while manufacturing is growing so rapidly? If this is not the case, than growth would be overstated.

Given the general tendency to overstate industrial performance, our preferred estimates are consistently the most conservative ones, but even those show spectacular growth of productivity in the 1990s.

3 Unit value ratios and productivity comparisons

3.1 Methods

The shortcomings of exchange rates for purposes of international comparisons of output and productivity are by now well-known, while expenditure based purchasing power parities are not very well suited for sector by sector comparisons. An alternative methodology has been developed in the International Comparison of Output and Productivity (ICOP) project, developed at the University of Groningen. The ICOP methodology for the benchmark comparisons has been discussed in detail in many papers in this field (see van Ark, 1993; Ren, 1997, Szirmai and Ren, 2000 and Timmer, 1996). Timmer et al., (2001) have refined the approach used in the recent comparisons. Here we provide only a brief summary.

The basic approach is to make binary matches of products or product groups from industrial censuses of the two countries being compared. For each country, we need information on product quantities and ex factory output values (output or sales). These are used to calculate unit values for products or product groups. For each match, unit value ratios are calculated. These are subsequently aggregated to higher levels. This is done in three steps. First, all unit value ratios within an industry are weighted with their gross output values. This gives us industry unit value ratios. Next, all industry unit value ratios in a branch are weighted with their industry gross output values. This gives us branch unit value ratios. Finally, all branch unit value ratios are weighted by branch gross output, to derive unit value ratios for total manufacturing.

In a binary comparison we can use either US quantity weights or Chinese quantity weights. At each level, we therefore have two sets of unit value ratios. Usually, the Fisher (geometric) average of these two is used as converter. The Fisher unit value ratio is then used to convert GDP into the currency of the other country, for purposes of real level comparisons of output and productivity. Dividing a UVR by the exchange rate for that year gives sector by sector real price levels, which are interesting for assessing competitiveness.

A typical effect of the use of unit value ratios for developing countries is that real output and productivity in developing countries is shown to be up to twice as high as when using exchange rates. Thus the structure of world manufacturing will look very different when one replaces exchanges rates by UVRs.

3.2 Derivation of unit value ratios China/US for 1995

A first benchmark comparison between China and the USA for 1985 made use of the 1985 Chinese census (Szirmai and Ren, 1995, 2000). One of the problems of our 1985 benchmark was that the 1985 Chinese industrial census presents a wealth of commodity quantity information, but no direct values of quantities produced. We were therefore forced to calculate implicit unit values by dividing quantities of commodities into the appropriate subsectoral values of output from another part of the census. This affected the reliability of our unit value ratios, because there was not a perfect match between quantities and values. A step forward was made by Wu (2001) who made a new benchmark comparison for 1987 based on very detailed ex factory price data from outside the census, which he matched and merged with quantity data from another source to derive his unit values. A drawback of these new estimates was that price and quantity data used to calculate unit values did not come from one and the same source.

Bai, Ren and Szirmai (2002) used detailed and compatible data on output quantities and values from the 1995 industrial census for their new benchmark comparison for 1995. In contrast to the 1985 census, the 1995 industrial census contains information which does allow us to calculate unit values directly for large and medium sized enterprises. It contains one list with detailed output quantities and output values (1995 census, p. 314 ff). A second list contains average sales prices and the value of sales by commodity (census, p. 382 ff), thus allowing for the calculation of implicit quantities. Sales values and prices were adjusted to factor costs, using information from the census. The resulting data on sales quantities were adjusted to output quantities, using output to sales ratios for 549 subsectors from the census. Combining these two lists, we were able to construct a unit value list with output quantities and values coming from the same source, and which is consistent with the employment and value added data in the same census. The new list of some 800 well defined unit values is a major step forward. The only drawback of this approach is that the list refers to medium and large scale manufacturing output, while the unit values are applied to total manufacturing at township level and above. But the advantages of the method outweigh the disadvantages by far.

The methods have been discussed in detail in Szirmai et al, (2001), Bai et al. (2002) and in full detail in Ren et al. (2002). Here we only present the final results, starting with unit value ratios in. Table 15.

Table 15: Unit Value Ratios and Relative Price Levels by Major Manufacturing Branch, China/USA 1995 (Yuan to $)

		UVR (Yuan/$)			Relative
		at Chinese Quantity Weights	at USA Quantity Weights	Geometric Average	Price Level China (USA = 100)
1/2/3	***Food, beverages and tobacco***	5.8	5.8	5.8	69.9
1	Food manufacturing	6.3	5.9	6.1	73.0
2	Beverage industries	3.6	4.6	4.1	49.1
3	Tobacco Products	7.4	7.4	7.4	88.1
4	Textiles	3.9	5.3	4.6	54.6
5	Wearing apparel	3.4	5.7	4.4	52.7
6	Leather and footwear	2.2	2.2	2.2	26.7
7	Wood and wood products, excl. furniture	2.3	3.7	2.9	34.5
8	Pulp, Paper, Printing and publishing	5.5	5.2	5.4	64.1
9	oil and gas refining	7.9	8.1	8.0	95.5
10	Chemicals excl. oil/gas	7.1	7.8	7.4	89.1
11	Rubber and plastic products	6.8	7.0	6.9	82.5
12	Non-metallic mineral products	2.4	1.7	2.0	23.9
13	Basic metals	4.2	6.8	5.3	64.0
14	Fabricated metals	4.2	6.8	5.3	64.0
15	Machinery and Equipment	1.5	2.4	1.9	22.5
16	Transport Equipment	1.5	2.4	1.9	22.5
17	Electr. machin. and equipment total	2.9	4.0	3.4	41.2
	of which office and accounting machinery	2.5	6.6	4.1	48.5
18	Medical, optical and precision instrument	2.9	4.0	3.4	41.2
19	Furniture	2.3	3.7	2.9	34.5
20	Miscellaneous	4.2	5.0	4.6	55.3
	Total Manufacturing	4.2	5.0	4.6	55.3
	Exchange Rate 1995			8.35	

Sources: US Census of manufacturing, 1997; Industrial Census, 1995.
Notes: a. 1995/1997 Unit value ratios moved to 1995/1995 using US deflators from BLS, Data Based Producer Price Indices. The Chinese unit values refer to commodities produced by medium and large scale enterprises at township level and above.

The geometric average (Fisher) unit values in Table 15 form the basis for the rest of this paper. They will be used to convert Chinese output into US dollars. This allows us to assess the relative size of Chinese manufacturing sectors compared to the USA and allows us to make absolute comparisons of productivity.

The Fisher unit value ratio for total manufacturing in 1995 is 4.6 Yuan to the dollar. This is 55.3 % of the exchange rate. This provides a rough indication of the price competitiveness of Chinese manufacturing. Productivity comparisons for the 1995 benchmark year are presented below in Table 16.

Table 16 Gross Value Added per Person Employed, China/USA 1995

	|-- at Chinese Prices --|		|-- at USA Prices ---|		Geometric average
	China in RMB	USA in RMB	China/ USA (%)	China (in $)	USA (in $)	China/ USA (%)	China/ USA (%)
Food and Kindred Products	19,443	400,105	4.9	3,328	68,611	4.9	4.9
Textiles Mill Products	9,970	180,839	5.5	2,526	34,357	7.4	6.4
Wearing apparel	12,342	154,503	8.0	3,642	26,985	13.5	10.4
Leather products and Footwear	12,608	103,544	12.2	5,652	46,482	12.2	12.2
Wood products	8,321	172,535	4.8	3,690	46,947	7.9	6.2
Paper Products, Printing & Publishing	11,618	299,566	3.9	2,126	57,178	3.7	3.8
Petroleum & Coal Products	55,961	1,519,243	3.7	7,083	188,671	3.8	3.7
Chemicals & allied Products	20,385	1,089,403	1.9	2,873	139,526	2.1	2.0
Rubber and Plastic products	12,818	316,248	4.1	1,877	45,467	4.1	4.1
Non-Metallic Mineral Products	10,698	94,691	11.3	4,547	56,097	8.1	9.6
Basic Metal Products	25,596	490,125	5.2	6,115	71,937	8.5	6.7
Fabricated metal products	12,987	396,399	3.3	3,103	58,180	5.3	4.2
Machinery and Equipment	12,846	133,343	9.6	8,754	55,485	15.8	12.3
transport equipment	17,739	191,268	9.3	12,089	79,589	15.2	11.9
Electrical Machinery and Equipment	24,129	336,163	7.2	8,193	83,557	9.8	8.4
Office, Accounting & Computing	66,618	694,801	9.6	26,890	104,911	25.6	15.7
Instruments	10,356	310,488	3.3	3,516	77,175	4.6	3.9
Furniture	10,534	130,787	8.1	4,671	35,587	13.1	10.3
Other manufacturing	10,267	248,734	4.1	2,419	49,534	4.9	4.5
Total Manufacturing (township +)	15,696	327,622	4.8	3,698	65,245	5.7	5.2
Total Manufacturing (village +)	14,758	327,622	4.5	3,477	65,245	5.3	4.9
Total manufacturing (census, full coverage)	12,216	327,622	3.7	2,878	65,245	4.4	4.1

Sources: Labour productivity China from table 9; Labour productivity USA: Annex table A4; UVRs from table 15. Chinese coverage: township level and above. The bottom lines of the table are based on rough estimates for full coverage, derived from table 9.

In spite of the spectacular productivity advances noted in the first half of the paper, comparative productivity in Chinese manufacturing remains very low. At township level and above average productivity is 5.2 percent of the US level. The rough estimate for all enterprises is below 4 percent of the US level. Best comparative performance is found in office, accounting and computing machinery, machinery and equipment, leather products, transport equipment, wearing apparel, and furniture.

It should be emphasized that exchange rate conversion would result in even lower figures. The results in table 16 illustrate the immensely labour intensive character of Chinese manufacturing in 1995. Low comparative productivity is compensated for by very low labour costs, resulting in the low comparative price levels of table 15.

4 China's position in the structure of world manufacturing

The use of unit values ratios as converters rather than exchange rates, will result in a different picture of the shares of developing countries in world manufacturing output. First, as UVRs are usually much lower than exchanges, the share of a developing country like China will be correspondingly higher. Next, rather than using the exchange rate as a single converter for all branches we have calculated sector specific UVRs for each sector. It can be seen that some sectors such as oil refining, chemicals

and rubber and plastics have UVRs close to the exchange rate, while other sectors are far below the exchange rate.

The approach in this section will be to convert current Chinese value added into US dollars, using benchmark UVRs, extrapolated forward and backward with the help of US and Chinese sectoral deflators.

4.1 The real size of Chinese manufacturing: Chinese GDP by sector, as a percentage of US GDP

Table 17 presents the information about the relative size of Chinese manufacturing. This table was put together in three steps. First, we calculated Fisher unit value ratios by sector for our benchmark year 1995. These were reproduced in Table 15. Next, we extrapolated the benchmark UVRs, using sectoral deflators for the China and the USA. The extrapolated UVRs and relative price levels are reproduced in the annex table B.9. The final step is to convert current Chinese value added in Yuan (Annex table B.2) into current dollars, using the extrapolated UVRs and dividing the resulting figure by the corresponding value added in current dollars for the USA from Annex table B.6. Note that the sectoral data for China refer to the series at township level and above, while the US data refer to the total economy.

At the bottom of the table there is a row for total manufacturing at township level and above. For total manufacturing, we have had to make a choice between two alternatives. The first alternative is based on the sum of the Chinese sectors after conversion into US dollars. The second – preferred – alternative takes the sum of Chinese sectors in current Yuan and converts it using the extrapolated UVRs for total manufacturing. This is the version included in the table.

There are very substantial differences between the two estimates. The use of sums of converted sectors gives much higher outcomes than the converted total (e.g. 64 % of the US level in 2002, rather than 43 % as indicated in the table). This illustrates one of the numerous index number problems involved in this type of comparative research. There are a number of reasons to prefer the converted total (the lower estimate) to the summed version. First, the weights used in the recent ICOP methodology to calculate the aggregate UVRS in the benchmark year are gross output weights, not value added weights. If one sums the sectors, one is implicitly using value added weights. Second, the use of chain index deflators in the USA does not allow one to sum deflated subsectors at constant prices (Landefeld et al, 2003). As the base year of the index shifts each year, there can vast discrepancies between summed deflated sectors and deflated totals. Though the present estimates are in current dollars, the UVRs used as converters were extrapolated using the US chain index deflators. So we expect to find large discrepancies between sums of converted sectors and converted totals. In addition, the deflators in China are usually linked indices with different base years. This also contributes to the discrepancies between summed subsectors and totals. So in Table 17, we only reproduce the converted totals.[22]

At township level and above total GDP in Chinese manufacturing increases from 12.3 per cent in 1980 to 42.9 per cent in 2002, marking the emergence of a new industrial giant. The table also illustrates the vital effect of the use of UVRS as converters. If we were to use exchange rates, as is done in the row 'total manufacturing using exchange rates', China's GDP would amount to only 23.4 per

[22] The alternative results are available on request.

cent of US 'GDP, in 2002. Exchange rates underestimate the role of China in world manufacturing. In relative terms, the largest Chinese sectors are leather and footwear (more than six times US output in 2002), non-metallic minerals and textiles (more than twice US output) and machinery and equipment and basic metals (over 100 per cent of the US, in 2002).

Total manufacturing

Unfortunately, there are no published series for total manufacturing GDP in Chinese statistics. There are only figures for total industry, including mining and utilities. Using the 1985 and 1995 census, we have made rough of calculations of the grand total of GDP in manufacturing including the non-covered sector, using value added gross output ratios from the input-output tables (see the discussion of tables 8 and 9). We interpolated coverage ratios of township to total for the intervening years, resulting in estimates of total GDP in current Yuan from 1985-1995. These have also been converted into current US dollars to get a rough idea of the real size of total Chinese manufacturing GDP, relative to the US.

If we assume that ratio of total manufacturing to township + remained unchanged between 1995 and 2002, than total Chinese manufacturing GDP would be around 60.8 per cent of US manufacturing GDP. But further research is needed here before this figure can be used with any confidence. On the one hand, the undercoverage of manufacturing GDP in the most often used time series seems to be increasing over time, so that the actual percentage may be higher. On the other hand, we assumed in tables 8 and 9 that the whole of the non-covered part of the industrial sector should be allocated to manufacturing, which may be an exaggeration. Finally, the UVR calculated for the total township + enterprises may not be applicable to total manufacturing. So the 60.8 per cent estimate is a first working hypothesis.

Table 17: Chinese GDP as a percentage of US GDP in manufacturing

(In current US dollars, converted with extrapolated UVRs)

Branch	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Food, beverages and tobacco	8.7	9.6	9.8	11.3	13.1	13.5	16.0	17.5	18.3	19.5	21.2	24.8	26.6	36.9	36.0	23.9	34.2	39.3	42.1	45.5	59.3	70.9	85.2
Food manufacturing	*4.6*	*5.0*	*4.8*	*5.5*	*6.1*	*6.4*	*7.7*	*8.2*	*8.4*	*8.9*	*9.2*	*11.5*	*11.7*	*20.2*	*19.5*	*11.3*	*17.4*	*20.0*					
Beverage industries	*12.7*	*13.6*	*14.4*	*16.3*	*18.7*	*20.6*	*21.8*	*25.0*	*29.4*	*28.3*	*33.3*	*41.7*	*50.0*	*69.7*	*64.0*	*47.7*	*67.4*						
Tobacco Products	*16.3*	*18.0*	*20.7*	*21.9*	*27.1*	*27.5*	*35.0*	*38.9*	*40.0*	*45.2*	*52.0*	*55.4*	*56.4*	*67.0*	*65.7*	*48.2*	*63.8*	*66.0*	*73.0*				
Textiles	52.6	49.4	53.0	51.1	53.6	60.8	67.4	67.8	67.3	68.0	71.2	69.7	70.7	119.3	97.6	64.7	89.4	98.6	97.6	127.1	137.4	187.3	222.6
Wearing apparel	8.7	9.7	11.2	12.1	13.2	15.9	16.4	17.3	18.1	19.1	19.0	20.8	23.1	45.0	42.8	38.4	48.6	48.2	51.7	55.5	67.5	84.5	90.0
Leather and footwear	29.7	30.3	34.1	37.0	40.1	52.6	69.5	69.2	66.9	62.7	70.6	79.2	79.6	211.4	219.8	173.6	274.0	286.7	302.2	388.8	392.7	552.4	630.9
Wood and wood products	4.2	4.6	4.9	4.7	4.4	4.2	4.1	3.0	3.0	2.9	2.8	3.6	4.5	9.6	8.9	8.0	12.9	15.5	10.6	12.3	14.3	19.0	20.5
Pulp, Paper, Printing and publishing	2.4	2.6	2.8	2.8	2.9	3.2	3.3	3.4	3.5	3.2	3.3	3.6	4.2	5.4	5.8	4.9	5.8	6.4	6.7	7.4	8.4	10.8	13.2
oil and gas refining	71.4	42.9	56.5	41.2	36.9	36.1	58.9	35.7	33.7	32.4	37.5	47.6	52.5	36.2	30.0	26.1	21.9	25.9	23.5	18.1	19.5	26.8	24.3
Chemicals excl. oil/gas	6.7	7.1	7.9	7.9	8.4	8.8	9.3	8.9	9.9	9.5	9.7	11.0	12.9	16.0	14.4	13.0	15.1	15.2	16.4	19.0	22.0	25.4	28.1
Rubber and plastic products	14.6	14.1	16.0	15.9	14.7	15.0	15.2	14.0	14.8	13.2	13.7	14.5	15.6	16.9	14.0	11.8	15.5	15.8	15.5	16.2	17.2	21.8	26.9
Non-metallic mineral products	65.1	77.1	102.2	94.8	94.1	102.9	105.9	116.3	120.5	100.6	97.3	124.6	147.3	186.5	165.1	144.3	161.7	152.8	130.1	143.9	163.2	195.7	230.6
Basic metals	18.3	18.8	27.7	35.9	31.5	37.9	37.8	42.7	42.5	44.0	38.5	40.4	52.4	65.8	59.3	49.7	49.5	48.7	49.7	56.1	67.3	84.2	102.4
Fabricated metals	6.3	6.6	7.9	8.0	7.4	8.2	8.9	9.1	8.7	8.7	8.4	9.0	9.1	11.8	10.7	8.4	10.8	11.3	11.8	13.0	13.5	17.8	22.0
Machinery and Equipment	20.4	22.7	31.7	38.5	36.2	42.9	48.7	50.6	46.9	41.2	38.5	47.3	61.1	72.1	67.0	57.0	63.3	66.5	60.8	71.7	75.0	96.3	127.9
Transport Equipment	6.5	7.4	7.9	8.0	7.4	9.6	8.0	8.5	9.9	9.8	10.8	15.0	22.0	32.1	30.1	30.0	36.5	38.2	38.3	41.6	47.2	62.8	81.6
Electr. machin. and equipment	6.9	7.4	8.6	9.2	8.9	11.4	11.6	11.0	11.7	12.0	11.4	13.4	14.4	22.3	20.3	18.1	19.7	22.1	25.8	30.1	35.5	49.6	61.5
Medical, optical & precision instruments	3.5	3.5	3.8	3.9	3.8	4.0	3.9	3.7	3.4	3.2	2.9	3.3	3.8	6.9	6.4	5.3	6.2	6.3	7.6	8.8	9.5	11.4	11.8
Furniture	9.3	8.9	9.9	9.7	8.9	9.4	9.5	7.1	6.9	6.2	6.7	7.9	8.0	9.9	11.1	10.3	14.5	15.3	13.2	16.4	19.0	27.1	33.9
Miscellaneous	12.5	11.7	13.2	14.6	12.6	16.2	21.4	19.4	18.5	18.9	19.1	22.5	25.8	40.5	37.9	32.6	39.7	39.7	39.7	33.0	32.8	40.3	46.8
Total Manufacturing (township+) converted total	12.3	12.6	14.5	15.0	14.4	16.0	17.2	17.0	17.3	16.7	16.6	19.0	21.8	29.3	26.4	21.3	24.5	25.2	24.6	26.6	29.4	36.2	42.9
Total manufacturing share using exchange rate	9.5	8.9	9.3	9.6	8.6	9.9	9.1	7.6	8.0	8.7	8.2	8.7	9.5	12.5	12.1	11.8	13.9	14.3	13.4	14.3	16.3	19.8	23.4
Total manufacturing (rough estimate total)						18.8	19.3	19.1	19.9	19.4	19.6	23.1	27.7	37.9	35.5	30.2							60.8

Sources: Chinese GDP at current prices from Annex table B2; US GDP at current prices from Annex table B.6. Extrapolated UVRs from Annex table B.9. Estimate for total manufacturing in 2002, assuming the same coverage of ratio as in 1995.

5 From Growth without catch up to accelerated catch up: Chinese productivity performance in comparative perspective

In table 18, we have extrapolated the benchmark productivity comparisons for 1995 of Table 16, using indexes of GDP per worker of the two countries being compared, China and the USA. One should note that the comparison is made between Chinese enterprises at township level and above for which detailed data are available and the sum total of US manufacturing enterprises.

The bottom rows of table 18 also provide rough estimates for total Chinese manufacturing, and enterprises at village level and above. In Table 8 we had provided estimates of value added at village level and above in the benchmark year 1995. We extrapolated comparative productivity at village level and above, assuming that the productivity trends at township + level were representative of those at village + level as well. This is an optimistic assumption as most of the labour shakeout has been concentrated in the large enterprises at township level and above. So our comparative productivity estimates for village plus enterprises in 2002 should be considered to be an upper bound.

We also entered a row for total manufacturing, based on the aggregate Chinese productivity trends in Table 14. That table uses the broader social labour force employment concept, rather than the staff and workers concept used at township level and above. This results in a much slower rate of productivity growth. The comparative estimates for total manufacturing are still tentative and preliminary and should be taken with more than a grain of salt. In this case they should be taken as a lower bound, due to the use of the broadest employment concept. They do illustrate a very important phenomenon, namely that the shakeout of staff and workers in large enterprises at higher administrative levels is not mirrored in the employment figures for the total economy. There manufacturing employment continues to increase from 1995 to 1997 and stabilises thereafter, cushioning the shock of lay-offs in the township and above enterprises. Therefore, it is not surprising to see that productivity growth rates in the total economy are less spectacular, though still very high by international standards.

These productivity differentials between the small and the large scale sector are in line with what we know about growing disparities in income levels which seem to be characteristic of modern Chinese growth. In our interpretation of the productivity figures, we will concentrate on the enterprises at township level and above.

With regard to the shakeout of labour at township level and above, a question which merits further research is to what extent the spectacular shrinking of the labour force reflects changes in definitions of employment, rather than changes in the real world. It is not inconceivable that large numbers of workers, who were on the payroll prior to 1995, were not making much of a productive contribution. In that sense, productivity growth rates may be exaggerated. Also, we are witnessing a rapid process of outsourcing where services which used to be supplied by the manufacturing enterprises to their employees are now being provided by the service sector.

Table 18:
Comparative Labour Productivity by Branch of Manufacturing
1980-2002 (GDP per person engaged, China as % of the US)

	1980	1984	1985	1990	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
1. Food and Kindred Products	3.8	3.8	3.5	4.9	5.8	7.8	7.5	**4.9**	7.0	8.3	9.4	10.9	15.5	20.8	25.4
2. Textiles Mill Products	10.7	7.5	7.4	6.7	6.5	11.5	9.6	**6.4**	9.0	10.2	10.7	14.8	16.4	21.6	25.5
3. Wearing apparel	7.3	7.1	7.1	7.2	7.6	14.1	11.7	**10.4**	12.4	12.2	12.5	12.2	13.5	14.7	12.5
4. Leather products and Footwear	11.6	10.0	10.2	9.4	8.5	19.2	17.8	**12.2**	19.7	19.1	20.9	27.6	25.4	32.8	30.9
5. Wood products	6.0	4.3	3.8	2.4	3.7	6.8	6.3	**6.2**	9.9	13.1	10.0	13.1	17.1	23.8	26.5
6. Paper Products, Printing & Publishing	2.8	2.9	3.0	2.9	3.3	4.4	4.5	**3.8**	4.6	5.3	6.0	7.2	9.0	12.4	14.8
7. Petroleum & Coal Products	31.3	12.1	10.8	6.7	7.7	5.7	4.4	**3.7**	2.9	3.4	3.2	2.5	2.7	4.0	3.6
8. Chemicals & allied Products	2.1	2.1	2.1	1.8	2.2	2.7	2.3	**2.0**	2.3	2.4	2.7	3.4	4.2	5.2	5.8
9. Rubber and Plastic products	7.3	6.0	5.6	4.8	5.0	5.8	5.0	**4.1**	5.6	6.1	6.6	7.4	8.7	11.2	13.0
10. Non-Metallic Mineral Products	9.3	9.3	9.0	7.6	10.4	12.7	11.4	**9.6**	11.5	11.4	10.4	12.6	15.9	20.7	24.5
11. Basic Metal Products	7.3	8.2	8.7	6.7	7.9	8.8	7.8	**6.7**	6.8	7.0	7.5	8.7	11.1	13.7	15.9
12. Fabricated metal products	4.5	4.2	4.5	4.1	4.1	5.5	5.0	**4.2**	5.7	6.3	7.4	9.2	10.6	14.4	16.8
13. Machinery and Equipment	5.9	7.8	8.8	7.3	10.1	14.0	13.4	**12.3**	14.2	15.8	15.8	20.1	23.3	31.2	40.2
14. transport equipment	4.8	4.8	6.2	6.5	11.3	13.7	12.5	**11.9**	15.1	16.6	17.9	20.0	24.5	32.5	40.9
15. Electrical Machinery and Equipment	35.1	28.0	28.6	13.8	11.9	16.2	12.5	**8.4**	7.5	7.0	6.4	5.9	5.7	6.1	5.9
16. Instruments	4.2	4.5	4.7	3.1	3.9	5.5	4.6	**3.9**	4.7	5.1	6.7	8.2	9.4	11.6	10.3
17. Furniture	7.2	6.4	6.5	5.5	6.5	9.8	10.8	**10.3**	16.1	18.0	16.7	22.1	28.9	41.9	43.7
18. Miscellaneous	4.7	3.5	3.8	3.4	4.4	6.1	4.7	**4.5**	5.4	6.0	6.5	6.1	6.3	8.1	9.5
Total Manufacturing (township +)	5.6	5.1	5.2	4.6	5.5	7.3	6.4	**5.2**	6.1	6.7	7.0	8.0	9.5	12.1	13.7
Total Manufacturing (village +) (a)								**4.9**	5.8	6.3	6.6	7.5	9.0	11.3	12.9
Total manufacturing (census, full coverage) (b)								**4.1**	3.7	3.7	3.9	4.0	4.1	4.6	4.6

Sources: Benchmark productivity from table 16, extrapolated with indices of Chinese GDP per worker at constant prices (table 12) and US GDP per worker (annex table B.7)
Notes: (a) The estimate for village plus is extrapolated using the same constant price productivity series as for township and above. (b) The estimate for total manufacturing is extrapolated using the constant price series from table 14.

In comparative perspective the period from 1980 to 1995 can be characterised as one of rapid growth of output and productivity without substantial catch up. The level of comparative labour productivity in total manufacturing (township plus) in the years 1994 to 1996 was not more than one per cent higher on average than in 1980.[23] This implies that productivity in China was growing at the same rate as that of the world productivity leader, the USA. But the productivity gap was not being bridged.

This changed after 1996. In a few years comparative productivity increased from 5 to 13.1 percent of the US level for enterprises at township level and above. After years of preparation, China is engaged in a full-blown catch up spurt of Gerschenkronian proportions.

It is important to remark that efficiency gains are a crucial element of recent catch up. China does not seem to be adding more capital to the existing workforce; rather it is shedding labour at a rapid rate. These efficiency gains are once and for all gains. Once redundant labour has been shed, productivity growth will have to be driven by the more difficult processes of capital intensification, human capital improvement, technological change and upgrading of production.

Catch up is not evenly distributed across manufacturing. Some sectors show much more catch up than others. The most striking are the productivity gains achieved in sectors such as furniture, transport equipment, machinery and equipment and leather products. In 2002, these sectors had a comparative productivity of 30-40 percent of the US level. Such productivity gaps are becoming comparable to those of the Asian Tigers Taiwan and Korea.

It is worth noting that the sectors with the fastest comparative productivity growth are those that have been shedding labour most rapidly, as is illustrated by the examples of transport equipment and furniture.

The performance of chemicals and oil refining is consistently weak, with low productivity levels in chemicals and productivity declines in oil refining and coal.[24] In the Chinese context, productivity growth in the electrical machinery and electronics sectors has been well above average productivity growth (see Table 12). The decline in comparative productivity relative to the US has more to do with the astounding US productivity growth in these sectors.[25]

The final observation emerging from this paper is that after years of very rapid growth of output and productivity, China's comparative level of productivity remains rather low. The productivity gap facing the Chinese economy is still very substantial. In the long run, sustained increases in wages and welfare will depend on bridging the productivity gap.

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[23] 1993 was an atypical outlier.

[24] The deflator used for oil refining and coal products shows very rapid price increases, far in excess of that in other sectors. The appropriateness of this deflator merits further attention.

[25] Comparative performance is also influenced by the use of hedonic price indices in the electronics sector in the USA. An option being considered is to apply US deflators to Chinese sectors, but this is only appropriate if the production package in the two countries is sufficiently similar.

References

Statistical Sources[26]:

Census 1985: National Bureau of Statistics, (1987-88), Office of Leading Group of the National Industrial Census under the State Council, Peoples Republic of China, *Industrial Census 1985*, Vol. I-X, China Statistics Press (in Chinese).

Census 1995: National Bureau of Statistics, Office of the Third Industrial Census (1997), Vol: *The Data of the Third National Industrial Census of the People's Republic of China in 1995*, China Statistics Press.

CIESY 1993: National Bureau of Statistics (1993c), *1993 Zhongguo Gongye Jingji Tongji Nianjian*, (1993 Chinese Industrial Economy Statistics Yearbook), Beijing.

CIESY, 1995: National Bureau of Statistics, 1996 Zhonggua Gongye Jingji Tongji Nianjian (1995 Chinese Industrial Economy Statistics Yearbook) (data for 1993 and 1994)

CIESY 1998: National Bureau of Statistics, 1998 Zhonggua Gongye Jingji Tongji Nianjian (1998 Chinese Industrial Economy Statistics Yearbook) (data for 1997 and 1996)

CLSY, 1996: National Bureau of Statistics, Department of Population, Social Science and Technology Statistics, China Labour Statistical Yearbook 1996 (data for 1995), China Statistics Press,

CLSY 2000: National Bureau of Statistics, Department of Population, Social Science and Technology Statistics, *China Labour Statistical Yearbook 2000* (data for 1999), China Statistics Press, 2000.

CSY 1995: National Bureau of Statistics (1995), China Statistical Yearbook 1995, China Statistics Press.

CSY 1996: National Bureau of Statistics, (1996), *1996 China Statistical Yearbook*, Beijing: China Statistics Press (in English).

CSY, 2000: National Bureau of Statistics (2000), *China Statistical Yearbook, 2000*, China Statistics Press.

CSY, 2002: National Bureau of Statistics (2002), *China Statistical Yearbook, 2002*, China Statistics Press.

CSY, 2004: National Bureau of Statistics (2004), *China Statistical Yearbook, 2004*, China Statistics Press.

IO Table 1987: National Bureau of Statistics (1987c), Department of Balances of National Economy and Office of the National Input-Output Survey, *Input-Output Table of China 1987*, China Statistics Press, Beijing.

IO Table 1992: National Bureau of Statistics, P.R. China, Department of National Accounts, *Input-Output Table of China, 1992,* China Statistics Press, 1995

IO Table 1995: National Bureau of Statistics, P.R. China, Department of National Accounts, *Input-Output Table of China, 1995*, China Statistics Press, 1997.

IO Table 1997: National Bureau of Statistics (1999), P.R. China, Department of National Accounts, *Input-Output Table of China, 1997*, China Statistics Press, 1999.

National Bureau of Statistics, Department of National Economic Accounting, *The Gross Domestic Product of China, 1952-1995*, Donghei University of Finance and Economics Press, 1997.

National Bureau of Statistics (State Statistical Bureau)/Institute of Economic Research Hitotsubashi University 1997), *The Historical National Accounts of the People's Republic of China*, 1952-1995, September 1997..

SCIT 2000: National Bureau of Statistics Department of Industry and Transport, *Statistics of China's Industry and Transport, 1949-1999,*China Stastics Press, Beijing, November, 2000.

TVE (1996), The Editing Committee of the Township and Village Owned Enterprises Yearbook of China, *Township and Village Owned Enterprises' Yearbook of China*, 1996 and various issues.

USA

Bureau of Labour Statistics (1998), *Data Base Producer Price Indices*, Internet: http:\\146142.424\CGI-BIN\DSRV. Version d.d. April 26, 1998.

[26] To avoid multiple references to the national bureau of statistics, statistical sources are referred to by their abbreviations (CSY, CLSY etc). The English translation of the Chinese statistical bureau has been changed from State Statistical Bureau to National Bureau of Statistics, the China Statistical Publishing house has now been translated as China Statistics Press.

Current Industrial Report, 1995
Lum, S.K.S, B.C. Moyer and R.E. Uskavage (2000), Improved Estimates of Gross Product by Industry for 1947-98, *Survey of Current Business*, June, 2000, pp. 24-54.
Groningen Growth and Development Centre, 60-Industry Database, February 2005, http://www.ggdc.net: 60-I_US_05.xls

General
World Bank, World Development Indicators, 2004

Other References
Bai, Manyin, Ren, Ruoen and Szirmai, Adam (2002), *A New Benchmark Comparison in Manufacturing between China and the US by ICOP Approach*, School of Economics and Management, Beijing University of Aeronautics and Astronautics, June, , mimeo.
Chen, Shaohua. and Wang, Yan, (2001), *China's Growth and Proverty Reduction: Recent Trends between 1990 and 1999*, paper for a WBI-PIDS Seminar on "Strengthening Poverty Data Collection and Analysis" Manila Philippines, April 30-May 4, 2001..
Holz, C. A. and Lin, Y. (2001), 'The 1997–1998 break in industrial statistics. Facts and appraisal' *China Economic Review* **12** (2001) 303–316.
Hsueh Tien-tung and Li Qiang (eds) (1999), *China's National Income, 1952-1995*, Westview Press.
Landefeld, J.S., B.R. Moulton and C.M. Vojtech (2003), 'Chained Dollar Index', *Survey of Current Business*, November, pp. 8-16.
Maddison, A. (1998), *The Chinese Economy in the Long Run*, OECD Development Centre, Paris.
OECD (2000), *National Accounts for China. Sources and Methods*, OECD Centre for Cooperation with Non-Members
Ren, R. (1997), *China's Economic Performance in an International Perspective*, OECD, Paris.
Ren, R., A. Szirmai and M. Bai (2002), *How Productive is Chinese Manufacturing? Comparative Labour Productivity in Chinese Manufacturing, 1980-99*, paper for the 27th IARIW conference, Stockholm, August.
Szirmai, A. (1994),'Real Output and Labour Productivity in Indonesian Manufacturing, 1975-1990', *Bulletin of Indonesian Economic Studies*, No. 3, August, pp. 49-90.
Szirmai, A. and R. Ren, 'China's Manufacturing Performance in Comparative Perspective, 1980-1992' (1995), Research Memorandum 581 (GD-20) Groningen Growth and Development Centre, Groningen (65 pp.)
Szirmai, A, and R. Ren. (1998), 'Chinese Manufacturing in Comparative Perspective', in : M. Fouquin and F. Lemoine, eds., *The Chinese Economy*, London, Economica, pp. 49-64.
Szirmai, A. and R. Ren (2000), 'Comparative Performance in Chinese Manufacturing, 1980-92', *China Economic Review*, 11 (1), pp. 16-53**.**
Szirmai, A, R. Ren and M. Bai (2001), *Labour Productivity Trends in Chinese Manufacturing, 1980-99*, Eindhoven Centre for Innovation Studies, ECIS working Paper, 0.10, October.
Timmer, M.P (1996),. 'On the Reliability of Unit Value Ratios in International Comparisons', Research Memorandum GD-31, Groningen Growth and Development Centre, University of Groningen.
Timmer, M., B. van Ark, N. Mulder, L. Nayman and D. Ünal-Kesenci, (2001), *Formalization of the ICOP Methodology for Binary Manufacturing Comparisons*, Mimeo, Groningen.
Van Ark, B. , The ICOP Approach – Its Implications and Applicability, in: A. Szirmai, B. van Ark and D. Pilat, Explaining Economic Growth. Essays in Honour of Angus Maddison, Amsterdam, North Holland, 1993, pp. 375-398.
Wu, H. X. (1997), 'Reconstructing Chinese GDP According to the National Accounts Concept of Value Added: the Industrial Sector, 1949-94', *SOM Research Report 97C24*, University of Groningen.
Wu, H.X (1998), Reconstructing Chinese GDP According to the National Accounts Concept of Value Added: The Industrial Sector, COPPAA Working Paper Series No. 4, Centre for the Study of Australia-Asia Relations, Griffiths University.
Wu, H.X. (2000a), 'China's GDP Level and Growth Performance: Alternative Estimates and Implications', in *Review of Income and Wealth*, **46 (4),** December, pp., 475-499.
Wu, H.X (2000b), 'Alternative Estimation of the Post-War Chinese Industrial Production and Growth', Discussion Paper, D99-10, 1-51, Institute of Economic Research, Hitotsubashji University.
Wu, H.X (2000c), 'China's Long-Run Comparative Labour Productivity Performance in Manufacturing: An Industry-of Origin PPP Approach', Department of Business Studies, Hong Kong Polytechnic University, mimeo.

Wu, H.X, (2001), Comparative Labour Productivity Peformance in Chinese Manufacturing, 1952-97, An ICOP-PPP approach, Groningen Growth and Development Centre, GD. 49.
Young, A., Gold into Base Metals: Productivity Growth in the People's Republic of China during *the Reform Period*, Chicago, Graduate School of Business, July, 2000, mimeo.

Annex A Background Tables for 1995 benchmark

Proportions of value added to gross output from the 1995 IO table were used to calculate census value added, where the 1995 census only provides information about gross value of output. This assumes that sector shares in the census and the input output table are comparable. Annex Table A. 1 compares the gross output shares of the census (IAS enterprises at township level and above) and the 1995 IO table. The 1995 IO publication only has 33 by 33 tables. We based ourselves a the 33*33 use tablle. Where more detail was required for the comparison, we used proportions from a 124*124 commodity by commodity table from the 1997 IO to break down totals from the 1995 33*33 use table.[1] The sector structure in the two sources is very similar giving us some confidence in our application of IO ratios to the census.

Annex Table A. 1 : Sector Shares in Gross Value of Output in 1995 in Census and IO Tables

	Census, 1995	IO 1995
Food manufacturing	8.8	8.5
Beverages	2.0	2.0
Tobacco	1.0	0.8
Manufacturing of textiles	9.0	9.9
Manufacture of wearing apparel	3.6	4.4
Leather and fur	2.3	2.6
Wood products and furniture	1.9	2.2
Paper, printing and publishing	4.1	5.6
Petroleum refining and coking	3.3	3.2
chemicals excluding rubber and plastics	10.3	9.9
rubber	1.2	1.2
plastics	2.8	2.7
Non-metallic minerals	8.1	7.9
Primary Metal manufacturing	9.4	9.2
Fabricated metal products	4.4	4.9
Machinery and equipment	8.8	9.6
Transport equipment	6.0	4.8
Electrical machinery and equipment	5.2	5.1
Electronic machinery	4.4	3.9
Instruments, metres	0.8	0.5
n.e.c., including maintenance and repair (a)	2.2	1.3
Total manufacturing	100	100
Mining	6.4	5.8
Manufacturing	89.7	90.9
Utilities	3.9	3.3
Total Industry	100	100

Sources: Census 1995, p. 3 ff.: Gross Output of enterprises at village level and above, and/or with annual sales of one million yuan and more ; Input-Output Table of China 1995 (IO 1995)
(a) including crafts and arts; cultural and sports products

[1] The combination of commodity by commodity and use table involves small discrepancies, but at the level of aggregation of table A.1, they are very minor ones.

Annex Table A. 2: Ratio of GVA to Net Industrial Output, 1992

	GVA	TNM (a)	Depreciation	NIO	GVA/NIO
Total industry	106248457	15668933	18432526	103484864	1.03
Food (incl. Forage)	4349756	728860	1442133	3636483	1.20
Beverages	2329310	443232	324716	2447826	0.95
Tobacco	3763131	172855	116044	3819942	0.99
Textile industry	7826214	1355821	1319105	7862930	1.00
Clothing	2244273	308181	232912	2319542	0.97
Leather and leather shoes	965730	279081	140563	1104248	0.87
Wood processing and furniture manufacturing	1232775	169064	174483	1227356	1.00
Paper and printing	2984755	352884	479963	2857676	1.04
Petroleum processing and coking	2742016	134312	543587	2332741	1.18
Petroleum processing industry	2339723	79532	396502	2022753	1.16
Coking,gas and coal products industry	402293	54780	147085	309988	1.30
Chemical products 14101-14300	10160534	1972451	1947087	10185898	1.00
Rubber and plastic products (14401-14502)	3369331	573667	542855	3400143	0.99
Building materials and other non-metallic mineral products	8793641	1058685	1307902	8544424	1.03
Basic and fabricated metals	12451649	2344270	1969495	12826424	0.97
Primary metal manufacturing	9030094	1916665	1588840	9357919	0.96
Metal products industry	3421555	427605	380655	3468505	0.99
Machinery and transport equipment	14832520	2427172	1912810	15346882	0.97
Machinery industry	10714545	1803115	1420397	11097263	0.97
Transport equipment	4117975	624057	492413	4249619	0.97
Electrical machinery and equipment	6494728	1387134	835038	7046824	0.92
Electrical machinery and equipment	3907988	788577	438591	4257974	0.92
Electronic and communication equipment	2586740	598557	396447	2788850	0.93
Other Manufacturing(culture, instruments other, repairing)	6187954	849189	902040	6135103	1.01
Instrument,instrument meter and measuring appl.	682306	128211	82419	728098	0.94
Machinery equipment repairing	929402	128374	181757	876019	1.06
Cultural products, etc.	*1778371*	*194889*	*187286*	*1785974*	*1.00*
Other industry	2797875	397715	450578	2745012	1.02
Total manufacturing	90728317	14556858	14190733	91094442	1.00
Power, steam and hot water	5743977	338098	2061263	4020812	1.43

Source: 1992 IO table (IO 1992)

Annex Table A. 3
Coverage Ratio: Gross Value of Match Output as % of Total Gross Value of Output in Sample Industries

	Branch and Sample Industries within the Branch	China 1995	US 1997	Number of Matches
1	**Food and Kindred Products**	**31.0**	**10.9**	**16**
	1. Forage and Grain Mill Products	18.7	61.0	4
	2. Edible Vegetable Oil	8.7	15.0	2
	3. Salt Industry	15.1	1.2	1
	4. Sugar & Sugar Factories	48.0	51.0	1
	5. Food Products	0.4	0.1	1
	6. Milk	22.2	4.8	1
	7. Beverages	36.9	18.4	5
	8. Tobacco	93.0	42.0	1
2	**Textile Mill Products**	**36.5**	**55.5**	**14**
	9. Fibre Raw and Processed Industry			
	10. Textile , Printing and Dyeing Product	43.5	54.2	13
	11. Knitting Industry	1.6	20.8	1
3	**Wearing Apparel**	**9.7**	**30.4**	**3**
	12. Wearing Apparel	11.1	40.5	3
4	**Leather Products and Footwear**	**6.8**	**25.1**	**2**
	13. Currying Leather	33.4	57.0	1
	14. Leather Industry	0.7	3.8	1
5	**Wood Products**	**22.3**	**25.9**	**5**
	15. Wood Products	11.5	49.6	1
	16. Man Building Board Proceeding	29.8	29.4	3
	17.Furniture	13.3	45.5	1
6	**Paper Products, Printing and Publishing**	**17.7**	**15.3**	**5**
	18. Paper Products, Printing and Publishing	35.3	58.1	5
7/8	**Chemicals and Allied Products, incl. petroleum and coal**	**21.2**	**23.0**	**15**
	of which			
7	***Chemicals and Allied Products***	**7.1**	**1.9**	**8**
	19. Inorganic Chemicals	25.1	3.0	3
	20. Fertilizers	39.5	54.9	5
8	***Petroleum and Coal Products***	**60.0**	**72.0**	**7**
	21. Petroleum Refineries	60.0	75.2	7
9	**Rubber and Plastic Products**	**15.7**	**8.90**	**3**
	22. Rubber Products	32.9	25.8	2
	23. Plastics	6.3	4.2	1
10	**Non-Metallic Mineral Products**	**14.3**	**14.7**	**7**
	24. Cements	28.2	80.9	2
	25 Ceramics	11.5	12.5	1
	26. Concrete Products and Fibrotile	1.0	9.2	1
	27. Bricks & Lime Manufacturing	2.0	62.7	2
	28. Other Enduring Fire Materials	77.6	78.2	1
11/12	**Basic and Fabricated Metals**	**18.2**	**9.7**	**19**
	of which:			

11	***Basic Metal Products***	***23.9***	***32.1***	***17***
	29. Iron and Steel	42.5	30.6	9
	30. Non-ferrous Metals	33.9	33.9	8
12	***Fabricated Metal Products***	***0.8***	***0.1***	***2***
	31. Fabricated Metal Products	0.5	0.1	2
13/14	**Machinery and transport Equipment**	**7.5**	**3.5**	**46**
	of which:			
13	***Machinery and Equipment***	***13.4***	***10.1***	***45***
	32. Metal Proceeding Industry	27.2	9.9	17
	33. Common Machine Industry	27.9	11.2	9
	34.General Components and Accessories	26.6	72.4	4
	35. Machine Industry for Other Purpose	1.7	4.8	7
	36. Agriculture and Forest Machine Industry	26.4	12.5	8
14	***Transport Equipment***	***0.03***	***0.3***	***1***
	37. Ships	0.4	15.8	1
15/16	**Electrical Machinery incl. office and accounting**	**18.3**	**20.1**	**53**
	of which			
15	***Office, Accounting and Computing Machinery***	***7.5***	***45.1***	***15***
	38. Office, Accounting and Computing Machinery	0.4	39.0	1
	39.Computing machinery	11.0	45.3	14
16	***Electrical Machinery and Equipment***	***19.2***	***13.8***	***38***
	40. Electrical Machinery and Equipment Industry	6.8	6.6	7
	41. Lights and Bulbs	3.7	7.2	1
	42. Electrical Household Appliances	41.1	17.8	5
	43. Electronic Components and Accessories	22.8	34.5	9
	44. Electronics and Telecommunication	31.3	40.9	3
	45. Communication Equipment	24.4	0.5	4
	46. Measurement Instruments	5.2	6.7	9
17	**Other Manufacturing Products**			
	Total Manufacturing:	**19.1**	**14.0**	**188**

Annex Table A. 4: Basic Data on Output and Employment USA, 1995

	Branch	Gross Value of Output (mill. US$)	Gross Value Added (nat. acc. concept) (mill. US$)	Gross Value Added in Branch as % of Total	Employment (persons)
1/2/3	Food and Kindred Products	481,389	119,974	9.7	1,746,000
4	Txtiles Mill Products	79,742	30,460	2.5	886,577
5	Wearing apparel	78,097	20,520	1.7	760,423
6	Leather products and Footwear	9,064	5,206	0.4	112,000
7	Wood products	104,923	41,313	3.3	880,000
8	Paper Products, Printing & Publishing	361,077	135,854	10.9	2,376,000
9	Petroleum & Coal Products	151,261	26,980	2.2	143,000
10	Chemicals & Allied Products	362,126	145,665	11.7	1,044,000
11	Rubber and Plastic products	145,426	44,740	3.6	984,000
12	Non-Metallic Mineral Products	75,990	31,302	2.5	558,000
13	Basic Metal Products	180,303	51,075	4.1	710,000
14	Fabricated metal products	204,819	85,234	6.9	1,465,000
15	Machinery and Equipment	304,085	104,479	8.4	1,883,006
16	transport equipment	462,616	142,941	11.5	1,796,000
17	Electrical Machinery and Equipment	415,663	147,465	11.9	1,831,034
	Office, Accounting & Computing machinery	*90,249*	*27,174*	*2.2*	*259,021*
18	Instruments	72,113	67,448	5.4	873,960
19	Furniture	24,613	19,039	1.5	535,000
20	Miscellaneous manufacturing	75,849	22,092	1.8	446,000
	Total Manufacturing:	3,589,157	1,241,607	100.0	19,030,000

Source: Gross Output from Current Industrial Report, 1995; Value added and employment, based on GGDC 60 industry database

Annex B Time Series

Annex Table B. 1: Industrial Producer Price Index China by Sector of Manufacturing, 1979-2002

Branch	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Overall index	100	100	100	100	100	101	110	114	123	142	168	175	186	199	246	294	338	348	347	333	325	334	329	322	330
Metallurgical Industry (a)	94	100	102	103	104	108	124	133	142	164	198	219	250	285	450	480	507	495	482	449	430	444	438	427	456
Power Industry	102	100	102	100	106	108	112	115	118	120	127	137	160	174	236	330	361	409	466	491	496	508	519	523	528
Coal Industry	94	100	103	105	106	109	128	124	127	141	158	168	190	220	308	376	419	476	514	497	471	462	492	549	588
Petroleum Industry (b)	98	100	99	100	106	119	127	133	139	148	160	172	204	235	403	599	726	760	816	759	832	1200	1190	1133	1309
Chemical industry	102	100	97	97	98	100	103	106	119	143	171	174	178	183	198	228	288	298	285	264	255	258	250	244	250
Machine building industry	103	100	99	98	97	98	110	113	119	132	161	165	170	181	217	237	252	256	251	244	236	230	223	214	208
Building materials	98	100	102	104	107	109	126	143	151	171	211	210	223	248	354	381	405	423	421	407	398	397	393	384	383
Wood products (c)	96	100	111	118	118	122	140	150	217	260	301	285	286	302	399	426	424	416	414	395	395	392	390	385	382
Food manufacturing	99	100	102	105	106	108	114	117	128	149	170	172	177	188	214	264	326	339	338	333	322	309	310	309	312
Textiles	98	100	99	96	91	88	91	94	101	124	152	163	170	168	174	238	279	268	263	247	237	249	245	232	237
Sewing industry	99	100	100	96	92	92	97	97	106	123	147	160	175	176	207	241	281	304	315	308	302	300	298	294	294
Leather industry	98	100	102	101	102	103	115	117	120	138	163	173	189	213	238	290	354	393	387	380	368	369	372	369	368
Paper making	100	100	101	101	102	102	116	122	137	165	203	208	214	220	239	255	369	428	405	381	365	365	364	356	352
Cultural etc.	98	100	99	99	99	99	102	102	122	137	152	164	173	177	196	214	238	241	241	228	213	212	207	202	199

Source SSS, China Statistical Yearbook, 1993, Beijing 1993, table T7.24, pp. 238, ex factor prices indexes of industrial products by sector, updated with CSY, 2000, p. 305 and CSY, 2004
Notes:
(a) Combined index for metal mining and metal manufacturing
(b) Including petroleum refining
(c) Forestry including both logging and wood products

Annex Table B. 2: Gross Value of Output and Gross Value Added in Chinese Manufacturing, 1980-2002

(current yuan, 100 mill.)

		1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total Industry	GO	4,703	5,160	5,662	6,214	6,818	8,435	9,436	11,319	14,586	17,474	18,689	22,089	27,724	39,693	51,353	54,947	62,740	68,353	67,737	72,707	85,674	95,449	110,776	142,271
	GVA	1,641	1,784	1,941	2,110	2,295	2,810	3,058	3,581	4,416	5,034	5,229	6,073	7,646	12,843	14,700	15,446	18,209	19,835	19,422	21,565	25,395	28,329	32,995	41,990
Food manufacturing	GO	396	433	473	518	566	658	741	857	1,127	1,318	1,389	1,627	1,872	2,357	3,335	4,040	4,626	5,095	4,730	4,779	5,165	5,726	6,744	8,442
	GVA	67	74	81	89	98	118	140	165	213	244	257	321	338	683	834	708	1,010	1,134	1,006	1,106	1,251	1,397	1,666	2,134
Beverages	GO	67	78	90	104	121	150	168	229	307	349	385	462	568	767	1,010	1,156	1,423	1,620	1,580	1,659	1,752	1,824	1,996	2,233
	GVA	23	26	30	34	39	47	50	65	94	99	110	145	176	278	330	354	461	557	544	586	619	643	710	796
Tobacco processing	GO	86	101	119	140	165	202	225	277	368	451	512	547	647	776	969	1,004	1,202	1,296	1,375	1,391	1,451	1,695	2,037	2,236
	GVA	53	62	73	86	102	115	138	168	219	257	293	312	347	422	553	613	758	823	886	892	936	1,093	1,360	1,573
Textile industry	GO	699	742	788	837	888	1,056	1,163	1,373	1,728	2,110	2,291	2,533	2,899	3,521	4,950	4,604	4,722	4,760	4,376	4,530	5,149	5,622	6,371	7,725
	GVA	199	199	200	201	201	249	283	320	405	475	490	500	545	951	1,117	898	1,046	1,117	1,017	1,117	1,273	1,388	1,569	1,907
Wearing apparel	GO	107	115	123	132	142	172	187	228	286	353	415	523	682	994	1,441	1,470	1,777	1,845	2,019	2,039	2,291	2,596	2,915	3,426
	GVA	25	27	30	33	37	47	51	59	71	88	98	118	142	325	355	347	450	464	482	506	592	688	746	917
Leather and fur products	GO	50	53	55	58	61	84	100	120	150	175	199	253	325	571	843	974	1,112	1,186	1,192	1,198	1,345	1,573	1,801	2,274
	GVA	12	12	13	13	14	19	23	26	30	34	39	49	55	152	202	201	280	291	273	284	324	392	458	591
Wood products	GO	31	34	39	44	49	57	64	80	100	107	103	122	157	279	366	406	513	626	492	561	657	741	828	993
	GVA	10	11	12	13	15	16	18	22	26	28	24	28	36	95	100	95	143	170	113	133	158	193	214	266
Pulp, paper and printing	GO	135	147	160	174	190	238	271	341	448	530	562	640	755	950	1,163	1,426	1,747	1,819	1,788	1,906	2,207	2,530	2,907	3,553
	GVA	44	48	51	55	59	76	85	102	130	145	149	165	195	275	316	356	504	526	502	554	614	719	850	1,016
Oil refining & coal products	GO	184	199	214	231	250	281	325	372	434	514	573	799	993	1,446	1,880	2,028	2,212	2,569	2,329	2,706	4,429	4,588	4,785	6,235
	GVA	83	91	98	107	116	130	149	160	173	166	164	213	281	346	434	561	560	602	529	590	788	883	1,004	1,287
Chemicals, excl. oil (b)	GO	459	510	567	630	700	771	893	1,156	1,553	1,932	2,121	2,404	2,852	3,521	4,677	5,591	6,425	6,847	4,827	7,397	8,773	9,367	10,720	13,583
	GVA	143	157	174	192	212	228	264	329	442	512	564	643	790	1,058	1,216	1,410	1,753	1,811	1,721	1,984	2,345	2,546	2,946	3,785
Rubber and plastics	GO	155	171	189	209	231	279	310	374	532	612	635	757	947	1,160	1,477	1,748	2,087	2,224	2,263	2,404	2,712	3,030	3,553	4,377
	GVA	51	55	60	65	70	84	88	100	128	149	158	184	228	334	360	363	522	568	557	590	683	793	939	1,133
Non-metallic minerals	GO	201	227	256	288	325	423	517	593	753	892	891	1,055	1,422	2,333	2,997	3,018	3,560	3,828	3,204	3,395	3,693	4,026	4,557	5,653
	GVA	83	92	103	115	129	167	203	219	268	292	282	349	506	898	942	900	1,062	1,107	909	1,005	1,127	1,212	1,365	1,749
Basic metals	GO	439	471	505	542	581	739	893	1,042	1,283	1,612	1,808	2,112	2,790	4,906	5,368	5,033	5,170	5,326	5,512	5,891	6,913	8,076	9,092	13,571
	GVA	121	131	142	154	167	205	236	278	341	414	398	465	701	1,546	1,554	1,355	1,348	1,337	1,315	1,486	1,812	2,121	2,426	3,726
Fabricated metals	GO	125	136	149	162	177	234	274	338	412	494	523	615	800	1,302	1,708	1,651	1,944	2,078	2,151	2,215	2,540	2,852	3,294	3,857
	GVA	42	46	49	53	57	75	85	99	116	135	139	157	185	398	440	384	494	517	504	541	609	713	841	971
Machinery	GO	467	519	576	639	709	935	1,016	1,233	1,554	1,727	1,674	1,995	2,672	3,465	4,184	4,122	4,669	4,884	4,500	4,675	5,240	5,858	7,067	9,543
	GVA	164	179	195	214	233	309	327	375	456	502	467	546	716	1,049	1,174	1,119	1,254	1,340	1,182	1,259	1,422	1,609	1,935	2,599
transport equipment	GO	172	194	218	245	275	380	347	426	574	670	714	976	1,544	2,599	3,186	3,303	3,785	4,123	4,212	4,659	5,365	6,475	8,359	11,214
	GVA	51	57	64	72	81	118	98	115	152	169	182	237	370	698	755	805	933	1,006	1,080	1,193	1,324	1,634	2,177	2,897
Electrical machinery & equip.	GO	152	173	195	221	251	355	407	481	666	850	797	917	1,236	1,851	2,327	2,594	3,060	3,366	3,629	4,022	4,835	5,481	6,142	7,916
	GVA	47	53	59	66	73	103	111	123	162	205	193	219	264	531	582	604	743	820	880	1,003	1,232	1,378	1,585	2,023
Electronic and telecom equipmen	GO	76	93	114	139	169	244	242	339	497	551	584	765	928	1,299	2,000	2,530	3,051	3,921	4,894	5,831	7,550	8,990	11,289	15,840
	GVA	24	30	36	43	53	70	63	83	117	132	136	171	191	355	484	635	721	902	1,121	1,348	1,824	2,035	2,521	3,483

Annex Table B.2 continued:

		1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
instruments	GO	40	44	48	53	59	70	71	82	101	113	110	137	183	366	424	426	529	600	693	706	868	938	1,090	1,637
	GVA	16	18	20	21	23	28	27	30	36	40	38	46	55	122	129	123	144	149	168	180	214	238	269	445
Furniture	GO	23	26	29	33	37	47	51	62	77	82	81	90	114	154	219	226	282	320	295	318	370	435	524	720
	GVA	8	9	10	11	12	15	16	18	22	23	22	24	28	48	59	56	79	89	77	78	95	118	139	183
Other manufacturing (c)	GO	70	75	81	87	93	145	180	208	264	319	355	426	544	960	1,274	1,350	1,523	1,657	3,611	1,677	1,805	2,002	2,255	2,322
	GVA	27	29	31	33	34	47	60	69	82	97	104	123	141	299	338	333	413	430	396	417	461	521	594	608
Total manufacturing (IAS)	GO	4,134	4,539	4,988	5,486	6,038	7,522	8,444	10,211	13,215	15,759	16,722	19,757	24,930	35,575	45,799	48,700	55,418	59,992	59,672	63,956	75,111	84,425	98,328	127,352
	GVA	1,294	1,406	1,532	1,671	1,826	2,268	2,516	2,927	3,685	4,205	4,307	5,015	6,289	10,863	12,275	12,221	14,677	15,758	15,262	16,853	19,702	22,313	26,314	34,089
Total manufacturing, full coverage (d)	GVA						2,673	3,021	3,579	4,590	5,335	5,565	6,600	8,431	14,832	17,071	17,310								
Total industry, full coverage (e)	GVA	1,997	2,048	2,162	2,376	2,789	3,349	3,967	4,586	5,777	6,484	6,858	8,087	10,285	14,144	19,360	24,718	29,083	32,412	33,388	35,087	39,047	42,375	46,536	

Sources:
1980-1992: China industry economy statistics yearbook] P142-154 (1993)
1993-1999:Statistics of China's Industry and Transport, 1949-1999,China Stastics Press, Beijing, November, 2000 (SCIT), pp. 94 ff.
Update: 1999-2003: CSY, 2000, 2003, CSY, 2004
The data for 1993, 1994 in the SCIT are identical to those in the CIESY 1994: p. 81-245
(a) Unless otherwise indicated the coverage is independent accounting enterprises at township and above. Net Industrial Output, 1980-1992 adjusted to gross value added, using ratios from Annex Table A. 2
(b) including medical industry and chemical fibres industry
(c). We combined cultural products, arts and crafts, miscellaneous manufacturing and the residual difference between totals and summed sectors in category other manufacturing
(d) Own estimates for 1985 and 1995 based on census data, see main text table 8 and 9. Intervening years, using interpolated ratios.
(e) Industry including mining and utilities, excluding construction. Source CSY, various issues.

Annex Table B. 3: Unadjusted Employment Figures and Adjustments Ratios by Branch of Manufacturing, 1993-2002

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	1995	1998	1993
	urban staff and workers					urban on post staff and workers					Census	adjustment factors	adjustment factors
Branch of manufacturing												1998-2002	1993-2002
Total Industry	6338	6580	6610	6450	6215	4753	4428	4103	3838	3729	8501	1.24	1.29
Food manufacturing	313	318	322	317	304	218	200	180	160	155	413	1.31	1.28
Beverage manufacturing	113	117	121	121	123	94	89	84	75	73	152	1.27	1.26
Tobacco processing	29	34	33	33	33	30	29	27	25	23	33	1.08	1.01
Textile industry	684	691	673	634	596	393	353	327	301	280	878	1.39	1.31
Clothing industry	164	181	175	168	162	127	122	120	121	130	273	1.23	1.56
Leather and fur products	85	92	99	91	85	62	57	58	55	57	154	1.27	1.56
Wood products	73	77	73	72	67	39	35	31	28	26	108	1.58	1.49
Paper and printing products	218	227	229	224	214	153	139	124	112	106	293	2.59	2.51
Oil refining, coking and coal products	68	71	72	76	74	67	63	61	56	56	79	1.07	1.10
Chemical industry,excl. oil	523	547	561	558	543	430	399	370	342	325	661	3.53	3.54
Rubber and plastics	177	178	186	180	170	125	115	104	96	96	260	2.53	2.76
Non-metallic minerals	396	401	425	407	387	284	263	240	219	207	802	1.28	1.89
Basic metals	433	447	447	438	419	340	325	302	283	263	511	2.34	2.34
Fabricated metals	192	196	193	181	174	119	106	96	89	87	283	1.34	1.47
Machinery	724	736	709	702	677	472	428	385	348	323	844	1.34	1.19
Transport equipment	338	345	370	354	346	279	269	244	232	226	420	1.20	1.14
Electrical machinery and equipment	226	233	244	236	227	170	158	145	137	140	312	1.26	1.28
Electronic and telecom equipment	151	163	172	163	165	134	133	138	143	155	196	1.22	1.14
Instruments	86	90	86	82	79	53	48	46	44	44	96	1.39	1.12
Furniture	34	35	35	31	30	19	18	16	15	17	51	1.49	1.45
Other manufacturing	203	252	217	224	207	162	146	142	129	118	305	3.45	3.18
Total manufacturing	5230	5432	5439	5293	5082	3769	3496	3240	3010	2907	7126	1.27	1.31

Sources: 1995: CLSY, 1996, table 3-7, p. 185 ff.; 1995-99, CSY, 2000, p. 408 (original source CLSY, various issues).1992-94, CSY, 1995, table 12-2, p. 376. 2000-2002, CSY, 2003, p. 460, table 13-2: staff and workers by industrial branch;1995 Census: from Industrial census, 1995.

The figures for 1998-2002 refer to on post staff and workers. They have been adjusted to the older staff and workers concept by applying ratios of old to new concept for 1999. The figures for 1993 and after refer to staff and workers in urban enterprises. They have been adjusted to the concept of total staff and workers using 1995 ratios of census to CLSY data.

Annex Table B. 4: Growth Rates of GDP in Chinese Manufacturing, 1980-2002

	1980-92	1992-97	1997-2002	1992-2002	1980-2002
Total Industry	7.4	8.2	12.4	10.3	8.7
Food manufacturing	8.5	13.3	10.0	11.6	9.9
Beverages	12.4	12.1	6.9	9.4	11.0
Tobacco processing	11.0	5.8	12.6	9.1	10.1
Textile industry	4.2	5.6	9.7	7.6	5.7
Clothing industry	10.3	12.7	11.5	12.1	11.1
Leather and fur products	6.8	23.9	10.5	17.0	11.3
Wood products	1.9	27.9	6.2	16.6	8.3
Paper and printing products	6.0	7.9	12.9	10.4	8.0
Oil refining, coal, coking	3.0	-9.2	3.7	-2.9	0.3
Chemical industry,	9.7	8.0	13.6	10.8	10.2
Rubber and plastics	7.0	7.3	12.2	9.8	8.2
Non-metallic minerals	7.8	5.2	6.2	5.7	6.8
Basic metals	6.0	2.5	15.4	8.7	7.3
Fabricated metals	3.6	10.6	12.9	11.7	7.2
Machinery and equipment	7.6	6.2	11.1	8.6	8.1
Transport equipment	12.2	14.4	20.5	17.4	14.5
Electrical machinery	9.0	12.2	15.8	14.0	11.2
Electronics & telecom	12.1	22.1	24.6	23.3	17.1
instruments (m)	4.4	9.1	14.2	11.6	7.6
Furniture	1.3	18.7	11.0	14.8	7.2
Other manufacturing	9.1	12.5	9.6	11.1	10.0
Total manufacturing	7.6	8.7	13.3	10.9	9.1

Source: text table 10, GDP at constant 1980 prices

Annex Table B. 5:
Labour Productivity Growth in Chinese Manufacturing with Unadjusted Employment Figures, 1992-2002
(No adjustment for changes in employment concept)

	1992-97	1997-2002	1992-2002
Total Industry	9.6	24.4	16.8
Food manufacturing	23.9	25.8	24.9
Beverage manufacturing		18.6	
Tobacco processing		21.0	
Textile industry	10.3	27.6	18.7
Clothing industry	14.3	16.6	15.4
Leather and fur products	24.5	19.7	22.1
Wood products	30.1	28.4	29.2
Paper and printing products	9.5	30.0	19.3
Oil refining, coking and coal products	-6.0	9.7	1.5
Chemical industry,excl. oil	7.8	25.9	16.5
Rubber and plastics	9.1	25.8	17.1
Non-metallic minerals	6.3	20.4	13.1
Basic metals	2.1	26.7	13.7
Fabricated metals	11.8	29.7	20.4
Machinery	13.9	28.8	21.1
Transport equipment	6.3	31.2	18.1
Electrical machinery and equipment	9.0	27.5	17.9
Electronic and telecom equipment	22.3	26.2	24.3
Instruments	7.1	28.4	17.3
Furniture	25.7	24.3	25.0
Other manufacturing	15.4	22.7	19.0
Total manufacturing	10.4	26.7	18.3

Source: GDP from table 10, unadjusted employment from annex table B.3

Annex Table B. 6 GDP in current dollars by Manufacturing Branch United States, 1980-2002

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Food, beverages and tobacco	51,095	56,035	62,887	65,298	66,957	71,021	74,630	77,579	84,101	88,302	96,430	101,651	104,189	103,972	107,727	119,794	117,068	121,344	119,221	136,391	122,367	118,856	124,152
Food manufacturing, incl. beverages	43,999	47,975	54,582	55,431	57,168	59,999	61,400	64,450	69,822	73,408	80,050	83,861	85,824	88,803	91,459	102,506	100,060	106,937	104,006				
Tobacco Products	7,096	8,060	8,305	9,867	9,789	11,022	13,230	13,129	14,279	14,894	16,380	17,790	18,365	15,169	16,268	17,288	17,008	14,407	15,215				
Textiles	17,008	17,767	17,257	20,117	20,926	20,768	22,696	23,785	24,853	26,361	26,646	27,217	30,239	30,817	31,823	30,460	31,145	31,135	30,815	29,552	29,373	27,348	26,874
Wearing apparel	14,784	16,089	16,104	16,952	17,451	17,419	18,406	18,641	19,153	19,168	19,824	20,327	21,856	21,512	21,244	20,520	20,035	20,028	19,840	18,899	18,020	16,884	17,179
Leather and footwear	4,150	4,423	4,254	4,116	3,938	3,813	3,377	3,879	4,330	4,582	4,661	4,804	4,852	4,611	4,904	5,206	4,115	4,243	3,992	3,347	3,631	3,198	3,254
Wood and wood products	18,866	17,266	16,322	20,957	23,612	23,924	26,730	31,589	32,406	33,144	31,503	29,610	31,482	34,826	38,844	41,313	38,756	40,096	40,778	42,874	40,895	37,917	39,136
Paper, Printing and publishing	54,474	58,956	63,897	68,938	77,683	84,337	90,472	97,462	107,651	114,096	114,969	116,372	121,054	121,806	129,820	135,854	140,113	140,870	147,078	157,844	162,253	151,597	149,789
oil and gas refining	18,607	20,510	17,864	18,513	16,302	17,489	17,500	20,704	30,687	28,250	29,758	26,524	25,789	28,761	27,223	26,980	28,429	29,559	31,098	28,644	36,623	38,645	28,954
Chemicals excl. oil/gas	46,629	55,038	56,022	60,958	64,292	66,149	69,221	81,616	92,829	100,262	106,213	109,679	114,588	117,855	133,656	145,665	147,741	159,715	159,910	161,821	163,376	157,630	168,359
Rubber and plastic products	16,147	18,769	19,178	21,479	24,110	25,442	26,464	28,800	29,766	32,763	32,939	34,811	37,321	40,457	43,609	44,740	48,239	50,568	55,248	57,090	57,627	54,858	54,253
Non-metallic mineral products	17,661	17,477	15,362	18,335	21,207	22,569	24,823	22,583	23,012	24,390	24,502	22,980	25,343	25,482	29,352	31,302	32,022	36,005	37,438	40,071	39,153	35,240	35,082
Basic metals	43,144	48,645	35,922	29,932	36,893	31,644	32,913	33,125	41,607	43,731	41,549	38,145	37,741	41,189	45,676	51,075	48,872	50,572	51,126	48,455	48,183	43,123	41,891
Fabricated metals	44,680	48,569	45,976	47,098	54,734	57,999	59,052	61,431	66,076	67,101	67,925	65,750	67,904	71,650	81,375	85,234	91,141	95,564	99,568	104,788	107,455	98,544	97,415
Machinery and Equipment	65,182	73,359	63,451	58,954	68,653	70,397	66,396	69,459	81,114	87,661	89,356	87,000	85,411	90,766	100,142	104,479	109,545	115,758	119,246	114,368	124,167	114,799	108,810
Transport Equipment	51,390	59,906	70,938	82,749	103,026	103,049	108,004	111,715	112,364	107,307	105,398	105,352	114,165	129,411	141,926	142,941	140,528	148,752	166,460	180,920	183,061	179,113	187,439
Electr. machin. and equipment	55,440	62,823	64,845	70,643	84,123	83,210	81,588	93,118	105,461	109,299	110,999	109,334	112,916	116,036	132,419	147,465	156,562	165,442	171,200	175,007	186,584	151,349	147,294
Office machinery (incl. computers)	12,779	15,299	16,584	17,711	20,972	20,169	19,889	24,127	26,458	26,603	25,712	22,886	22,457	21,840	23,959	27,174	28,969	30,612	34,915	31,805	30,144	24,568	24,274
Electrical machinery and apparatus	23,608	26,697	26,507	28,563	33,889	34,206	33,399	37,590	41,869	42,926	43,326	44,030	44,875	45,630	48,947	49,816	51,324	54,235	57,020	55,336	59,908	54,068	51,182
Radio, Television and Telecommunication	19,053	20,827	21,755	24,369	29,262	28,834	28,300	31,400	37,134	39,770	41,961	42,419	45,583	48,566	59,513	70,475	76,268	80,594	79,265	87,866	96,531	72,712	71,839
Medical, optical and precision instrument	29,557	34,225	37,291	40,971	46,162	49,674	48,827	52,874	59,760	62,979	67,121	68,892	68,609	69,544	67,480	67,448	69,007	72,921	75,809	73,097	78,111	76,654	75,734
Furniture	8,238	9,043	9,134	10,413	12,222	13,051	13,391	14,277	14,740	15,500	15,242	14,852	16,171	17,626	18,417	19,039	20,177	22,048	23,829	19,826	20,735	18,578	18,330
Miscellaneous	9,480	11,366	11,313	10,995	13,565	14,161	14,366	15,435	17,581	18,812	19,398	19,330	19,104	20,388	21,715	22,092	23,151	24,711	25,097	33,577	36,462	35,187	36,293
Total manufacturing	566,532	630,266	628,018	667,418	755,856	776,116	798,855	858,071	947,491	983,708	1,004,433	1,002,630	1,038,734	1,086,709	1,177,352	1,241,607	1,266,646	1,329,331	1,377,753	1,426,571	1,458,075	1,359,520	1,360,239

Source: Groningen Growth and Development Centre, 60-Industry Database, February 2005, http://www.ggdc.net: 60-I_US_05.xls

Annex Table B. 7: GDP per Person by Manufacturing Branch, United States, 1979-2002
constant 1996 dollars

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Food, beverages and tobacco	55,547	56,409	62,473	62,247	60,833	66,034	62,636	63,030	68,460	64,393	63,731	61,678	60,718	61,109	63,164	75,016	66,973	65,649	60,272	61,243	53,439	49,404	50,035
Food manufacturing, incl. beverages	50,837	51,398	57,584	56,353	55,311	60,181	57,252	57,576	62,504	58,945	58,396	56,515	55,234	56,299	57,779	68,311	60,967	59,234	53,805				
Tobacco Products	178,007	180,958	182,976	211,118	203,972	219,538	215,796	228,135	248,524	238,932	243,645	240,367	252,553	243,143	281,672	353,853	317,015	334,596	338,051				
Textiles	27,089	29,683	30,937	33,855	32,308	35,453	34,837	35,851	37,313	35,243	33,395	34,752	36,851	36,886	37,486	39,997	36,284	37,372	37,643	34,539	36,517	33,261	36,170
Wearing apparel	16,146	16,479	17,865	19,049	18,963	21,069	22,611	22,513	22,549	22,413	23,841	24,920	27,610	27,681	28,560	27,831	29,136	30,386	32,893	37,470	40,628	43,293	52,224
Leather and footwear	25,660	24,954	25,377	25,928	27,109	29,080	28,296	33,070	33,750	35,148	36,337	39,919	41,317	38,263	41,557	46,521	38,821	45,239	42,891	37,898	46,068	45,199	54,523
Wood and wood products	40,868	39,301	43,277	47,227	50,355	52,491	55,989	59,643	57,187	54,905	53,191	52,500	49,739	44,269	44,461	46,139	44,293	43,205	42,466	42,752	44,081	43,086	46,944
Pulp, Paper, Printing and publishing	62,131	61,630	62,328	64,207	64,805	65,577	65,175	66,505	66,071	65,151	63,034	62,812	64,054	62,736	63,340	57,733	59,903	59,366	58,036	61,075	60,552	57,280	61,084
oil and gas refining	49,825	87,630	76,393	110,435	124,979	138,375	97,898	168,375	185,256	173,707	137,169	116,896	124,044	133,550	138,882	174,897	204,525	175,805	183,750	251,356	225,785	187,266	250,316
Chemicals excl. oil/gas	72,211	77,266	78,879	89,640	90,315	91,560	99,055	114,889	111,665	110,879	115,808	114,048	117,487	117,588	132,467	136,943	142,470	152,944	144,161	149,411	150,928	148,776	164,507
Rubber and plastic products	23,747	26,225	26,834	28,426	29,688	32,152	31,838	33,564	34,839	37,428	36,855	39,185	41,787	43,583	45,176	46,306	48,874	51,358	52,753	55,040	58,317	57,920	60,119
Non-metallic mineral products	38,331	37,013	33,986	39,769	41,769	43,819	45,923	44,901	45,359	48,450	49,465	47,894	53,773	52,497	56,158	56,862	55,690	61,762	61,368	62,012	60,724	55,568	57,067
Basic metals	50,972	54,014	47,558	43,764	50,279	47,926	55,461	54,912	56,411	54,226	55,240	56,266	59,951	68,063	69,542	67,356	68,737	71,245	73,240	77,874	76,739	78,901	85,736
Fabricated metals	41,029	42,052	41,630	45,279	47,763	48,839	49,318	53,227	55,545	52,766	51,676	50,274	52,309	54,247	59,714	60,583	61,832	62,564	61,454	62,223	64,629	60,873	64,714
Machinery and Equipment	48,472	48,710	43,726	44,519	48,049	48,486	46,227	49,851	56,219	56,607	55,549	53,498	53,857	55,179	58,006	58,535	56,757	57,486	55,910	53,277	59,180	57,116	59,718
Transport Equipment	58,138	58,255	66,830	74,307	82,501	78,912	75,008	78,919	79,937	73,116	71,054	68,789	70,919	79,700	84,709	83,559	78,245	80,062	85,107	89,784	91,959	92,903	105,244
Electr. machin. and equipment	5,239	6,286	6,807	8,292	9,551	10,959	12,182	15,508	18,025	19,788	22,943	25,067	29,918	34,682	43,259	62,101	83,536	107,262	148,040	202,946	273,290	289,705	351,206
Office machinery (incl. computers)	403	629	761	1,204	1,732	2,424	3,331	5,786	7,398	9,081	11,137	12,783	18,374	26,264	38,668	63,868	106,004	180,044	349,523	586,225	662,440	720,921	936,569
Electrical machinery and apparatus	33,053	35,008	34,570	37,174	39,022	39,576	38,457	42,209	45,535	44,781	46,273	47,611	49,039	49,194	52,564	53,908	55,195	56,766	58,481	57,834	64,125	63,320	68,615
Radio, Television and Telecommunication	4,083	4,747	5,251	6,056	6,670	7,697	8,748	10,733	12,644	14,685	18,595	21,140	26,877	32,869	43,549	76,692	113,659	152,367	224,252	359,946	571,731	625,082	812,062
Medical, optical and precision instrument	49,811	52,395	52,059	54,992	57,398	59,011	56,979	63,045	69,851	71,397	74,458	76,733	76,597	78,431	79,808	81,009	79,709	78,786	76,896	75,635	80,059	76,147	98,924
Furniture	27,148	28,250	28,680	30,935	33,438	34,026	32,892	34,359	33,847	34,268	32,919	33,041	34,741	36,502	36,355	37,156	38,071	39,831	40,962	33,279	35,064	32,077	32,616
Miscellaneous	32,248	37,053	36,497	35,465	41,991	45,235	43,236	46,369	49,382	49,368	51,034	49,587	48,012	48,012	49,215	51,720	50,992	52,373	51,918	66,833	72,911	72,068	76,815
Total manufacturing	36,335	38,618	39,204	42,280	44,825	46,658	46,713	50,792	53,259	52,636	53,071	53,099	55,268	57,188	60,932	64,803	66,711	69,923	72,100	77,100	81,020	79,297	88,012

Source: Groningen Growth and Development Centre, 60-Industry Database, February 2005, http://www.ggdc.net: 60-I_US_05.xls

Annex Table B. 8: US deflators, 1979-2002

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Food, beverages and tobacco	51	56	58	61	65	64	70	72	72	80	87	94	99	97	98	91	100	105	112	127	131	137	144
Food manufacturing, incl. beverages	50	54	57	60	63	61	65	67	67	75	81	87	93	93	93	88	96	105	112				
Tobacco Products	59	65	67	72	76	81	106	105	104	120	134	151	151	139	138	119	131	105	112				
Textiles	63	61	61	65	68	65	71	72	72	80	88	90	92	94	93	86	100	101	102	112	110	127	124
Wearing apparel	79	86	87	86	89	86	87	88	91	93	94	95	95	94	94	97	100	100	100	95	94	94	93
Leather and footwear	66	70	73	73	73	75	76	77	84	87	91	93	95	96	98	100	100	102	106	106	102	106	104
Wood and wood products	57	57	55	61	60	59	61	64	66	71	71	74	82	97	102	102	100	104	104	108	101	101	100
Paper, Printing and publishing	43	46	50	51	55	58	62	65	69	74	76	79	82	83	87	99	100	100	107	110	116	119	119
Oil and gas refining	189	114	121	90	73	73	109	76	105	105	138	144	134	144	133	108	100	123	124	86	129	165	94
Chemicals excl. oil/gas	58	64	65	65	67	69	68	69	78	84	84	88	90	93	95	102	100	100	106	104	104	104	103
Rubber and plastic products	93	96	103	106	103	100	104	100	98	98	100	102	101	101	100	98	100	98	102	102	97	99	100
Non-metallic mineral products	67	72	77	78	82	85	90	88	86	86	86	89	89	91	95	99	100	102	106	111	109	108	110
Basic metals	73	80	81	82	85	81	79	81	96	104	99	93	91	89	94	107	100	100	97	89	89	84	85
Fabricated metals	67	72	76	75	77	79	83	81	82	87	91	95	96	97	96	96	100	101	105	109	107	109	110
Machinery and Equipment	57	65	71	73	74	76	79	78	78	82	86	90	93	95	96	95	100	102	106	109	106	108	109
Transport Equipment	46	54	60	64	65	65	71	70	69	71	73	80	87	92	95	95	100	101	102	106	107	109	107
Electr. machin. and equipment	519	485	480	430	405	355	332	300	287	277	253	238	214	191	170	130	100	80	60	46	36	29	27
Office machinery (incl. computers)	8400	6250	5510	3544	2789	1985	1594	1169	989	871	728	605	455	319	244	164	100	61	35	22	19	15	13
Electrical machinery and apparatus	74	79	84	85	87	88	92	92	94	100	102	104	105	104	103	100	100	100	102	100	100	97	95
Radio, Television and Telecommunication	666	624	616	608	593	506	466	433	419	390	335	310	271	244	213	142	100	77	51	36	24	17	15
Medical, optical and precision instrument	61	65	70	73	75	76	78	78	79	83	86	89	92	94	95	95	100	104	110	112	113	117	104
Furniture	63	67	71	72	72	74	78	78	79	83	86	90	93	94	96	96	100	102	105	107	106	109	111
Miscellaneous	63	67	71	72	72	74	78	78	79	83	86	90	93	94	96	96	100	102	105	107	106	109	111
Total manufacturing	75	79	83	83	85	84	88	87	90	94	96	100	101	102	102	101	100	99	99	97	95	95	92

Source: Groningen Growth and Development Centre, 60-Industry Database, February 2005, http://www.ggdc.net: 60-I_US_05.xls

Annex Table B. 9: Unit Value Ratios China/US, 1980-2002
(1995 benchmark UVRs extrapolated with Chinese and US deflators)

	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Food, beverages and tobacco		3.2	3.0	3.0	2.8	2.7	2.9	2.7	2.9	3.4	3.5	3.2	3.1	3.1	3.6	4.4	5.8	5.6	5.3	4.9	4.2	3.9	3.7	3.5
Food manufacturing	3.5	3.3	3.1	3.1	2.9	2.8	3.1	3.0	3.1	3.6	3.7	3.5	3.3	3.4	3.8	4.7	6.1	5.8	5.3	4.9				
Beverage industries	2.4	2.2	2.1	2.1	2.0	1.9	2.1	2.0	2.1	2.5	2.5	2.3	2.2	2.3	2.6	3.1	4.1	3.9	3.6	3.3				
Tobacco Products	4.7	4.5	4.3	4.3	4.0	3.8	3.8	3.0	3.3	3.8	3.8	3.4	3.2	3.3	4.2	5.2	7.4	7.0	8.7	8.0				
Textiles	2.1	2.2	2.3	2.2	2.0	1.8	2.0	1.8	2.0	2.4	2.7	2.6	2.6	2.6	2.6	3.6	4.6	3.8	3.6	3.4	3.0	3.2	2.7	2.6
Wearing apparel	2.1	1.9	1.8	1.7	1.6	1.6	1.7	1.7	1.8	2.1	2.4	2.6	2.8	2.8	3.4	3.9	4.4	4.6	4.8	4.7	4.8	4.9	4.8	4.8
Leather and footwear	1.0	1.0	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.2	1.2	1.3	1.4	1.6	1.9	2.2	2.5	2.4	2.3	2.2	2.3	2.2	2.2
Wood and wood products	1.1	1.2	1.3	1.5	1.3	1.4	1.6	1.7	2.4	2.7	2.9	2.8	2.7	2.6	2.8	2.9	2.9	2.9	2.7	2.6	2.5	2.7	2.7	2.7
Paper, Printing and publishing	3.7	3.3	3.1	2.9	2.9	2.6	2.9	2.8	3.0	3.4	4.0	3.9	3.9	3.9	4.1	4.2	5.4	6.2	5.8	5.1	4.7	4.5	4.4	4.3
Oil and gas refining	0.7	0.6	1.0	1.0	1.4	1.9	2.1	1.4	2.2	1.7	1.8	1.5	1.7	2.1	3.3	5.3	8.0	9.0	7.9	7.2	11.4	11.0	8.5	14.3
Chemicals excl. oil/gas	5.5	4.6	4.0	3.9	4.0	3.9	3.9	4.1	4.5	4.8	5.4	5.5	5.3	5.4	5.6	6.3	7.4	7.8	7.5	6.6	6.4	6.5	6.4	6.2
Rubber and plastic products	2.2	2.2	2.1	1.9	1.9	2.0	2.2	2.2	2.5	2.9	3.4	3.5	3.6	3.9	4.9	5.9	6.9	7.0	7.1	6.5	6.4	6.9	6.6	6.4
Non-metallic mineral products	0.8	0.7	0.7	0.7	0.7	0.6	0.7	0.8	0.8	1.0	1.2	1.2	1.2	1.4	1.9	1.9	2.0	2.1	2.0	1.9	1.7	1.8	1.8	1.7
Basic metals	1.5	1.5	1.4	1.4	1.4	1.4	1.7	1.9	2.0	1.9	2.2	2.5	3.0	3.5	5.7	5.7	5.3	5.6	5.4	5.2	5.5	5.6	5.8	5.7
Fabricated metals	1.5	1.5	1.4	1.4	1.4	1.4	1.6	1.6	1.8	2.0	2.3	2.4	2.7	3.0	4.7	5.0	5.3	5.0	4.8	4.3	4.0	4.2	4.1	3.9
Machinery and Equipment	1.4	1.2	1.1	1.0	0.9	0.9	1.0	1.0	1.1	1.2	1.4	1.4	1.3	1.4	1.6	1.7	1.9	1.8	1.7	1.6	1.5	1.5	1.5	1.4
Transport Equipment	1.7	1.5	1.3	1.2	1.1	1.1	1.2	1.1	1.2	1.4	1.6	1.6	1.5	1.5	1.7	1.8	1.9	1.8	1.8	1.7	1.6	1.5	1.5	1.4
Electr. machin. and equipment		1.9	1.8	1.7	1.7	1.7	1.8	1.8	2.0	2.3	2.6	2.6	2.7	2.8	3.4	4.0	4.6	4.8	4.7	4.5	4.5	4.6	4.6	4.5
Medical, optical and precision instruments	1.8	1.6	1.5	1.4	1.3	1.3	1.4	1.4	1.5	1.7	2.0	2.0	2.0	2.1	2.5	3.0	3.4	3.4	3.2	2.9	2.8	2.9	2.7	3.0
Furniture	1.1	1.0	1.1	1.1	1.1	1.1	1.2	1.3	1.8	2.1	2.4	2.1	2.1	2.1	2.8	2.9	2.9	2.7	2.6	2.4	2.4	2.4	2.3	2.2
Miscellaneous		2.3	2.2	2.0	2.0	2.0	2.0	2.0	2.3	2.5	2.7	2.8	2.8	2.8	3.6	4.1	4.6	4.5	4.4	4.0	3.8	3.9	3.7	3.5
Total Manufacturing		1.9	1.8	1.7	1.7	1.7	1.8	1.8	2.0	2.2	2.6	2.6	2.6	2.8	3.4	3.9	4.6	4.7	4.7	4.5	4.4	4.6	4.5	4.5
Exchange rates		2.4	2.5	2.6	2.6	2.8	2.9	3.5	4.5	4.9	4.9	5.2	5.7	6.4	8.0	8.6	8.4	8.3	8.3	8.3	8.3	8.3	8.3	8.3
Comparative price levels (a)		77.4	70.1	64.1	64.1	59.8	62.2	53.0	45.0	46.3	51.7	49.4	46.0	43.7	42.5	45.8	55.3	56.9	56.7	54.4	53.7	55.4	54.7	54.5

Source: Benchmark uvrs from table 15, extrapolated with Chinese deflators and US deflators from Annex table B.1 and Annex Table B.8 respectively
Note (a): Comparative price level is the the UVR for total manufacturing divided by the exchange rate.

Annex Table B. 10: Comparative Price levels China/US, 1980-2002

	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Food, beverages and tobacco		134	120	114	109	98	100	80	66	70	71	62	54	49	45	51	70	67	64	59	50	47	45	43
Food manufacturing		138	123	117	112	100	104	86	70	75	76	67	58	53	47	54	73	70	64	59				
Beverage industries		93	83	79	75	68	70	58	47	50	51	45	39	35	32	36	49	47	43	40				
Tobacco Products		189	169	162	153	136	129	86	74	79	77	66	55	53	52	60	88	84	105	96				
Textiles		93	90	84	75	64	67	54	45	50	54	49	46	40	32	42	55	45	44	41	36	38	33	32
Wearing apparel		80	70	64	62	57	58	49	41	42	49	49	49	44	42	45	53	56	58	57	58	59	58	58
Leather and footwear		40	36	34	34	32	33	28	22	21	24	23	22	22	19	22	27	30	29	27	26	27	27	27
Wood and wood products		50	53	56	51	50	56	49	53	56	59	53	47	40	35	33	34	35	33	32	31	32	32	32
Paper, Printing and publishing		139	124	111	109	94	97	82	68	71	80	75	68	61	52	49	64	74	70	62	57	55	53	52
Oil and gas refining		26	41	37	54	69	70	42	48	34	37	28	29	33	41	62	96	108	95	87	138	133	103	172
Chemicals excl. oil/gas		190	160	149	153	140	134	119	102	99	109	104	92	84	70	73	89	94	90	79	78	79	77	75
Rubber and plastic products		90	83	74	73	71	75	64	55	60	70	67	63	62	61	68	83	84	86	79	77	83	80	78
Non-metallic mineral products		30	27	25	25	23	24	22	19	20	24	23	21	21	24	23	24	25	24	23	21	21	21	20
Basic metals		64	57	55	55	51	58	55	44	40	44	48	53	56	71	67	64	67	66	63	66	67	71	68
Fabricated metals		63	57	52	54	51	54	47	40	42	47	46	46	47	59	59	64	60	58	52	48	51	49	48
Machinery and Equipment		51	43	37	36	34	35	29	24	25	28	26	23	22	20	20	22	22	21	20	19	18	18	17
Transport Equipment		64	52	44	42	38	41	33	27	28	32	30	26	23	21	21	22	22	21	20	19	19	18	17
Electr. machin. and equipment		78	70	64	64	60	63	53	45	47	52	50	46	44	43	46	56	57	57	55	54	56	55	55
Medical, optical and precision instruments		67	59	53	51	47	48	41	34	36	40	38	35	33	32	35	41	41	39	35	34	35	33	36
Furniture		43	43	41	41	39	42	36	41	44	48	41	36	33	34	33	34	33	32	30	29	29	28	27
Miscellaneous		96	87	78	78	72	70	57	51	52	55	53	49	45	45	48	55	54	53	48	45	47	44	42
Total Manufacturing		77	70	64	64	60	62	53	45	46	52	49	46	44	43	46	55	57	57	54	54	55	55	54

Sources: The comparative price level equals the UVR divided by the exchange rate. UVRs from Annex Table B.9. Exchange rates China/US from World Bank, World Development Indicators, 2004.