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Pitfalls of China's Industrial Statistics: Inconsistencies and Specification Problems[*]

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China's industrial statistics are used for numerous purposes, from comparing enterprise profitability and efficiency to gauging the relative significance of the state economic sector. Yet, as this paper shows, definitions of variables and the categorization of enterprises have changed frequently in the two decades of reform. Two major statistical breaks occurred in 1993 and 1998, and numerous partial revisions also took place in other years. These changes, most of which have gone unnoticed in the literature, have caused severe comparability problems in both time series and cross-sectional data. Although detailed data that are in line with Western national income accounting standards are available for the 1990s, inconsistencies due to periodic adjustments abound. Far less data are available for the 1980s, when industrial statistics were constructed in accordance with the Material Product System, but these data are somewhat more consistent.

Introduction

The publication of the *China Statistical Yearbook* (*Statistical Yearbook*

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hereafter) in 1982 marked the beginning of the regular release of official statistics in China.[1] Since then numerical data on the Chinese economy have grown in importance. Not only are economic success figures much touted in the Chinese press, but research on China's economy increasingly relies on statistical data. Earlier evaluations of Chinese official statistics tended to give them a clean bill of health; yet recent reports are more sceptical of the quality of the data.

In 1986 Chow concluded that "by and large Chinese statistics officials are honest"; and in particular that "the Chinese official consumption and income data, by and large, are accurate enough for use in econometric analysis."[2] Similarly, in a 1992 internal report the World Bank found Chinese statistics to be basically reliable.[3] Yet in 2000 Rawski, based on the income approach to the calculation of Gross Domestic Product (GDP), proposed that real GDP growth in China in 1998 was not the official 7.8%, but 5.7% or even less.[4] The sum of the reported provincial GDP in recent years regularly exceeds the published national GDP, suggesting further inconsistencies.

Doubts about the quality of Chinese statistics are not limited to GDP data. Chen et al., Woo et al., and Jefferson et al., among others, have proposed alternative sets of fixed assets series because the official time series suffers from the inclusion of non-productive fixed assets, and the value of individual fixed asset items is not adjusted for inflation.[5] Rawski and Mead question the agricultural labour force data because they appear to have been derived as the residual by subtracting employment in all other sectors from the total work force, resulting in a likely over-reporting of farm employment by 100m workers.[6] Data on township and village enterprise output are notoriously unreliable, as are many other rural statistics.[7]

Overall, Chinese official statistical data are beset by three major problems. First, some data may have been purposely misreported (such as data on GDP). Second, data such as those on fixed assets and farm employment are of dubious economic meaning due to the way in which they are constructed. Both of these shortcomings have been widely noted. A third, largely unnoticed problem is the frequent re-definition of economic variables and enterprise categories. Such adjustments are often not accompanied by a revision of the variable or category name(s), and few indications are given of such statistical breaks. The resulting inconsistencies in time series data are perhaps most pronounced in the statistics on the industrial sector.[8] Given that the industrial sector contributes the largest share of China's economic output and is one of the most extensively researched

sectors of the Chinese economy, it is important that official industrial statistics are well understood.[9]

This paper examines the inconsistencies and specification problems caused by changes in the definition of variables and in industrial enterprise classification during the reform period. These problems directly affect the results of academic, commercial, and policy studies using official data. Studies estimating total factor productivity growth, for example, tend to accept whatever employment data are given in official statistical yearbooks. Yet, as will be discussed below, employment in industrial state-owned enterprises (SOEs) may have been exaggerated by up to one third in recent years, since many of those registered as SOE employees were no longer part of the active workforce of their enterprises. Repeated re-definitions of Gross Output Value of Industry (GOVI) as well as value-added may further invalidate efficiency and growth estimates. Inter-enterprise variation in the inclusion of the value of land in assets renders the liability-asset ratio, a potential indicator of the solvency of an enterprise, inconsistent over time. Such problems are not limited to official statistics. Enterprise-level surveys are likely to be affected in the same way as long as enterprises in their accounting system and statistical compilations comply with nationwide rules and regulations.

Our investigation seeks to reveal the sources of these and other problems in the official industrial statistics. We focus on the following official publications. Since 1982 the National Bureau of Statistics (NBS) has been publishing annual statistics on the industrial sector in the *Statistical Yearbook* and *A Statistical Survey of China* (*Statistical Abstract*).[10] A second major source of annual industrial statistics is the *China Industrial Statistical Yearbook* (*Industrial Yearbook*) and its predecessor, the *China Industrial Statistical Material* (*Industrial Material*).[11] In addition, the NBS has published *Statistics of the 1985 Industrial Census* (*Census 1985*), which are reported in 10 volumes released in 1987, and *Statistics of the 1995 Industrial Census* (*Census 1995*), which are contained in three volumes released in 1997, following a summary volume released in 1996 (*Census 1995 Summary*).[12] Statistics on rural industrial enterprises can also be found in the *China Township Enterprise Yearbook* (*Township Enterprise Yearbook*), and statistics on industrial employment in the *China Labour Statistical Yearbook* (*Labour Yearbook*).[13]

The next section defines two major aggregates of industrial enterprises on which statistics are reported. The two sections thereafter look at the statistical breaks in 1993 and 1998. The fifth and sixth sections focus

on two prominent economic variables, output and employment. The last section concludes.

Industrial Enterprise Coverage

Industrial activities occur in two types of organizations: enterprises with independent accounting system, and units with dependent accounting system. The NBS defines the former as legal persons that fulfil the following requirements: (i) they have been established in accordance with the law, have their own name and organization as well as location of activity, and can be held responsible under civil law; (ii) they independently possess and use assets, assume liabilities, and have the right to enter contracts with other units; and (iii) they maintain their own profit and loss account and draw up their own balance sheet.[14] The latter are units that do not fulfil these requirements.[15]

Two sets of aggregate industrial statistics are reported in NBS publications: statistics on all industrial enterprises and statistics on a subset of the industrial enterprises with independent accounting system. For the sake of simplicity, we use the abbreviation "EIAS" (industrial *e*nterprises with *i*ndependent *a*ccounting *s*ystem) to refer to the second group of enterprises. Data on all industrial enterprises are only available on four statistical indicators: (i) GOVI, (ii) the number of industrial enterprises, (iii) industrial net output, defined as net material product (*gongye jingchanzhi*) through 1992 and as industrial value-added (*gongye zengjiazhi*) since 1993, and (iv) the industrial workforce. Moreover, aggregate statistics on GOVI, the number of enterprises, and the workforce are also reported for four sub-categories of all industrial enterprises, namely, (i) state-owned enterprises (SOEs) (together with state-controlled enterprises since 1998), (ii) collective-owned enterprises (COEs), (iii) individual-owned enterprises (IOEs), here including private enterprises, and (iv) "other" enterprises.[16]

Prior to 1998, total industry data covered all industrial enterprises, regardless of the type of accounting system. Since 1998, data on industrial units with dependent accounting system under *non*-industrial organizations have no longer been collected, and these industrial units have then been excluded from the data on total industry. Data on industrial units with dependent accounting system under industrial organizations that practice independent accounting have always been, and continue to be, included in the data on their parent organizations.

For the second group of industrial enterprises, the EIAS, more detailed data on output, balance sheet, and the profit and loss account are available. Inclusion in this group requires independent accounting status. Enterprises must also meet an additional criterion that has varied over time. Prior to 1998, only enterprises with independent accounting system and under the supervision/regulation of township or higher level authorities were included. As of 1998, all SOEs with independent accounting system plus all non-SOEs with independent accounting system and annual sales revenue exceeding RMB5 million have been included.[17] The criterion based on the administrative rank of the supervising authority no longer applies. In addition, all self-employed individuals (*getihu*), which were previously excluded from the detailed statistics, continue to be excluded, regardless of their size.

The *Statistical Yearbook* and the *Industrial Yearbook* provide data on several sub-categories of the EIAS: (i) SOEs (since 1998 including state-controlled enterprises), (ii) COEs, (iii) shareholding enterprises (since 1998: stock companies only), (iv) enterprises with investment by Hong Kong, Macau, and Taiwanese entrepreneurs (HKMT enterprises), (v) other foreign-invested enterprises, and (vi) an unspecified residual (including, among others, joint operation and private enterprises, which only the *Industrial Yearbook* lists separately). The *Statistical Yearbook* and *Industrial Yearbook* also provide provincial and sectoral data for the total of all EIAS, and sometimes even for individual enterprise categories within the EIAS.[18] The *Statistical Yearbook* furthermore regularly provides provincial and sectoral statistical tables on all large and medium-sized industrial enterprises, which are invariably EIAS. For a tabular overview of the 1998 change in enterprise coverage see Table 1.

The 1993 Statistical Break

Three developments in 1993 affected the definition of variables on which data are available for one or both of the two enterprise groups just discussed. The Material Product System (MPS) was replaced by the System of National Accounts (SNA), new industrial accounting procedures were adopted, and a new tax system was introduced.

Adoption of the System of National Accounts

The most important implication of the switch from the MPS to the SNA is

Table 1. Scope of Enterprise Coverage

	All industry		EIAS	
	Since 1998	Before 1998	Since 1998	Before 1998
I. Type of accounting system				
(1) Industrial enterprises with independent accounting	included	included	included if (1) under IV	included if (1) under III
(2) Industrial units with dependent accounting under industrial enterprises with independent accounting	included	included	if parent enterprise is in I (1), then I (2) is part of I (1)	if parent enterprise is in I (1), then I (2) is part of I (1)
(3) Industrial units with dependent accounting under non-industrial organizations with independent accounting	excluded	included	excluded	excluded
II. Ownership category				
(1) SOEs (all years)	included	included	included if (1) under I	included if (1) under I & III
(2) COEs (all years)	included	included	included if (1) under I & IV	included if (1) under I & III
(3) IOEs (as of 1983)	included	included	excluded	excluded
(4) Others				
HKMT-invested enterprises (as of 1983)	included	included	included if (1) under I & IV	included if (1) under I & III
Other foreign-invested enterprises (as of 1983)	included	included	included if (1) under I & IV	included if (1) under I & III
Private enterprises (as of 1988)	included	included	included if (1) under I & IV	included if (1) under I & III
Shareholding enterprises (as of 1992)	included	included	included if (1) under I & IV	included if (1) under I & III
Joint operation enterprises (as of 1983)	included	included	included if (1) under I & IV	included if (1) under I & III
III. Level of supervising/regulating authority				
(1) Township or above	N/A	included	N/A	included if (1) under I
(2) Village	N/A	included	N/A	excluded
IV. Annual sales volume				
(1) Exceeding RMB5 million	included	N/A	included if (1) under I	N/A
(2) No more than RMB5 million	included	N/A	included if (1) under I & II; otherwise excluded	N/A

the adoption in 1993 of value-added (*zengjiazhi*) in place of net material product (*jingchanzhi*).[19] The sum of the net material product from all economic sectors equals national income. Industrial value-added, on the other hand, constitutes the contribution of the industrial sector to GDP.[20]

Although both indicators are derived by deducting intermediate inputs from GOVI, what is included in intermediate inputs differs. In the calculation of net material product, intermediate inputs include depreciation but not service payments to non-productive units (e.g., interest payments). Net material product thus excludes depreciation and includes service payments to non-productive units. In the calculation of industrial value-added, the opposite rule applies. Industrial value-added thus equals net material product in industry plus depreciation minus service charges paid to non-productive units.[21]

Throughout the period 1952–1992, for which the data are available, the industrial net material product is consistently smaller than industrial value-added. On average, industrial net material product amounts to 93.58% of industrial value-added with a standard deviation of 2.28 percentage points, a minimum value of 89.83% in 1981, and a maximum value of 99.44% in 1960. In the first half of the 1980s, the gap tended to be just below 10 percentage points, whereas in the second half of the 1980s and in the early 1990s it was close to 5%.[22]

A comparison of net material product and value-added for EIAS, including the individual enterprise categories, is only possible for the years 1985 and 1992. The net material product of the EIAS in 1985 was equal to 90.09% and in 1992 equal to 97.15% of value-added. The net material product of the SOEs within the EIAS in 1985 was equal to 89.35% and in 1992 equal to 93.28% of value-added. These percentages are reasonably close to those of all industry (91.72% in 1985, and 95.34% in 1992). This suggests that value-added for EIAS as well as for individual enterprise categories could be approximated by multiplying their net material product with the ratio of value-added to net material product obtained from all industry.[23]

New Industrial Accounting Procedures

The adoption in 1992 of the "General Procedures of Enterprise Financial Accounting" (*Qiye caiwu tongze*) and the "Principles of Enterprise Financial Accounting" (*Qiye kuaiji zhunze*) marked the transition to balance

sheet and profit and loss accounting.[24] Prior to 1993, the accounting system focused on material production, in conformity with the MPS. Thus the value of net fixed assets (*guding zichan jingzhi*) plus the value of fixed-quota working capital (*ding'e liudong zijin*) and above-quota working capital (*chao ding'e liudong zijin*) equalled total funds of the enterprise (*zijin zong'e*). Fixed-quota working capital reflected regular funding needed to maintain planned production; it was meant to cover reserves of material goods to be used in production, products in processing, and inventories of intermediate and final products, and was traditionally provided by finance departments of the government. Above-quota working capital funded additional production or met any unanticipated needs, and was typically provided by the banking system.[25]

The Western-type accounting system adopted in 1993 with the introduction of the SNA goes beyond the production-focused accounting system in that it includes some physical as well as financial assets that were neglected in the previous accounting system. It also clarifies the ownership structure by distinguishing clearly between liabilities and equity (*suoyouzhe quanyi*).

Total assets (in the Western-type accounting system in place since 1993) equal (i) current assets (*liudong zichan*, also translated by the NBS as "circulating funds"), plus (ii) fixed assets (*guding zichan*), plus (iii) long-term investment (*changqi touzi*), plus (iv) a residual category of intangible assets, deferred assets, "other long-term assets," and deferred taxes. The pre-1993 accounting system covered only sub-categories of the first and second items, with some intangible assets included since 1989. Current assets, in contrast to working capital, also include such items as short-term investments and reserves for potential current asset losses. Fixed assets, in contrast to the net value of fixed assets in the pre-1993 accounting system, further include construction in process, fixed assets awaiting re-valuation, and fixed asset losses yet to be written off. Another change is that under the new accounting procedures the depreciation rate for fixed assets is on average higher by 20–30%, and ad hoc approval can be obtained for even faster depreciation.[26] The net fixed assets time series itself thus experienced a statistical break between 1992 and 1993.

No data are available on long-term investment (the third component of total assets) and the fourth, residual asset category of intangible assets, deferred assets, other long-term assets, and deferred taxes. Yet the sum of these two categories together can be obtained as a residual by subtracting current assets and the value of fixed assets from total assets. As Table 2

Table 2. Share of Residual Assets in Total Assets of EIAS, in %*

Year	All	SOEs	COEs	Shareholding	Other foreign	HKMT
1993	5.02	5.98	2.19	–1.08	10.11	4.63
1994	7.22	7.00	6.41	9.15	9.55	7.41
1995	6.60	6.22	6.21	9.75	8.47	6.22
1996	7.97	7.12	7.11	10.04	12.64	9.11
1997	8.61	8.01	8.03	10.37	11.08	9.30
1998	8.86	8.84	8.41	N/A	9.67	8.46

Note: * The residual assets are derived as total assets minus the sum of current assets and fixed assets. Data on total assets for 1993 are not available and are therefore approximated by total current liabilities plus long-term liabilities plus equity. The enterprise categories in 1998 differ from those in previous years. For 1999 no fixed asset data are available.

Sources (each with data on the previous year): *Statistical Yearbook 1994*, pp. 379–81; *Statistical Yearbook 1995*, p. 389; *Statistical Yearbook 1996*, p. 415; *Statistical Yearbook 1997*, p. 425; *Statistical Yearbook 1998*, p. 445; *Statistical Yearbook 1999*, p. 433.

shows, the importance of these two categories has increased almost continuously since 1993.

Much of the variation in these residual assets across ownership forms is likely to be due to the different treatment of land use rights which, along with patents, non-patent technologies, trade marks, copyright, business reputation, are part of intangible assets.[27] The inclusion of land use rights in intangible assets did not become widespread practice until after the passing of the new accounting regulations in 1992, which first allowed for land to be valued across all enterprises. In the following years a host of regulations on the valuation of assets, including land, were issued. Since 1995, the assets of all SOEs should include land use rights. In shareholding companies and foreign-invested enterprises land has always been valued. Urban COEs entered their own period of asset evaluation in 1997. COEs in the form of rural shareholding cooperatives are likely to have up-to-date land valuations included in their intangible assets, but much depends on the locality. For all other rural COEs, land may well continue to be communal property without valuation.

Independent of enterprise category, land prices may differ significantly between localities and over time. Base prices for land are established by local authorities for their particular locality. If an enterprise purchases land, the actual purchasing price enters the intangible assets; if this land has formerly been listed in the balance sheet of another enterprise at a low original base price, aggregate intangible assets following the transaction

rise. Thus not only does the extent to which land use rights are valued in the aggregate balance sheet of different enterprise categories in a particular year differ, but furthermore, even if all land use rights are valued for one particular enterprise category, this value may change over time depending on changes in the market value of land and in the proportion of land that is currently valued at market prices in the balance sheets.

For any economic analysis over time that uses total assets since 1993, one option is to focus solely on current plus fixed assets, setting aside all other assets, which comprise, among others, land. For the years prior to 1993 total assets can only be approximated by the sum of net fixed assets and fixed-quota working capital, keeping in mind that these together account for only part of actual assets.

New Tax System

The new tax system took effect on 1 January 1994. One of the most important changes under the new system was the adoption of the value-added tax for all industrial enterprises. This has important implications for the statistics on sales revenues.

The sales revenues reported in the *Statistical Yearbook* and in the *Industrial Yearbook* include a tax component labeled "sales taxes and surcharges" (*chanpin xiaoshou shuijin ji fujia*). Prior to 1994, sales taxes and surcharges consisted of product taxes, the value-added tax, business tax (*yingye shui*), urban maintenance tax, resource tax, and education fund surcharge. Since 1 January 1994, the category "sales taxes and surcharges" excludes the value-added tax as well as the business tax. Furthermore, the 1994 tax reform replaced the product taxes with a consumption tax (*xiaofei shui*).[28]

Since the business tax focuses on services and transactions other than product sales and thus primarily affects non-industrial enterprises, the main item relevant in the re-definition of the category sales taxes and surchages of industrial enterprises is the value-added tax; the tax reform of 1994 also led to a drastic increase in the volume of the value-added tax. The value-added tax was first levied in 1984, targeting a selected group of industrial products. By the end of 1993, the last year before it was excluded from the published sales revenue data, the value-added tax covered 31 types of industrial products, and equaled 2.84% of the sales revenues of the (industrial) EIAS.[29]

The product taxes were first levied on selected industrial products

in 1984. By the end of 1993, before they were replaced, they covered 96 product categories, and were equal to 2.2% of the sales revenues of (industrial) EIAS. Starting from 1994, a small number of products previously subject to product taxes (e.g., tobacco and alcohol) were charged a consumption tax, which has also been applied to some other products (e.g., jewelry, sedan cars, motorcycles, etc.). The total number of products subject to the consumption tax is 11, and the total volume of consumption taxes in 1994 was equivalent to 59.3% of the total volume of product taxes in 1993.

It appears that had the components of the category "sales taxes and surchages" not changed in 1994, post-1993 sales revenues of the EIAS would be up to 4% higher (2.84% value-added tax and about 0.5 times 2.2% formerly product taxes, both no longer included), although the effect is likely to vary among different enterprises. (The 4% estimate assumes that only industrial EIAS prior to 1994 paid these now excluded/abolished taxes.) A simple remedy for the statistical break in the sales revenues time series between 1993 and 1994 is to subtract the item "sales taxes and surcharges" from sales revenues throughout all years; data on sales taxes and surcharges are regularly available for the EIAS.

The 1998 Statistical Break

The 1998 statistical break affects the categorization of industrial enterprises. First, the scope of enterprise coverage was revised. This revision has already been introduced above. Second, the official registration-based classification into different enterprise categories was modified. Third, the aggregation of data published under different enterprise categories since 1998 follows a set of new rules for data allocation. These changes apply to all data except labour data. Employment data underwent a different statistical break in 1998.

Changes in Registration-based Classification of Industrial Enterprises

Table 3 provides a complete list of the registration-based classification of industrial enterprises prior to 1998 and since 1998. SOEs by definition are the enterprises organized in accordance with the 1988 *PRC SOE Law* and, in the case of those established before 1988, in accordance with the pre-existing rules and regulations that were subsequently superseded by the

Table 3. Registration-based Industrial Enterprise Classification Prior to and Since 1998

Code	Since 1998		Prior to 1998	Notes
100	***Domestic enterprises***			
110	SOEs	*1*	*State-owned economy*	
		11	SOEs, including solely state-invested enterprises	new 151
		12	State-owned joint operation enterprises	new 141
120	COEs	*2*	*Collective-owned economy*	
		21	COEs, including employee shareholding companies	new 140
		22	Collective-owned joint operations	new 142
130	Employee shareholding companies			formerly in 21
140	Joint operation enterprises	*5*	*Joint operation economy*	12, 22 in 140
141	State-owned			formerly in 12
142	Collective-owned			formerly in 22
143	State- and collective-owned	51	State- and collective-owned joint operation enterprises	
149	Other joint operation ent.	52	State-owned and private joint operation enterprises	into new 149
		53	Collective-owned and private joint operation enterprises	into new 149
		54	State-, collective-owned and private joint operation enterprises	into new 149
		6	*Shareholding economy*	
150	Limited liability companies	62	Limited liability companies	
151	Solely state-invested			formerly in 11
159	Others			
160	Stock companies	61	Stock companies	
170	Private enterprises	*3*	*Private economy*	
171	Private sole proprietorships	31	Private sole proprietorships	
172	Private partnerships	32	Private partnerships	
173	Private limited liability co.	33	Private limited liability companies	
174	Private stock companies			new
190	Other enterprises	*9*	*Other economy*	
		4	*Individual-owned economy*	abolished

Table 3. (Cont'd)

Code	Since 1998		Prior to 1998	Notes
200	***HKMT-invested enterprises***	*8*	*HKMT-invested enterprises*	
210	Joint equity ventures (JEVs)	81	Joint equity ventures	
220	Contractual joint vent. (CJVs)	82	Contractual joint ventures	
230	Wholly HKMT-owned	83	Wholly HKMT-owned	
240	HKMT stock companies			new
300	***Foreign-invested enterprises***	*7*	*Foreign-invested enterprises*	
310	Chinese-foreign JEVs	71	Chinese-foreign JEVs	
320	Chinese-foreign CJVs	72	Chinese-foreign CJVs	
330	Wholly foreign-owned	73	Wholly foreign-owned	
340	Foreign-invested stock comp.			new

Note: This table is a direct translation of the original Chinese table. "Individual-owned economy" (item 4) comprises the self-employed in industry (*chengxiang geti gongshang hu*) and partnerships between individuals (*geren hehuo*). The self-employed in industry and partnerships between individuals ("individual-owned economy" before 1998) are not regarded as registered enterprises and thus not included in the classification since 1998. HKMT denotes Hong Kong, Macau and Taiwan. Foreign-invested enterprises in the narrow definition used in the table excludes HKMT-invested enterprises.

Source: National Bureau of Statistics (Division for Industry and Transportation), *Xinbian gongye tongji gongzuo zhinan* (New Guide to Industrial Statistics) (Beijing: Zhongguo tongji chubanshe, 1999), p. 11.

law. With the introduction of the "company" as a new enterprise form in 1992, solely (100%) state-owned limited liability companies (*guoyou duzi gongsi*) prior to 1998 were included as SOEs; as of 1998 they have been listed separately as a sub-category of limited liability companies. State-owned joint operation enterprises, i.e., formal alliances between two or more SOEs, constituted part of the state-owned economy prior to 1998, but have been classified with the joint operation enterprise category since 1998.

COEs comprise four types of enterprises: (i) urban COEs (*chengzhen jiti qiye*), (ii) township COEs (township-run enterprises [*xiangban/zhenban qiye*]), (iii) village COEs (village-run enterprises [*cunban qiye*]), and (iv) employee shareholding cooperatives (*zhigong gufen hezuozhi qiye*). Village COEs were first included in industry rather than in agriculture in 1984.[30] Employee shareholding cooperatives were first established in the late 1980s, but instead of being classified as a separate category, they were treated as COEs until 1997. Since 1998 they have been classified as a separate category.[31] Collective-owned joint operations were included in

the collective-owned economy before 1998, but have been classified with the joint operation category since 1998.

Individual-owned enterprises (IOEs), or the "self-employed in industry" (*getihu*), refer to privately owned entities with no more than 7 employees. Rural IOEs, like village COEs, were reported as part of the agricultural sector until 1983. Although IOEs have always been included in the statistics on all industry, the registration-based classification of industrial enterprises in effect since 1998 regards them as "self-employed" rather than as enterprises and therefore excludes them from the statistics on EIAS.

Privately owned entities employing more than 7 persons are classified as private enterprises. They were legalized in 1988. Before 1998 private enterprises consisted of private sole proprietorships, private partnerships, and privately owned limited liability companies. Since 1998, private stock companies have also been classified as a sub-category of private enterprises. If such organizations existed before 1998, they were then classified as stock companies.

Foreign-invested enterprises were first included in the *Statistical Yearbook 1984* with data (constructed retrospectively back to 1980) on the number of enterprises and their gross output value.[32] Foreign-invested enterprises are classified according to the origin of the investor. A distinction is made between investment by Hong Kong, Macau or Taiwanese Chinese (HKMT) and that by (other) foreigners. As in the case of private enterprises, two new categories — HKMT stock companies and foreign-invested stock companies — were established in the 1998 classification. These categories comprise the HKMT and foreign-invested stock companies in which the HKMT/foreign share in company capital (*guben*) exceeds 25%. Prior to 1998, such enterprises (if any) were included in the stock company category.[33]

Joint operation enterprises (*lianying qiye*) involve various formal alliances between SOEs, COEs and private enterprises, including many so-called "enterprise groups." The rules and regulations governing such enterprises are vague.[34] They were first included in the *Statistical Yearbook 1984* with data on the number of enterprises and their gross output value.[35] Before 1998, alliances between SOEs or COEs were included in the SOE or COE category, respectively; all other alliances were classified as joint operation enterprises. Since 1998, alliances between SOEs or COEs have also been listed as sub-categories of the joint operation enterprises.[36]

Shareholding companies were first included in the residual category of the aggregate statistics on EIAS in 1992, and have been listed as a separate enterprise category since 1993.[37] They comprise limited liability companies (*youxian zeren gongsi*) and stock companies (*gufen youxian gongsi*). Since 1998, solely state-owned limited liability companies (*guoyou duzi gongsi*) have been listed as a separate sub-category of limited liability companies.[38] Private stock companies and HKMT/foreign-invested stock companies (identified according to the 25% share rule mentioned above) are excluded from the stock company category.

Prior to 1998, the statistics published on industrial enterprise categories were primarily derived by aggregating data on the registration-based sub-categories of industrial enterprises. As a result of the reclassification of industrial enterprises in 1998, the content of these sub-categories has changed. Furthermore, a new rule for data aggregation across registration-based sub-categories of enterprises has been adopted.

Aggregation of Data

Under the new rule for data aggregation across registration-based sub-categories, adopted in 1998, major economic indicators (*zhuyao jingji zongliang zhibiao*) of industrial enterprises, such as output value, sales revenue, and value-added, are proportionally allocated to five groups of owners: state, collective, individual (including private), HKMT, and foreign. The proportion that each of these five ownership categories receives is determined by its share in paid-in capital (*shishou ziben*) — the main component of equity — where the share of institutional owners (legal persons) is excluded from the total paid-in capital for the purpose of this calculation. Data on employee shareholding cooperatives are allocated to the collective category in full.

Even though the proportional allocation rule in the aggregation of data has been clearly spelled out in writing by the NBS, the NBS in aggregating data for publication only makes partial use of it.[39] Table 4 repeats the registration-based classification in effect since 1998, shows the corresponding ownership-based classification under the proportional allocation rule, and then contrasts these two classifications with the classification of the industrial statistics actually published in the *Statistical Yearbook* (before and since 1998). There exists no written evidence on how the published data have been actually aggregated. Our presentation relies on deduction from the published data and communication with the NBS.

Table 4. Contrast Among Three Classifications: Organization Forms, Ownership-based Data, and Actually Published Aggregate Data

Code	I. Registration-based classification (since 1998)	II. Ownership-based classification (since 1998)[a]	III.a. Categories under which data on all industrial enterprises are reported in the *Statistical Yearbook*		III.b. Categories under which data on EIAS are reported in the *Statistical Yearbook*[e]	
			Since 1998[b]	Pre-1998	Since 1998[f]	Pre-1998[g]
100	***Domestic enterprises***					
110	SOEs	State	State[b]	SOEs	State[b]	SOEs
120	COEs	Collective	COEs	COEs	COEs	COEs
130	Employee shareholding comp.	Collective	COEs	COEs	COEs	COEs
140	*Joint operation enterprises*					
141	State-owned	State	State, also others (double-counted)	SOEs	State, also others (double-counted)	SOEs
142	Collective-owned	Collective	Others	Others	Residual	COEs
143	State- and collective-owned	Proportional alloc.	Others, also proportionally as state[c]	Others	Residual, also proportionally as state[c]	Residual
149	Other joint operation ent.	Proportional alloc.	Others, also proportionally as state[c]	Others	Residual, also proportionally as state[c]	Residual
150	*Limited liability companies*					
151	Solely state-owned	State	State	SOEs	SOEs	SOEs
159	Others	Proportional alloc.	State, if state-controlled:[d] other-wise: others, also prop. as state[c]	Others	State, if state-controlled:[d] otherwise: residual, also proportionally as state[c]	Share-holding
160	Stock companies	Proportional alloc.	Same as above	Others	Same as above	Shareh.
170	*Private enterprises*					
171	Private sole proprietorships	Individual-owned	IOEs	IOEs	Residual	Residual
172	Private partnerships	Individual-owned	IOEs	IOEs	Residual	Residual
173	Private limited liability co.	Individual-owned	IOEs or others	Others	Residual	Residual
174	Private stock companies	Individual-owned	IOEs or others	N/A	Residual	N/A
—	*Self-employment economy*	Individual-owned	IOEs	IOEs	Excluded	Excluded

190	Other enterprises	Proportional alloc.	Others	Others	Residual	Residual
200	***HKMT-invested enterprises***					
210	Joint equity ventures (JEVs)	Proportional alloc.	Others, also proportionally as state if state-owned shares exist[c]	Others	HKMT, also proportionally as state if state-owned shares exist[c]	HKMT
220	Contractual joint v. (CJVs)	Proportional alloc.	Others, also proportionally as state if state-owned shares exist[c]	Others	HKMT, also proportionally as state if state-owned shares exist[c]	HKMT
230	Wholly HKMT-owned	HKMT	Others	Others	HKMT	HKMT
240	HKMT stock companies	Proportional alloc.	Others, also proportionally as state if state-owned shares exist[c]	N/A	HKMT, also proportionally as state if state-owned shares exist[c]	N/A
300	***Foreign-invested enterprises***					
310	Chinese-foreign JEVs	Proportional alloc.	Others, also proportionally as state if state-owned shares exist[c]	Others	Foreign-invested, also proportionally as state if state-owned shares exist[c]	Foreign-inv.
320	Chinese-foreign CJVs	Proportional alloc.	Others, also proportionally as state if state-owned shares exist[c]	Others	Foreign-invested, also proportionally as state if state-owned shares exist[c]	Foreign-inv.
330	Wholly foreign-owned.	Foreign-invested	Others	Others	Foreign-invested	Foreign-inv.
340	Foreign-invested stock co.	Proportional alloc.	Others, also proportionally as state if state-owned shares exist[c]	N/A	Foreign-invested, also proportionally as state if state-owned shares exist[c]	N/A

Notes: [a] The ownership-based classification comprises only five ownership categories: state-owned economy, collective-owned economy, individual-owned economy (including the private economy), HKMT enterprises (enterprises run by Hong Kong, Macau and Taiwanese entrepreneurs), and foreign-invested enterprises. Proportional allocation means that the economic data in this registration-based category are redistributed to the five ownership categories in proportion to the shares in paid-in capital.

[b] The categories available in the *Statistical Yearbook* (ZGTJNJ) are: state-owned industry (SOEs and state-controlled shareholding enterprises), collective-owned industry, individual-owned industry (*geti qiye*) which includes private enterprises (as a double-check on 1995 data, using *Census 1995*, Vol. 1, p. 1, reveals), and "others."

[c] The state share, if any, and only the state share is double-counted in the two categories.

[d] State-controlled limited liability companies and state-controlled stock companies are fully counted as state-owned. State-controlled companies come in two categories. Absolute state control (*guoyou juedui konggu*) implies that the state accounts for more than 50% of total capital (*ziben*). Relative state control (*guoyou xiangdui konggu*) implies that although the state holds less than 50% of total capital, (i) its share is relatively large compared to the shares of other ownership categories that hold shares in the enterprise, i.e., "relative state control" in its narrow meaning (*xiangdui konggu*), or (ii) even though one or more other ownership categories have a larger capital share than the state, the state in effect holds the control rights by agreement (*xieyi kongzhi*). (NBS, "Tongjishang huafen jingji chenfen," p. 14.)

[e] The detailed industrial statistics since 1998 cover "all industrial SOEs with independent accounting system plus all industrial non-SOEs with independent accounting system and annual sales revenue in excess of 5m yuan," and prior to 1998 "all industrial enterprises with independent accounting system at township level or above."

[f] The categories available in the *Statistical Yearbook* are: SOEs including state-controlled shareholding enterprises ("state"), COEs, stock companies (*gufen youxian gongsi*), foreign-invested enterprises, and HKMT enterprises.

[g] The categories available in the *Statistical Yearbook* are: SOEs, COEs, shareholding enterprises (*gufenzhi jingji*), foreign-invested enterprises, and HKMT enterprises. There is a small residual of 2.27%. A double-check on 1995 data using the industrial census (*Census 1995*, p. 47; *Statistical Yearbook 1996*, p. 414) reveals that the residual, then 1.60%, comprises private enterprises (0.27%), joint operation enterprises (1.19%), and a category others (0. 14%).

Sources: NBS, *Xinbian gongye tongji*; NBS, "Jingji leixing huafen"; NBS, "Tongjishang huafen jingji chengfen"; correspondence with NBS.

In the published statistics the use of the proportional allocation rule since 1998 has been limited to enterprises with some, but less than 100% state ownership, and non-SOEs have not been allocated their proportion. Even this partial application differs from the written version of the rule in two crucial respects, however. First, all state-controlled shareholding companies are regarded as state-owned industry in full, rather than being subject to the proportional allocation rule. (For the definition of "state-controlled" see note to the table.) Second, all other non-SOEs in which the state has a stake are fully counted in the category in which they are listed, and then the proportional allocation rule in addition is used to calculate the state-owned stake *only* and to add it to the data for state-owned industry. This leads to a double counting of the state's stake.

This double counting is apparent in the reported GOVI since 1996. GOVI data on all industrial enterprises for 1996 and 1997 were retrospectively revised in 1998;[40] the only effect of the revision is that the gross output value of the new category "SOEs including state-controlled shareholding enterprises" (i.e., state ownership) is larger than the earlier published gross output value of the SOEs. The gross output value of all other categories, as well as total GOVI, is unchanged in the retrospectively revised data.[41]

A final complication in the aggregation of published data occurs in the private sector data. Despite the registration-based classification of private limited liability companies as private enterprises, before 1998 their economic data were reported as part of the data on shareholding enterprises rather than private enterprises. Since 1998, local statistical departments have been given the option to include these data, as well as the data on the new registration-based category private stock companies, in either the private enterprise category (included with the IOEs in the statistics on all industry, and in the residual in the EIAS statistics) or in the shareholding category (included in "others" in the statistics on all industry, and depending on the type of company, in the residual or in the stock company category in the EIAS statistics).

These changes, together with the post-1997 exclusion of industrial units with dependent accounting under non-industrial organizations from the statistics on all industry, the replacement of the administrative rank rule by the size rule for the inclusion in EIAS data, and the redefinition of the joint operation enterprise category, have made it impossible to bridge the 1998 statistical break. A partial remedy can be applied in the case of all industry, where the extent of double counting of state-owned shares in the

SOE category can be determined by taking the difference between the reported total GOVI and the sum of the GOVI reported for SOEs, COEs, IOEs, and others. But for all other enterprise categories, and also for the EIAS with their individual enterprise categories, data aggregated using the old rule and, separately, using the new rule, are not available for one and the same year. The magnitude of the 1998 statistical break thus cannot be gauged.[42]

Employment Coverage

Data on the industrial workforce since 1998 include only those labourers who are "on their post" (*zai gang*); in other words, those who are still nominally employed by an enterprise but not actually working in the enterprise are excluded. Pre-1998 data, on the other hand, are based on reported employment and thus are likely to have exaggerated actual employment. No retrospectively revised employment time series are available.[43]

Statistics on SOE employment include employees in SOE-SOE joint operation enterprises and, as of 1993, in solely state-owned limited liability companies.[44] Unless specifically defined as data on employment of "state-owned and state controlled enterprises," SOE employment figures exclude all employees of state-controlled limited liability and stock companies.[45] Neither the proportional allocation rule nor the actual aggregation rule in effect since 1998 applies to labour data. SOE labour statistics since 1998 are thus not compatible with the output, balance sheet, and profit and loss account data on SOEs (including state-controlled shareholding enterprises).

Employment statistics on EIAS are not available for the years since 1998. For the previous coverage under the administrative rank rule, employment data on all EIAS as well as the individual enterprise categories were reported in the *Industrial Yearbook*. Its publication was discontinued as of 1999, with the last volume of 1998 covering the year 1997.

Output Data

The consistency of GOVI output data was affected not only by the 1998 statistical break in enterprise coverage and categorization, but also by a number of statistical breaks earlier in the reform era. Since the net output value is calculated as a residual of GOVI, all statistical breaks in GOVI also affect net output value.[46]

Changes in the 1980s, Revision of 1991–1994 Data, and Re-definition of GOVI in 1995

The GOVI data reported before the mid-1980s had a narrower scope of coverage than those reported thereafter. It was not until 1984 that village COEs were first included in the GOVI of all enterprises.[47] While urban IOEs have been included in the aggregate GOVI of all enterprises all along, rural IOEs, like village COEs, were not included until 1984.[48] A retrospectively revised time series, presumably to include village COEs and rural IOEs in earlier years, has been published beginning with the *Statistical Yearbook 1989*. Even if the later published statistics were not to have been revised to include rural IOEs and village COEs in the years before 1984, the impact on GOVI would be limited, as these enterprises accounted for only 6.82% and 1.21% of aggregate GOVI in 1985.[49]

GOVI of the years from 1991 through 1994 was retrospectively revised in 1995 following the 1995 industrial census. This resulted in significant changes in the GOVI of all industrial enterprises as well as the individual enterprise categories except for SOEs (Table 5). Studies using 1991 through 1994 GOVI data that were published before 1995 run the risk of using highly exaggerated GOVI values for non-SOEs. No revised data for EIAS are available, yet much economic analysis is based on data on this group of enterprises. Production function estimations based on unrevised data for 1991–1994, for example, will show good technological progress in COEs and IOEs as compared to SOEs, yet such conclusions are based on exaggerated output data.[50] To complicate matters, some later statistical yearbooks refer to the corrected and the original data interchangeably without making clear which data (the corrected or the original) they present.[51]

The NBS in 1995 re-defined GOVI. The re-defined GOVI encompasses four changes, the most important of which is the new exclusion of the value-added tax from GOVI. The other three changes concern the pricing of specific goods and services and are far less important, if not negligible. A comparison between GOVI figures following the new and the old definition is possible in the year 1995. The exclusion of the value-added tax reduces GOVI by more than ten percent.[52] As a result, pre-1995 GOVI data are neither comparable to 1995 GOVI data calculated using the new method, nor to post-1995 data, which are exclusively based on the new method of calculation.[53] The GOVI data of all industrial enterprises as well as the EIAS are affected.

Table 5. Retrospective Revisions and Re-definition of Gross Output Value of All Industrial Enterprises

	I										II						III					
	1991			1992			1993			1994			1995			1996			1997			
	(a)	(b)	(a/b)	(a)	(b)	(a/b)	(a)	(b)	(a/b)	(a)	(b)	(a/b)	(a)	(b)	(a/b)	(a)	(b)	(a/b)	(a)	(b)	(a/b)	
All	2824.8	2662.5	1.06	3706.6	3459.9	1.07	5269.2	4840.2	1.09	7691	7017.6	1.10	9189.4	8229.7	1.12	9959.5	9959.5	1.00	11373.3	11373.3	1.00	
SOEs	1495.5	1495.5	1.00	1782.4	1782.4	1.00	2272.5	2272.5	1.00	2620	2620.1	1.00	3122.0	2684.1	1.16	2836.1	3617.3	0.78	2903.8	3596.8	0.81	
COEs	1008.5	878.3	1.15	1410.1	1213.5	1.16	2021.3	1646.4	1.23	3143	2647.2	1.19	3362.3	2925.3	1.15	3923.2	3923.2	1.00	4334.7	4334.7	1.00	
IOEs	160.9	128.7	1.25	250.7	200.6	1.25	440.2	386.1	1.14	885.3	708.2	1.25	1182.1	1197.1	0.99	1542.0	1542.0	1.00	2037.6	2037.6	1.00	
Other	160.0	163.1	0.98	263.4	268.8	0.98	535.2	517.4	1.03	1042	901.8	1.16	1523.1	1423.2	1.07	1658.2	1658.2	1.00	2098.2	2098.2	1.00	

Notes: (a) refers to pre-adjustment gross output value, and (b) to adjusted gross output value; the adjustments I, II, and III are described below. Absolute data are in billion RMB at current prices.

I. Original (pre-adjustment) data for 1991–1994 refer to those reported in the 1995 *Statistical Yearbook* (or earlier yearbooks), adjusted data for 1991–1994 refer to those reported in the 1996 *Statistical Yearbook*; adjustments were made in accordance with the 1995 industrial census.

II. In 1995 gross output value was re-defined, and original as well as adjusted gross output value figures were issued for 1995 (published in the 1996 *Statistical Yearbook*). Gross output value figures for the years after 1995 follow the new stipulations. The adjusted 1991–1994 gross output value data in I. are based on gross output value calculated in accordance with the old stipulations (the NBS made adjustments only to correct for previously inaccurate measurement).

III. In 1998, the enterprise category “SOEs” in the statistics on all industrial enterprises turned into the category “state-owned (including state-controlled) enterprises.” 1996 and 1997 data on the new category for the years 1996 and 1997 were published retrospectively. Original SOE data for 1996–1997 are reported in the 1997 and 1998 *Statistical Yearbook*. Adjusted SOE data for 1996–1997 are reported in the 1999 (and 2000) *Statistical Yearbook*.

Sources: *Statistical Yearbook 1995*, p. 375; *Statistical Yearbook 1996*, p. 401; *Statistical Yearbook 1997*, p. 413; *Statistical Yearbook 1998*, p. 433; *Statistical Yearbook 1999*, p. 423.

Overall, there are no consistent time series data on GOVI for the entire two decades of reform due to periodic breaks, though intra-period consistency exists. GOVI of all industry and the major enterprise categories are consistent for the years through 1990, as long as the data are taken from the *Statistical Yearbook 1989* or a subsequent issue. For the years 1991–1995 both the panel reported for 1992–1995 and the retrospectively corrected data (*Statistical Yearbook 1996*) are internally consistent. Consistent data under the new definition of GOVI are available for the years 1995–1997. Data for the years since 1998 are again consistent; for SOEs (including state-controlled enterprises), retrospectively adjusted data for 1996 and 1997 are also consistent with those reported for the years since 1998.

GOVI data on the EIAS are regularly published in both the *Statistical Yearbook* and the *Industrial Yearbook*, beginning with the 1988 issue. The earliest available data are reported in the 1993 issue of the *Industrial Yearbook*,[54] with retrospectively constructed data on SOEs, COEs, and the category "others" for 1980 and the years 1984–1992. A special statistical compendium published in 1996 (*Seventeen Years of Reform*) offers time series data for the years 1978 through 1995.[55] EIAS are not affected by the changing treatment of village-level COEs or rural IOEs in 1984. Thus the available GOVI data on EAIS could be consistent from 1978 through 1994. (1995 data are only available following the new definition of GOVI.) *Seventeen Years of Reform* does not correct the 1991 through 1994 data published in the *Statistical Yearbook*s; it could be that there was never any need to correct the data on the EIAS, only on the non-EIAS.[56] The data are also consistent for the period 1995–1997; and separately for the years since 1998.

Impact on Net Output Data

Because the calculation of net material product through 1992 and industrial value-added since 1992 is based on the subtraction of intermediate inputs from gross output value, the statistical breaks in gross output value data inevitably affect net output data as well. The corrections to GOVI of non-SOEs in the years 1991 through 1994 as noted in the preceding section should have yielded a similar correction in industrial value-added, but did not.[57] Second, the 1995 re-definition of GOVI implies a minor re-definition of value-added. Of the four items in the re-definition of GOVI in 1995, one — namely the change in how self-produced semi-finished products and

goods in production are accounted for — affects value-added. This statistical break in 1995 (or 1996) is likely to be of minor size.[58]

Changes in enterprise coverage and categorization also affect net output data. Thus data on net material product published before 1987 excluded the output of village COEs and rural IOEs. Industrial net material product data published in the *Statistical Yearbook 1987* or a subsequent issue of the *Statistical Yearbook* include the output of industrial village COEs and rural IOEs and present retrospectively revised data for all earlier years.[59]

Overall, the net material product data on all industrial enterprises in total (no data on separate enterprise categories are available) are consistent for all years through 1992 (after 1993 they ceased to be published) as long as the data are taken from the *Statistical Yearbook 1987* or a subsequent recent issue. Industrial value-added data for the years 1992–1994 were never retrospectively revised. Industrial value-added data since 1995 should be consistent except that since 1998 the industrial units with dependent accounting system under non-industrial organizations have been excluded.

For EIAS, too, only intra-period consistency exists. The net material product of EIAS is likely to be consistent from 1982, the year for which the data were first published, through 1992. Value-added data are consistent from 1992 through 1994 *if* the corrections to GOVI data for the years 1992–1994 affected only non-EIAS. The data are also consistent for the years 1995 through 1997; and separately for the years since 1998.

Employment Data

Compared to output and balance sheet data, statistics on the industrial workforce have undergone fewer revisions in definition and enterprise coverage. The only major changes are the inclusion of employees of solely state-owned limited liability companies in the SOE category as of 1993, and the switch to counting "on-post" labourers only as of 1998.[60] For output and balance sheet data to be used together with employment data, however, the reclassification of enterprises and the use of the aggregation rule in 1998 should have been accompanied by corresponding changes in the employment statistics of the industrial sector.[61] The lack of such changes has resulted in inconsistencies.

As noted above, in all published statistics except the employment statistics, state-controlled shareholding companies have since 1998 been included in the state-owned economy; SOE-SOE joint operation

enterprises have been double-counted in both the state-owned economy and the category "others," while COE-COE joint operation enterprises have only been included in the category "others." In contrast, in the statistics on the industrial workforce since 1993 state-controlled shareholding enterprises have always been reported solely in the category "others"; on the other hand, SOE-SOE and COE-COE joint operation enterprises have always been included in the state-owned and the collective-owned sectors, respectively.[62]

Additional problems in the use of employment data may also arise due to confusion about the scope and definition of different employment data sets. Table 6 lists the labour time series that have been published. Yet not every one of them can be matched with a corresponding enterprise classification in the output statistics. Which labour statistics are relevant given one's interest may not be immediately obvious, as examples from the literature can attest.

Employment Data Covering All Industrial Enterprises

The first series in Table 6 provides information on the workforce in the three sub-sectors that by definition constitute industry. They are reported in the labour statistics section of the *Statistical Yearbook* and the *Industrial Yearbook*. These data cover industrial enterprises regardless of the type of accounting system, and include the workforce in enterprises below the township level. They can be collated with the aggregate data on output and the number of establishments for *all* industrial enterprises.

The second series in the table contains total workforce data from the two industrial censuses in 1985 and 1995. The data are significantly larger than those in the first column for these two years (from the *Statistical Yearbook* or the *Industrial Yearbook*). The difference may in part be due to the inclusion of seasonal labourers and the more extensive coverage of self-employed persons in the censuses.[63]

Employment Data with Partial Coverage of the Industrial Sector

The third series in Table 6 comprises the workforce labeled "staff and workers" in industrial enterprises with independent accounting system at and above the township level. These data correspond to the output and balance sheet data reported for this group in the *Statistical Yearbook* and the *China Industrial Statistical Yearbook*. One problem is that the data for

Table 6. Different Sets of Statistics Pertaining to the Size of the Industrial Workforce (million persons)[*]

	I	II	III	IV	V	VI	VII
1980	67.14 (50)		50.28 (65)	47.62 (70)	19.42 (13)	105.25 (75)	80.19 (42)
1981	69.75 (50)			49.83 (70)	19.81 (N/A)		83.72 (42)
1982	72.04 (50)			51.15 (70)	20.73 (N/A)		86.30 (42)
1983	73.97 (49)			52.05 (70)	21.68 (N/A)	117.46 (75)	87.71 (41)
1984	79.30 (46)		61.57 (60)	53.43 (69)	36.56 (18)	122.29 (71)	86.37 (43)
1985	83.94 (46)	93.96 (41)	66.05 (58)	55.57 (69)	41.37 (21)	128.08 (70)	89.90 (42)
1986	89.80 (44)			57.81 (68)	47.61 (N/A)	132.93 (70)	93.33 (42)
1987	93.42 (44)		72.98 (57)	59.71 (68)	52.67 (21)	137.83 (70)	96.54 (42)
1988	96.61 (45)		75.18 (57)	61.58 (69)	59.70 (22)	142.67 (70)	99.83 (42)
1989	95.69 (45)		75.46 (57)	62.28 (69)	60.00 (21)	143.90 (70)	101.09 (42)
1990	96.98 (45)		76.64 (57)	63.78 (68)	60.10 (21)	166.16 (62)	103.46 (42)
1991	99.47 (45)		79.65 (57)	65.51 (68)	58.14 (20)	169.77 (63)	106.64 (42)
1992	102.19 (44)		80.08 (57)	66.21 (64)	63.36 (18)	172.41 (63)	108.89 (39)
1993	104.67 (43)		83.00 (54)	66.26 (66)	72.6 (22)	175.89 (62)	109.20 (41)
1994	107.74 (41)		83.30 (51)	65.82 (66)	69.62 (21)	184.13 (61)	108.90 (40)
1995	109.93 (40)	147.35 (32)	85.01 (52)	66.10 (67)	75.65 (22)	190.93 (59)	109.55 (40)
1996	109.38 (39)		81.87 (51)	64.51 (66)	78.60 (24)	198.15 (57)	109.49 (39)
1997	107.63 (38)		78.73 (50)	62.16 (65)	61.49 (18)	202.07 (55)	107.66 (38)
1998	93.23 (29)		61.96 (N/A)	47.53 (57)	73.34 (N/A)	206.78 (44)	88.09 (31)
1999	90.61 (27)		58.05 (N/A)	44.28 (55)	73.95 (N/A)	210.14 (41)	83.36 (29)

Notes: * Figures in parentheses are the percentages of state-owned enterprises/units corresponding to the definition of each category, with the exception of those in series V, where the figures in parentheses are the percentages of industrial township COEs with independent accounting system.

I. Year-end workforce in the three components of industry, i.e., (i) mining and quarrying, (ii) manufacturing, and (iii) power, gas, and water; reported in the labour statistics section of the *Statistical Yearbook* and the *Labour Yearbook*.

II. Year-end workforce in the industrial sector, reported in the *Census 1985* and the *Census 1995*.

III. Year-end (1980-1992) and average annual figures (1993-1997) on staff and workers in industrial enterprises with independent accounting system, reported in the *Industrial Yearbook*. Figures for 1998 and 1999 are implicit numbers for the newly defined EIAS; they are derived from the labour productivity and value-added data in the 1999 issue (p. 432, p. 437) and the 2000 issue (p. 414, p. 419) of the *Statistical Yearbook*.

IV. Year-end figures on staff and workers in industrial enterprises, reported in the industrial statistics section of the *Statistical Yearbook*.

V. Year-end workforce in rural industrial enterprises (including township and village COEs and IOEs), reported in the *Township Enterprise Yearbook*.

VI. Year-end urban workforce in both economic and non-economic sectors, reported in the labor statistics section of the *Statistical Yearbook*.

VII. Year-end figures on staff and workers in all state-owned units, reported in the labour statistics section of the *Statistical Yearbook* and the *Labour Yearbook*.

Sources: *Statistical Yearbook 1994*, p. 84; *Statistical Yearbook 2000*, pp. 118, 120, 126, 408; *Labour Yearbook 1995*, p. 21, *Labour Yearbook 1999*, pp. 9, 17; *Industrial Yearbook 1993*, p. 26, 90; *Industrial Yearbook 1994*, p. 81; *Industrial Yearbook 1995*, pp. 79, 85; *Industrial Yearbook 1998*, pp. 20, 81; *Census 1985*, Vol. 3, p. 6; *Census 1995 Summary*, p. 52; *Township Enterprise Yearbook 1988*, p. 571; *Township Enterprise Yearbook 1991*, p. 135; *Township Enterprise Yearbook 1992*, p. 147; *Township Enterprise Yearbook 1993*, p. 157; *Township Enterprise Yearbook 1994*, p. 162; *Township Enterprise Yearbook 1995*, p. 92; *Township Enterprise Yearbook 1996*, p. 113; *Township Enterprise Yearbook 1998*, p. 115; *Township Enterprise Yearbook 1999*, p. 119; *Township Enterprise Yearbook 2000*, p. 121.

1981–1983, 1986, and after 1997 are unavailable. Another problem is that the data up through 1992 are year-end figures, while the post-1992 data are annual average figures.

The term "staff and workers" is defined as persons employed and being paid a salary by state-owned units, urban collective-owned units, joint operation units, shareholding units, foreign units (including HKMT units), "other" units and the subordinate units of all of the above. "Staff and workers" by definition excludes the employees of township and village enterprises, employees of urban private enterprises, labourers in urban individual-owned enterprises, retirees, re-employed retirees, teachers not funded through the state budget, and "others as specified in relevant regulations." The third series, however, appears to include employees of township-run enterprises with independent accounting system contrary to this official definition.[64]

The fourth series contains data on the total number of staff and workers reported in the industry section of the *Statistical Yearbook*, in the *Labour Yearbook*, and in the *Industrial Yearbook*. It strictly follows the definition of staff and workers (and thus excludes employees of township enterprises).[65] Although this series is the most widely reported one, it is perhaps the least useful, as there are no corresponding output, profit and balance sheet data to match. It is also potentially misleading, as it is prominently featured in the industry section of the *Statistical Yearbook*, where no other employment data are provided.

The fifth series comprises the workforce of rural industrial enterprises, including township and village COEs and rural IOEs. Unlike the other series, which are all compiled by the NBS in collaboration with the Ministry of Labour, it is compiled by the Ministry of Agriculture. It seems that it includes enterprises in rural areas regardless of the type of accounting system. The figures in parentheses indicate that industrial township COEs with independent accounting system, which are included in the third series, only account for a small fraction of the industrial workforce in rural areas. An implication of this is that a large number of rural industrial enterprises were not included in the EIAS data before 1998.

Employment Data with Coverage Beyond the Industrial Sector

The sixth series, on the urban workforce, has been published since 1994, with data retrospectively constructed back to 1980. The seventh series provides employment statistics of state-owned units, which include

industrial SOEs, non-industrial SOEs, and non-economic organizations in the state sector, such as government departments and non-profit organizations. Obviously, each of these series has a scope of coverage that extends beyond the industrial sector. But they are sometimes used to derive conclusions pertaining to the industrial sector, especially with regard to the share of SOEs in the industrial workforce.

Steinfeld, for example, re-labels the share of employees of urban state-owned units in the total urban workforce (see the sixth series with percentages in parentheses, Table 6) as "urban workforce employed by state-owned *firms*" (emphasis added) and discusses it along with data on the *industrial* sector.[66] Sachs and Woo divide the data in the seventh series on staff and workers in all state-owned *units* by data on China's total workforce and refer to the resulting percentage as the share of state *enterprise* employment.[67]

The NBS may be partially responsible for such confusion. Until 1998 the labour statistics section of the *Statistical Yearbook* referred to the total workforce in the state and the collective-owned sector as employees in "state-owned/collective-owned economic units" (*guoyou/jiti jingji danwei*). This has been corrected since the 1999 issue of the *Statistical Yearbook* (containing 1998 data), where the adjective "economic" (*jingji*) is dropped in the label.

Concluding Remarks

In the past two decades China's industrial statistics have seen numerous changes to definitions of variables and the classification of enterprises. The majority of these revisions are either undocumented in the statistics, or documented poorly in locations that are not immediately obvious. Table 7 highlights the major problems that the resultant inconsistencies pose to data users.

Although we have only examined the statistical problems at the national level, industrial statistics reported by local authorities are collected and reported in accordance with NBS regulations and therefore contain the same inconsistencies. Similarly, while the use of enterprise level data may circumvent the classification problems inherent in aggregate official statistics — the researcher then has to make the decision as to how to categorize the enterprise — enterprise accounts from which data are obtained still follow national accounting and statistical compilation rules.

A number of factors may have contributed to the periodic adjustments in definitions of variables and the classification of enterprises. Rapid rural

Table 7. Summary of Main Findings

Area/source of problem	Diagnoses
Enterprise coverage	(1) The scope of enterprise coverage in the statistics on all industrial enterprises as well as in the statistics on EIAS was re-defined several times. The most significant change occurred in 1998, when enterprises with dependent accounting system under non-industrial organizations began to be excluded from the statistics on all industrial enterprises, and the criteria for inclusion in the EIAS changed. (2) Data on the EIAS always exclude the self-employed (*getihu*).
1993 statistical break	(1) Time series data on net output for the pre-1993 and post-1992 periods are not comparable. (2) Post-1992 statistics on enterprise assets are only partially comparable to pre-1993 statistics. (3) Foreign-invested (including HKMT) enterprises and share-holding enterprises tend to have more broadly defined assets and equity as a result of earlier and more extensive valuation of land use rights. Ongoing changes in land valuation are likely to continue to have an impact on the intangible assets of all enterprise categories in the coming years. (4) The value-added tax is excluded from sales revenue statistics beginning in 1994; an adjustment is necessary in order for time series data to be consistent.
1998 statistical break	(1) For both the data on all industrial enterprises and those on the EIAS, the 1998 break renders all time series comparisons of the years up through 1997 with those since 1998 impossible. (2) Data on the individual enterprise categories since 1998 are not aggregated in accordance with the formal rules, but according to informal, ad hoc rules. (3) Post-1997 labour statistics no longer include off-post employees and thus cannot be compared with pertinent pre-1998 data, which contain a significant number of redundant personnel, especially in SOEs and COEs.
Output data	(1) Pre-1985 time series data on net and gross output value reconstructed since 1989 should be used in place of those published earlier due to changes in enterprise coverage. (2) Pre-1991, 1991–1995, and post-1995 data on gross output value are not comparable due to retrospective adjustments and re-definitions; pre-1998 and post-1997 data are not comparable due to the changes in enterprise coverage.

Table 7. (Cont'd)

Area/source of problem	Diagnoses
	(3) 1991–1994 value-added data are unreliable because of a lack of retrospective corrections corresponding to those made to gross output data; pre-1998 and post-1997 data are not comparable due to the changes in enterprise coverage.
Employment data	(1) Enterprise categories used in the labour statistics since 1998 mostly do not match those used with output, balance sheet, and profit and loss account statistics due to a lack of corresponding adjustments in employment data. (2) Precaution is necessary in the selection and interpretation of different sets of time series data on employment.

industrialization after decollectivization of agriculture in the early 1980s led to the early inclusion of village COEs and rural IOEs in the output statistics. Economic transition from central planning to markets made it necessary to switch from the traditional Material Product System to the System of National Accounts, and thus led to the introduction of new concepts to measure output and financial stocks and flows. This switch, however, has been accompanied by many problems, as the new variables are rarely comparable to those used previously, and not always clearly distinguished. Economic transition also opened the way for the advance of new ownership forms, such as individual-owned enterprises, that the NBS was and still is ill prepared to collect data on.

With rapid economic growth and a multiplication in the number of enterprises, financial and human resources have become inadequate for the NBS to systematically collect data on a large number of enterprises and at the same time ensure data quality. This has led to the re-identification (based on size in 1998) of the group of enterprises (the EIAS) on which detailed statistics are collected and published. The political desire to show the continued dominance of the state sector finally is likely to have influenced the choice of the new data aggregation rule in effect since 1998, as application of the new aggregation rule raises the state's share in industry significantly.

Compared to the statistics reported in the 1980s, those of the 1990s are defined more in line with international standards, and reveal more details about enterprise finances. However, most of the statistical breaks that have severely compromised data quality took place during the 1990s. The most recent data are the most problematic.[68]

In this paper we have attempted to cast some light on the 1993 and 1998 statistical breaks in industry, as well as on the most widely used data series on industrial output, employment, and enterprise finances. Much more needs to be done to pinpoint the pitfalls of Chinese industrial statistics and to understand other official statistics that researchers frequently use, such as those on the banking sector. It would, of course, be most desirable if the NBS, in recognition of the problems in existing statistics, could provide a clear explanation of variables and enterprise categories in its future publications, as well as a retrospectively revised, consistent data set for the 1990s.

Notes

* The authors are grateful to Gary H. Jefferson and two anonymous referees for their comments. We have tried to document all our sources in detail, and to indicate where we lack hard evidence. Nevertheless, more information may become available over time, and other researchers may be aware of additional, better sources. This paper represents our best effort to make sense of the information that to our knowledge is currently available.

1. *Zhongguo tongji nianjian* (China Statistical Yearbook) (Beijing: Zhongguo tongji chubanshe, annual publication since 1981). The 1981 issue covers 1981 data. Beginning with the following issue of 1983, the most recent data in each statistical yearbook are those of the previous year.
2. Gregory C. Chow, "Chinese Statistics," *The American Statistician*, Vol. 40, No. 3 (1986), pp. 191–96 (in particular pp. 193 and 195). Dwight H. Perkins, writing in an appendix to *Market Control and Planning in Communist China* (Cambridge, MA: Harvard University Press, 1966) about early pre-reform statistics, also reaches a generally positive conclusion on the accuracy of Chinese statistics.
3. Thomas G. Rawski, "China By the Numbers: How Reform Affected Chinese Economic Statistics" (Manuscript, University of Pittsburg, 2000, note 2). The World Bank report itself, entitled "China: Statistical System in Transition," is not publicly available.
4. Rawski, ibid. For similar views on the exaggeration of China's GDP, see Hsüeh Tien-tung and Li Qiang, *China's National Income, 1952–1995* (Boulder, CO: Westview Press, 1999); Ren Ruoen, *China's Economic Performance in International Perspective* (Paris: Development Centre of the OECD, 1997); Wing-Thye Woo "Why China Grew," in *Emerging from Communism: Lessons from Russia, China, and Eastern Europe*, edited by Peter Boone, Stanislaw Gomulka, and Richard Layard (Cambridge, MA: The MIT Press, 1998), pp. 153–82. The accuracy of Chinese GDP data is also

discussed in Chinese journals. See, for example, Xu Xianchun, "Shijie yinhang dui Zhongguo guanfang GDP shuju de tiaozheng he chongxin renke" (The Official Chinese GDP Figures as Adjusted and Approved by the World Bank), *Jingji yanjiu* (Economic Research), No. 6 (1996), pp. 52–58; Xu Xianchun, "Zhongguo guonei shengchan zongzhi hesuan zhong cunzai de ruogan wenti yanjiu" (Some Problems in the Calculation of China's GDP), *Jingji yanjiu*, No. 2 (2000), pp. 10–16; Meng Lian and Wang Xiaolu, "Dui Zhongguo jingji zengzhang tongji shuju kexindu de guji" (An Estimate of the Reliability of Chinese Economic Growth Statistics), *Jingji yanjiu*, No. 10 (2000), pp. 3–13; Wang Xiaolu, "Zhongguo jingji zengzhang de kechixuxing yu zhidu gaige" (The Possibility of Continued Economic Growth in China, and Systemic Reform), *Jingji yanjiu*, No. 7 (2000), pp. 3–15.

5. Chen Kuan, Gary H. Jefferson, Thomas G. Rawski, Wang Hongchang and Zheng Yuxin, "New Estimates of Fixed Investment and Capital Stock for Chinese State Industry," *The China Quarterly*, No. 144 (1988), pp. 243–66; Gary H. Jefferson, "Growth and Productivity Change in Chinese Industry: Problems of Measurement," in *Research in Asian Economic Studies: A Research Annual. Asian Economic Regimes: An Adaptive Innovation Paradigm*, Volume 4, edited by M. Dutta (Greenwich, Connecticut: JAI Press Inc., 1992 [Part B]); Wing-Thye Woo, Hai Wen, Jin Yibiao, and Fan Gang, "How Successful Has Chinese Enterprise Reform Been? Pitfalls in Opposite Biases and Focus," *Journal of Comparative Economics*, Vol. 18, No. 3 (1994), pp. 410–437; Gary H. Jefferson, Thomas G. Rawski, Wang Li, and Zheng Yuxin, "Ownership, Productivity Change, and Financial Performance in Chinese Industry," *Journal of Comparative Economics*, Vol. 28, No. 4 (December 2000), pp. 786–813.
6. Thomas G. Rawski and Robert W. Mead, "On the Trail of China's Phantom Farmers," *World Development*, Vol. 26, No. 5 (1998), pp. 767–81.
7. Cai Yongshun, "Between State and Peasant: Local Cadres and Statistical Reporting in Rural China," *The China Quarterly*, No. 163 (2000), pp. 783–805.
8. Industry, as officially defined, comprises (i) mining and quarrying, (ii) manufacturing, and (iii) production and supply of electricity, gas, water, and steam.
9. According to Hsüeh and Li (note 4, p. 171), "among all national economic sectors in China, the most satisfactory and complete statistics are those of the industrial sector." As will be shown below, however, such statistics have been subject to the impact of frequent and significant adjustments.
10. *Zhongguo tongji zhaiyao* (A Statistical Survey of China) (Beijing: Zhongguo tongji chubanshe, annual publication). In 1998, the *Guojia tongji ju* changed its English name from State Statistical Bureau to National Bureau of Statistics. In the following the more recent English name will be used throughout.

11. *Zhongguo gongye jingji tongji nianjian* (China Industrial Statistical Yearbook) (Beijing: Zhongguo tongji chubanshe, 1988, 1989, 1990, 1991, 1992, 1993, 1994, 1995, 1998); *Zhongguo gongye jingji tongji ziliao* (China Industrial Statistical Material) (Beijing: Zhongguo tongji chubanshe, 1949–1984, 1986, 1987). Each volume covers data up to the previous year, except the 1949–1984 volume, which covers the years up through 1984. In addition, as an anonymous referee has pointed out, the NBS publishes an internal *Zhongguo gongye tongji nianbao* (China Industrial Statistical Annual Report). The first volume covered the years 1949–1978; the other volumes are typically annual publications.
12. *Zhonghua renmin gongheguo 1985 nian gongye pucha ziliao* (Statistics of the 1985 PRC Industrial Census) (Beijing: Zhongguo tongji chubanshe, 1987); *Zhonghua renmin gongheguo 1995 nian quanguo gongye pucha ziliao* (Statistics of the 1995 PRC Industrial Census) (Beijing: Zhongguo tongji chubanshe, 1997); *Zhonghua renmin gongheguo 1995 nian quanguo gongye pucha ziliao zhaiyao* (Summary Statistics of the 1995 PRC Industrial Census) (Beijing: Zhongguo tongji chubanshe, 1996). The *Census 1985* volumes contain data for 1985 as well as selected statistics for 1980 and 1984. The NBS also compiled several additional volumes, known as the "blue-cover volumes" (in contrast to the red-cover volumes for public circulation), for internal circulation. Various central government ministries also released several sectoral volumes based on data compiled in the 1985 industrial census. Both censuses led to the publication of provincial and in some cases municipal volumes, which are not labeled "internal."
13. *Zhongguo xiangzhen qiye nianjian* (China Township Enterprise Yearbook) (Beijing: Zhongguo nongye chubanshe, annual publication beginning with a 1978–1987 issue); *Zhongguo laodong tongji nianjian* (China Labour Statistical Yearbook) (Beijing: Zhongguo tongji chubanshe, annual publication beginning in 1990), preceded by *Zhongguo laodong gongzi tongji ziliao* (China Labour and Wage Statistics) (Beijing: Zhongguo tongji chubanshe, two issues for 1949–1985 and 1978–1987 respectively).
14. *Statistical Yearbook 1995*, p. 419.
15. Industrial units with dependent accounting system have their own place of production, conduct primarily industrial activities, organize their own production, and have their own revenues and expenditures. But they are not legal persons and cannot enter contracts with other parties or be held liable independent of the organization with which they are affiliated. They are affiliated with enterprises with independent accounting system, including those in non-industrial sectors (e.g., construction, communication and transportation, commerce, agriculture, and services), or with non-profit organizations (e.g. schools) or administrative units of the government.
16. Private enterprises were legalized in 1988 and are since then included in the official industrial statistics. In the data on GOVI and the number of all

industrial enterprises, they have been grouped together with IOEs; in the data on the industrial workforce and those on EIAS, however, they appear either as a separate category or as part of the "others" or residual (unspecified) category. For a more detailed discussion on private enterprises and IOEs, see the section on the 1998 break.

17. The change in the category of enterprises on which detailed industrial statistics are available thus has two effects. Non-SOEs with independent accounting system at or above township level but with sales revenue of no more than five million yuan are now excluded from the detailed industrial statistics. On the other hand, village level enterprises that meet the two requirements are now included.
18. The sectoral classification changed twice during the reform period. Prior to 1985, it comprised 13 sectors, between 1985 and 1992 30 sectors, and since 1993 (*1994 Statistical Yearbook*) 39 sectors. The fortieth sector, weapons and ammunition, is not covered in the *Statistical Yearbook*, but in some provincial statistical yearbooks.
19. The first *Statistical Yearbook* of 1981 reported net material product of industry for selected years, dating back to 1952 (*Statistical Yearbook 1981*, p. 20). In 1983, the NBS published a full time series on net material product of industry dating back to 1949, as well as data on industrial enterprises with independent accounting system dating back to 1981 (*Statistical Yearbook 1983*, pp. 24, 238). The aggregate industry-wide series was subsequently modified in the 1987 *Statistical Yearbook* to include the contribution from industrial village COEs and the rural self-employed in industry. Hsüeh and Li, *China's National Income*, provide a detailed account of the evolution of the MPS and SNA.
20. In 1991, the NBS reported Gross National Product (GNP) for 1978 through 1990 (*Statistical Yearbook 1991*, p. 31), and in 1993 GDP for 1978 through 1992 (*Statistical Yearbook 1993*, p. 31). The most recent GNP and GDP data undergo minor adjustments within one year of their first publication. Statistical tables on GDP also provide data on the GDP component total industrial value-added. It was not until 1998 that the NBS for the first time reported retrospectively constructed figures on GNP and GDP dating back to 1952 in the *Statistical Yearbook 1998*, p. 55; the series can also be found in a special publication *Zhongguo guonei shengchan zongzhi hesuan lishi ziliao* (Historical Material on China's GDP) (Beijing: Zhongguo tongji chubanshe, 1997).
21. National Bureau of Statistics Department for National Income Accounting, *Zhongguo niandu guonei shengchan zongzhi jisuan fangfa* (Calculation of China's Annual Gross Domestic Product) (Beijing: Zhongguo tongji chubanshe, 1997), p. 12, reports that industry uses the production method to calculate value-added, i.e., intermediate inputs are subtracted from GOVI; an alternative method is the income approach. Since the MPS did not cover

service sectors, the service payments to non-productive units were counted as industrial net material product. With the introduction of the SNA, industrial net output, now value-added, no longer includes the service payments to non-productive units; these are now covered as part of the service sector.

22. This narrowing of the gap implies that interest and other service payments after the late 1980s increased faster than depreciation, a plausible development given that enterprises had virtually no liabilities in the early 1980s, but a liability-asset ratio of about 75% in the mid-1990s. The data in this paragraph are from the *Industrial Yearbook 1993*, p. 64, and the *Statistical Yearbook 2000*, p. 53.
23. *Industrial Yearbook 1986*, p. 21; *Statistical Yearbook 1993*, p. 417; *Industrial Yearbook 1993*, p. 64; *Statistical Yearbook 2000*, p. 53.
24. Ministry of Finance, (a) *Qiye caiwu tongze* (General Procedures of Enterprise Financial Accounting), (b) *Qiye caiwu zhunze* (Principles of Enterprise Financial Accounting), both of 30 November 1992 and published in Guowuyuan fazhi ju fagui bianzuanshi, *Zhonghua renmin gongheguo xin caiwu kuaiji zhidu daquan* (Compendium of the PRC New Financial Accounting System) (Beijing: Zhongguo wujia chubanshe, 1993), pp. 3–10.
25. The *Statistical Yearbook 1993*, containing 1992 data, no longer reports fixed-quota working capital for the EIAS but "total working capital," with the average 1992 value of the latter for all EIAS being 2.28 times the average 1991 value of the former. (*Statistical Yearbook 1992*, p. 419; *Statistical Yearbook 1993*, p. 425) On the definition of the two types of working capital see *Jingji da cidian: gongye jingji juan* (*Economics dictionary: industry*) (Shanghai: Shanghai cishu chubanshe, 1983), pp. 381 and 440; *Jingji da cidian: tongji juan* (*Economics dictionary: statistics*) (Shanghai: Shanghai cishu chubanshe, 1996), p. 415.
26. Current assets of all EIAS at year-end 1993 totalled RMB2,475.643b, which was 3.65 times larger than the average annual fixed-quota working capital of RMB678.400b in 1991 (*Statistical Yearbook 1994*, p. 379; *Statistical Yearbook 1992*, p. 419). Fixed assets of all EIAS in 1993 totalled RMB 2,184.487b, which was only 18.54% larger than the net value of fixed assets at RMB1,842.487b. (*Statistical Yearbook 1994*, p. 379. Since 1993 both series have been reported by the NBS.) On the change in depreciation rates see Ding Yun, Xia Fan, and Zhao Lun (eds), *Gongye qiye kuaiji zhidu wenti xiangjie* (Detailed Explanatory Notes on the Industrial Accounting System) (Beijing: Hongqi chubanshe, 1994). The 1989 revisions to the accounting system for the first time introduced intangible assets and accounts receivable. See Xiang Huaicheng, *Xin Zhongguo kuaiji wushi nian* (Fifty Years of Accounting in the New China) (Beijing: Zhongguo caizheng jingji chubanshe, 1999), p. 174.
27. *Statistical Yearbook 1995*, p. 449. For a detailed appendix on the development of land valuation as part of enterprise assets, please contact the first author.

28. *Industrial Yearbook 1994*, p. 483; *Industrial Yearbook 1995*, p. 403.
29. For an account of the evolution of the value-added tax and the product/consumer tax discussed in this and the following paragraph, see Guojia shuiwu zongju, *Zhongguo gongshang shuishou jiben fagui shiyong gailan* (A Practical Overview of the Basic Laws and Regulations on China's Industrial and Commercial Taxes) (Beijing, Jingji guanli chubanshe, 1993). For the data presented in this and the next paragraph see *Statistical Yearbook 1994*, p. 381; *Zhongguo caizheng nianjian 1997* (China Fiscal Yearbook 1997) (Beijing: Zhongguo caizheng zazhishe, 1997), p. 445.
30. See the definition of GOVI in the *Statistical Yearbook 1985*, p. 665.
31. Cao Yuanzheng, Qian Yingyi, and Barry R. Weingast, "From Federalism, Chinese Style to Privatization, Chinese Style," *Economics of Transition*, Vol. 7, No. 1 (1999), pp. 103–31, on p. 111, note 11, view employee shareholding cooperatives as private enterprises — quite contrary to the classification adopted by the NBS in 1998.
32. *Statistical Yearbook 1984*, pp. 193f.
33. PRC entities registered overseas are categorized as foreign-invested enterprises according to their place of registration, thus inflating the extent of foreign direct investment in Chinese industry. Moreover, there are large numbers of Chinese industrial enterprises undertaking processing contracts with foreign manufacturers; they are not classified as foreign-invested enterprises.
34. For a discussion of the regulations on enterprise groups, see Wang Shiyuan (ed.), *Zhongguo gaige kaifang shidian* (A Handbook of Important Events in China's Reform and Opening) (Guangzhou: Guangdong renmin chubanshe, 1993), pp. 98–102.
35. *Statistical Yearbook 1984*, p. 193f.
36. SOE-COE alliances have always been listed as joint operation enterprises. All other forms of alliances now enter the sub-category "other joint operation enterprises"; the establishment of public-private enterprise alliances in the form of joint operation enterprises is no longer permitted. Relatively detailed accounting data on joint operation enterprises are available in the *Census 1985*, Vol. 3, the *Industrial Yearbook* of 1994, 1995, and 1998 (*Industrial Yearbook 1994*, pp. 99–101; *Industrial Yearbook 1995*, pp. 91–93; *Industrial Yearbook 1998*, pp. 115–17), and *Census 1995 Summary*, pp. 3–23.
37. Although the *Company Law* did not take effect until 1 July 1994, some SOEs had taken part in pilot programs on ownership restructuring according to rules similar to those finalized in the law. See Wang (ed.) (Note 34), pp. 95–98; National Bureau of Statistics and Industrial and Commercial Administration, "Guanyu jingji leixing huafen de zanxing guiding" (Temporary Regulation on Economic Classification), 30 December 1992, in China Infobank at http://www.chinainfobank.com. State-controlled shareholding companies usually

come into existence when a former SOE changes its organizational form into a shareholding company.

38. The *Statistical Yearbook 1998* with 1997 data on EIAS confusingly includes the solely (100%) state-owned limited liability companies in the listed sub-category "state-controlled shareholding companies," a reference category only, but not in the main category "shareholding companies" (since solely state-owned limited liability companies are already included in the category SOEs). This leads to the odd result that the values of economic variables of the sub-category "state-controlled shareholding companies" exceed the values of the same economic variables of the main category "shareholding companies." (*Statistical Yearbook 1998*, pp. 444–47)
39. See National Bureau of Statistics, "Guanyu yinfa 'guanyu tongjishang huafen jingji chengfen de guiding' de tongzhi" (Circular on Publishing the Regulation on the Statistical Categorization of Economic Activity), 1998 (obtained through correspondence with NBS). In its 11th (November) issue of 1998 (pp. 5–8), the publicly circulated periodical *Zhongguo tongji* reproduces the complete content of this regulation almost verbatim. *Zhongguo tongji*, No. 2 (1999), p. 20, and No. 3 (1999), p. 17, contain additional explanations. Local statistical departments continue to collect and report to the NBS data using the registration-based classification. They also separately provide additional provincial statistics applying the proportional allocation rule.
40. *Statistical Yearbook 1999*, p. 423.
41. The sum of all enterprise categories continues to exceed the total GOVI in the years 1998 and 1999, implying continued double-counting of the state's share in enterprises with some, but less than 100% state ownership. Such double counting appears to occur also in the EIAS statistics, but the magnitude cannot be ascertained because not all enterprise categories included in the total are listed (and thus a residual exists). One further complication since 1998 is that the total GOVI (and the gross output value of the sub-categories of enterprises in the statistics on all industrial enterprises) no longer covers the industrial units with dependent accounting system under non-industrial enterprises, as noted above.
42. If the "representative" firm in each enterprise category had the same characteristics following the new classification and coverage as following the old classification and coverage, then most economic analysis would still be feasible. Since no data following both approaches are available for the same time period (except the gross output value of all SOEs in 1996 and 1997), it is impossible to ensure that the representative firms are indeed identical. A further complication in the case of the SOEs is that the retrospectively revised 1996 and 1997 gross output value data probably still include the industrial units with dependent accounting system under non-industrial SOEs, whereas the data since 1998 do not.

43. *Labour Yearbook 1998* (p. 230) reports the total number of "off-post" employees in "state-owned units," "urban collective units," and "other ownership units" in urban areas in 1997; no detailed figures are provided on the industrial sector. The number of staff and workers in SOEs fell by 32.65% between 1997 and 1998, the number of staff and workers in COEs by 39.56% (*Statistical Yearbook 1999*, p. 423). On the switch to reporting on-post labourers only see the *Statistical Yearbook 1999*, p. 177.
44. Employees of COE-COE joint operation enterprises have also been counted as employees of COEs instead of joint operation enterprises (communication with NBS).
45. The *Statistical Yearbook 2000* for the first time provides information on the combined size of staff and workers in both SOEs and state-controlled shareholding companies, across the whole economy (*Statistical Yearbook 2000*, p. 152). The 1999 year-end figure of 58.27m contrasts with the total number of staff and workers reported for SOEs (including non-industrial ones) of 47.33m (*Statistical Yearbook 2000*, p. 124). The difference between the two figures reflects the fact that the labour statistics section of the *Statistical Yearbook* (and the *Labour Yearbook*, which contains the same series) has consistently excluded from the employment figures for (industrial) SOEs the staff and workers in shareholding companies with state interest.
46. All data are in current prices. For some of the intricacies of deflating output and intermediate input data see, for example, Woo et al., "How Successful Has Chinese Enterprise Reform Been?" or Jefferson et al., "Growth and Productivity Change." Harry X. Wu, "China's GDP Level and Growth Performance: Alternative Estimates and the Implications," *Review of Income and Wealth*, Vol. 46, No. 4 (December 2000), pp. 475–99, includes a critical review.
47. See the definition of GOVI in the *Statistical Yearbook 1985*, p. 665; the actual GOVI table has no note to the effect that village COE's gross output value is included in 1984 GOVI. In 1985, the relevant GOVI table carries such a note (*Statistical Yearbook 1986*, p. 282).
48. For the gross output value of IOEs see the *Statistical Yearbook 1984*, p. 194; that these IOEs are only "urban" IOEs is apparent from the *Statistical Yearbook 1987*, p. 257, where the historical data were explicitly labelled "urban." Judging from the historical data published in the *Statistical Yearbook* 1984, p. 194, and the *Statistical Yearbook 1983*, p. 215, prior to 1983 the gross output value of urban IOEs was included in a residual enterprise category. Rural IOEs are not explicitly mentioned in gross output value tables or tables with the number of enterprises before the *Statistical Yearbook 1988*, pp. 301 and 310, which also published data for 1985 and 1986.
49. Until 1988, GOVI data for the 1980s was reported in 1980 prices. The *Statistical Yearbook 1989*, p. 265, for the first time offered historical GOVI data in current year prices. The 1980 value of GOVI for all industrial

enterprises exceeded the 1980 value of GOVI published in earlier issues of the *Statistical Yearbook* by 3.25%. With no explanation offered, these time series data, which are also reported in all more recent issues of the *Statistical Yearbook*, are presumably adjusted to include village COEs and rural IOEs in the years prior to 1984. For the percentage data in the text, see the *Statistical Yearbook 1988*, p. 310. A separate category of "rural joint enterprises" (*nongcun hezuo jingying qiye*) accounted for a further 1.56% of aggregate GOVI in 1985; it may have been treated like village COEs in previous years. Detailed data on village COEs and rural IOEs are since 1988 (with 1987 data) available in the *Township Enterprise Yearbook*.

50. On the use of these exaggerated GOVI data in the calculation of total factor productivity of TVEs see, for example, Christopher S. P. Tong, "Total Factor Productivity Growth and Its Spatial Disparity Across China's Township and Village Enterprises," *Journal of Contemporary China*, Vol. 10, No. 26 (2001), pp. 155–72. Jefferson et al., "Ownership," p. 790, note the revisions but appear to continue with the un-revised data, presumably because no revised data for EIAS are available (neither for gross output value nor for any other variable, such as intermediate outputs, which are needed for the analysis). Calculation of ownership shares in total industrial output is also affected by the retrospective revisions. On omissions in this respect, see, for example, Joseph C. H. Chai, *China: Transition to a Market Economy* (Oxford: Clarendon Press, 1997), p. 179; Xu Chenggang and Zhuang Juzhong, "Why China Grew: The Role of Decentralization," in *Emerging from Communism: Lessons from Russia, China, and Eastern Europe*, edited by Peter Boone, Stanislaw Gomulka, and Richard Layard (Cambridge, MA: The MIT Press, 1998), pp. 183–212 (in particular p. 199).
51. *Statistical Yearbook 1996*, p. 403, *Statistical Yearbook 1997*, p. 413, *Statistical Yearbook 1998*, p. 433, *Statistical Yearbook 1999*, p. 423, and *Statistical Yearbook 2000*, p. 409, provide the corrected data for 1991 through 1994 without saying so. *Statistical Yearbook 1996*, p. 405, *Statistical Yearbook 1997*, p. 415, and *Statistical Yearbook 1998*, p. 435, at the same time in separate tables revert to the old data without making this explicit.
52. The re-definition is spelt out in the *Census 1995 Summary*, p. 1, and, in further detail, in NBS, *Zhongguo guonei shengchan zhongzhi*, p. 33. The four changes are as follows: (i) All raw materials mined and processed by the enterprise itself, independent of the complexity of the processing work, are to be included in GOVI at their full price. (Previously, some goods which were produced with raw materials processed by the enterprise itself were valued only at the production cost of the final product.) (ii) All processing of materials supplied by others (most likely imported from abroad) is to be counted towards GOVI at the processing fee charged and entered into the financial accounts. (Previously, for some goods produced with materials supplied by others the

full price was used.) (iii) The value of the change in self-produced semi-finished products and products in processing over the relevant period of time is to be included in GOVI if the change affects the production cost accounts. (This revises the old distinction according to which the value was to be included in GOVI only if the production process exceeds 6 months.) (iv) GOVI is calculated according to the product price excluding the value-added tax. (Previously, GOVI included the value-added tax). The *Census 1995*, p. 47, reports gross output value of EIAS in 1995 according to both the old and the new definition, and GOVI of all industrial enterprises (p. 1). 1995 GOVI of all industrial enterprises (including the individual ownership categories) following the old method of calculation is also reported in the *Statistical Yearbook 1996*, p. 403. 1995 GOVI data following the new method of calculation are available in the *Statistical Yearbook 1997*, p. 413, as well as in all subsequent statistical yearbooks through 2000. For all years since 1996 (*Statistical Yearbook 1997*), the corresponding as well as subsequent statistical yearbooks only provide GOVI data following the new method of calculation.

53. James Laurenceson and J.C.H. Chai, "The Economic Performance of China's State-owned Industrial Enterprises," *Journal of Contemporary China*, Vol. 9, No. 23 (2000), pp. 21–39, for example, appear unaware of the re-definition of gross output value and simply use the 1996 SOE data published in the *Statistical Yearbook 1997* together with the SOE data of earlier years published in the corresponding yearbooks. Jefferson et al., "Ownership," adjust the gross output value for the most recent year in their study, 1996, using the 1995 ratio of gross output value measured using the old vs. the new method (p. 811).
54. *Industrial Yearbook* 1993, p. 142.
55. For the first data in the *Statistical Yearbook* see *Statistical Yearbook 1988*, p. 318. The special statistical compendium is National Bureau of Statistics, *Gaige kaifang shiqi nian de Zhongguo diqu jingji* (China's Regional Economy in Seventeen Years of Reform) (Beijing: Zhongguo tongji chubanshe, 1996), p. 146. National Bureau of Statistics, *Xin Zhongguo wushinian tongji ziliao huibian* (Statistical Compendium of New China's Fifty Years) (Beijing: Zhongguo tongji chubanshe, 1999), offers GOVI data for 1952–1998 on all industrial enterprises, including for the sub-categories state-owned as well as collective-owned, but not on EIAS.
56. Furthermore, GOVI data until 1994 presented in *Seventeen Years of Reform* follow the old definition of GOVI, while 1995 data follow the new definition, without this being made explicit.
57. The *Statistical Yearbook 2000*, p. 47, states that historical data were corrected following the 1995 industrial census, but the actual data do not bear this out for industrial value-added. Total industrial value-added as reported in the *Statistical Yearbook 2000*, p. 47, for all earlier years is no different from total industrial value-added reported for 1993 through 1995 (as well as for earlier

years) in the corresponding annual yearbooks (*Statistical Yearbook 1994* through *Statistical Yearbook 1996*). If the corrections to the GOVI statistics in the years 1991 through 1994 were to have arisen from village COEs and IOEs only (which cannot be determined, as aggregate data of all collective-owned enterprises were revised), then the statistics of all EIAS are not affected. If the revisions had been solely due to a new evaluation of intermediate goods consumed in the process of production, total value-added would likewise not be affected.

58. Prior to 1995, the change in self-produced semi-finished products and goods in production over the reporting period was only included in GOVI if the production process exceeded six months. Since 1995 any such change has been included in GOVI as long as the production cost accounts are affected. This change in GOVI leads to a similar change in value-added, but the NBS deems it of minor importance (NBS, *Zhongguo guonei shengchan zhongzhi*, p. 36); the official statistics carry no note explaining the statistical break. The other items in the re-definition of GOVI (note 52) have no impact on value-added. The first two items concern prices of items that are included in GOVI as well as in intermediate inputs, and thus drop out in the calculation of value-added; the fourth item, the value-added tax, is now added separately.
59. See *Statistical Yearbook 1987*, p. 50, which carries a note that village COEs and rural IOEs are included in the national income data. The industrial net material product values in this table for the years 1971 through 1985 are higher than those published in earlier issues of the *Statistical Yearbook*, which presumably means that village COEs (and rural IOEs, as far as they existed), were retrospectively included.
60. For many purposes, the number of labourers may not even be good enough for productivity analysis. For example, the length of the work week was reduced from 48 hours per week to 44 hours per week on 1 March 1994, and further to 40 hours on 25 March 1995. (Jefferson et al., "Ownership," p. 809).
61. NBS, "Tongjishang huafen jingji chengfen," does not provide for adjustment of labour statistics, in contrast to the proportional adjustment it applies to all other aggregate economic indicators.
62. Communication with NBS.
63. None of the data sources provide any information on how many days per year labourers must be employed to be included in the employment statistics. According to one of the anonymous referees, a NBS document exists that defines an employed person as "one who had worked at least one hour during the time of the survey." Census data may be more likely to include such temporary labourers than employment data based on annual enterprise report forms or estimates by local statistical bureau staff. Much of the discrepancy is likely to arise in the IOE category. For example, the 1985 workforce of urban IOEs reported in the first series is only equivalent to 41% of that reported in the

Census 1985 (*Labour Yearbook 1999*, p. 24; *Census 1985*, Vol. 3, p. 6). The data on self-employed persons were derived on the basis of surveys during the censuses, whereas such data in other years were derived primarily based on estimates.

64. On the definition see the *Labour Yearbook 1999*, p. 699, or the *Industrial Yearbook*. The *Industrial Yearbook* (incorrectly) labels the statistics on the workforce of all EIAS *at* and above the township level as those on "staff and workers" of such enterprises (e.g., *Industrial Yearbook 1998*, p. 81).
65. In the *Industrial Yearbook* (e.g., p. 20 of the 1998 issue), however, such statistics are defined as those on staff and workers of all EIAS at and above the township level, implying (incorrectly) that township enterprise employees are included as well.
66. Edward S. Steinfeld, *Forging Reform in China: The Fate of State-owned Industry* (New York: Cambridge University Press, 1998), pp. 16f. The sixth series' data reported in Table 6 are taken from the 2000 *Statistical Yearbook* (*Statistical Yearbook 2000*, p. 118). The actual figures — but not the category titles — differ for the years 1989 through 1995 from Steinfeld's data obtained from the *Statistical Yearbook 1996*.
67. Jeffrey D. Sachs and Wing-Thye Woo, "Understanding China's Economic Performance," *The National Bureau of Economic Research Working Paper Series*, No. 5935 (1996), Table 6.
68. Just how problematic they are may be seen from the following example. The official statistics show an astounding improvement in SOE labour productivity (value-added per staff and worker) between 1997 and 1998. Value-added per (average annual) labourer in industrial SOEs with independent accounting system in 1997 of RMB23,609 (*Industrial Yearbook 1998*, pp. 85 and 89) compares to value-added per (year-end) labourer in industrial SOEs of RMB40,709 in 1998 (*Statistical Yearbook 1999*, pp. 408 and 432). Apart from the change in the coverage of labourers from average annual number of labourers to year-end number of labourers, this increase has three different causes: (i) the new exclusion from the 1998 employment data of labourers no longer actually working in industrial enterprises but still nominally counted as industrial employees; (ii) the new treatment of value-added but not of employment of various enterprises in which the state has a less than 100% stake; and (iii) the actual increase in value-added per labourer due to technological, organizational, skill or other improvements.