

## **The Impact of Competition and Labor Remuneration on Profitability in China's Industrial State-owned Enterprises**

[Suggested running title: SOE Profitability]

### Abstract

China's industrial state-owned enterprises (SOEs) have seen a secular decline in profitability throughout the reform period. Barry Naughton argues that this decline was in large part due to a decline in monopoly rents as competition with enterprises in other ownership forms increased. Fan Gang and Woo Wing-Thye, on the other hand, contend that profitability declined across all sectors independent of the degree of competition, and that excessive labor remuneration accounts for the broad decline in SOE profitability. Testing the two hypotheses with aggregate sectoral and provincial data from the mid-1980s to the late 1990s, none appears convincing. Yet at closer inspection these are not competing hypotheses. The two causes affect overall profitability through different channels. Competition and labor remuneration have a highly significant impact on intermediate profitability measures that take the two channels into account separately. Together they explain most of the variation in overall profitability.

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October 2000

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## Introduction

China's industrial state-owned enterprises (SOEs) have come to be viewed as highly loss-making and no longer economically viable. Various profitability measures paint a dismal picture of the finances of industrial SOEs. For example, losses of loss-making enterprises rose twenty-fold between 1978 and 1997, while gross profit (profit net of losses) in the same period fell by 16%.<sup>1</sup>

The secular decline in industrial SOE profitability has prompted two competing explanations. Barry Naughton argues that a reduction in barriers to entry has led to a reduction in SOE monopoly rents.<sup>2</sup> Thus he finds that while, overall, profit rates declined by 8.4% between 1980 and 1989, this average decline is due solely to a decline in profitability in the sectors which initially had above-average profit rates.<sup>3</sup> But these are also the sectors with lowest barriers to entry. Competition in those sectors where allowed and feasible thus is eroding monopoly profits, leading to a convergence of profit rates across all sectors.<sup>4</sup> Barry Naughton's view is echoed by Gary H. Jefferson and Thomas G. Rawski: "our own calculations show that profitability within the state industry is lowest in provinces where the output of non-state industry has grown most rapidly."<sup>5</sup>

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<sup>1</sup> See *Zhongguo tongji nianjian 1998 [China Statistical Yearbook 1998]* (Beijing: Zhongguo Tongji Chubanshe, 1998), p. 461. "Profit" (*lirun*) equals (gross) profit of profitable enterprises minus losses of loss-making enterprises.

<sup>2</sup> See Barry Naughton, 'Implications of the State Monopoly Over Industry and Its Relaxation', *Modern China* 18(1), (January 1992), pp. 14-41.

<sup>3</sup> Barry Naughton defines profitability as total profit and taxes, divided by total capital, where total capital equals "net fixed capital and working capital" (note 5).

<sup>4</sup> An auxiliary hypothesis is that profit rates in the non-SOE sectors, taken to be rural industries, should initially be high as these enterprises enter high-profit sectors that were formerly closed to them, but that competition would then drive down their profitability, too. Barry Naughton finds that the data also confirm this hypothesis. Barry Naughton repeats and further elaborates on the overall argument of profit rate convergence in Barry Naughton, *Growing Out of the Plan: Chinese Economic Reform, 1978-1993* (Cambridge: Cambridge University Press, 1995), pp. 235-40.

<sup>5</sup> See p. 60 of Gary H. Jefferson and Thomas G. Rawski, 'Enterprise Reform in Chinese Industry', *Journal of Economic Perspectives* 8(2), (Spring 1994), pp. 47-70. For the calculations also see Gary H. Jefferson and Thomas G. Rawski, 'How Industrial Reform Worked in China: The Role of Innovation, Competition, and Property Rights', in Michael Bruno and Boris Pleskovic, *Proceedings of the World Bank Annual Conference on Development Economics 1994* (Washington, D.C.: The World Bank, 1995), pp. 129-56.

Fan Gang and Woo Wing-Thye, as well as later Huang Yiping and Ron Duncan deny that competition is the cause of the decline in SOE profitability.<sup>6</sup> Fan Gang and Woo Wing-Thye present nationwide SOE profit rate and market share data for 27 sectors in 1989 and 1992 to argue that the collapse of SOE profitability occurred across all branches of industry independent of the degree of entry by non-SOEs. They show that in four of the five cases where the SOE market share was unchanged, the profit rates were lower in 1992. A regression of the change in the profit rate on the change in the market share yields an insignificant relationship. Barry Naughton's conclusion thus appears to not hold for the years 1989 through 1992. Huang Yiping and Ron Duncan use annual data from a survey of 421 selected SOEs in four sectors over the years 1980 through 1994 to regress total profit on twenty explanatory variables, several of which measure policy changes, such as the implementation of the manager responsibility system.<sup>7</sup> From the fact that almost none of the policy variables has a significant positive impact on profit, the authors conclude that their "study strongly rejects the popular argument that the worsening financial performance of China's SOEs during the reform period was mainly due to increased competition."

Fan Gang and Woo Wing-Thye as well as Jeffrey D. Sachs and Woo Wing-Thye propose excessive labor remuneration as alternative explanation for the 'disappearing profits.'<sup>8</sup> Using the

<sup>6</sup> See Fan Gang and Woo Wing-Thye, 'State Enterprise Reform as a Source of Macroeconomic Instability: The Case of China,' *Asian Economic Journal* 10(3), (1996), pp. 207-24; Huang Yiping and Ron Duncan, 'Did Competition Drive Down the Profitability of China's State-owned Enterprises?', *MOCT-MOST*9(1), (1999), pp. 49-60.

<sup>7</sup> Huang Yiping and Ron Duncan report that the survey they use was conducted by the Institute of Economics, Chinese Academy of Social Sciences, and covers about 800 enterprises, more than 600 of which had data points for each year of the period. Of these 600 enterprises, the 421 enterprises in the four sectors food processing, textiles, building materials, and machinery and electronics (out of 40 sectors in the official categorization of industries) were chosen. It is not stated whether the survey is a random sample, what the regional distribution of the enterprises is, and how the sectoral distribution was obtained.

<sup>8</sup> For the latter see Jeffrey D. Sachs and Woo Wing-Thye, 'Understanding China's Economic Performance,' *NBER Working Paper* 5935 (February 1997). Athar Hussain and Nicholas H. Stern, 'Comment on "How Industrial Reform Worked in China: The Role of Innovation, Competition, and Property Rights" by Gary H. Jefferson and Thomas G. Rawski', in Michael Bruno and Boris Pleskovic, *Proceedings of the World Bank Annual Conference on Development Economics 1994* (Washington, D.C.: The World Bank, 1995), pp. 156-62, commenting on the competition hypothesis explored by Gary H. Jefferson and Thomas G. Rawski, 'How Industrial Reform Worked', also suggest that a relative rise in the share of labor remuneration in value-added may be a competing explanation for the fall in profitability. The relative rise in labor remuneration appears characteristic for all transition economies.

aggregate of 300 large and medium-sized sample state enterprises for each of the years 1984 through 1988, Fan Gang and Woo Wing-Thye show that direct income rose faster than net output value in all years.<sup>9</sup> The same is true for indirect income; between 1984 and 1988, welfare funds increased by 240%, non-production expenditures (presumably enterprise consumption) by 234%, and net management costs by 165%, all exceeding the overall growth of net output value.<sup>10</sup> Yet none of these studies tests its hypothesis in a multivariate setting that controls for changes in other variables, including in the variable that according to the competing hypothesis matters.

This paper re-examines the impact of competition and labor remuneration on industrial SOE profitability since the mid-1980s. The data show that by itself, none of the two hypotheses is convincing. Yet a more detailed consideration of what constitutes “profitability” suggests that Barry Naughton’s and Fan Gang and Woo Wing-Thye’s hypotheses are not so much competing with each other as complementary. Each of the two causes affects overall profitability through a different channel. Competition and labor remuneration have a highly significant impact on intermediate profitability measures that take each channel into account separately. Once both hypotheses are allowed to cooperate, competition as well as labor remuneration have highly significant explanatory power for the decrease in the overall profitability of industrial SOEs.

The following section discusses the data and different measures of profitability. The third section argues that competition and labor remuneration are not competing hypotheses but two causes that impact on profitability through two separate channels. The fourth and fifth section investigate each of the

The adjective “excessive” in “excessive labor remuneration” is introduced by Fan Gang and Woo Wing-Thye on grounds that labor remuneration rose faster than net output. Another definition of “excessive” would be that labor remuneration exceeded the marginal product of labor, an altogether different issue.

<sup>9</sup> No further information on this survey is available. The survey is reported to also cover the year 1989, but the 1989 data are not used.

<sup>10</sup> The argument as presented remains one of plausibility, bare of statistical tests. Thus no correlation coefficients are calculated to further explore the relationship between profitability and direct income growth across the 300 enterprises. Neither do the authors question whether any rise in labor remuneration does not reflect a gradual move towards equalization of labor remuneration and the value of the marginal labor product. If labor remuneration had been below its marginal product value in pre-reform years, then profit in the pre-reform period was artificially inflated as it exceeded a competitive market return on equity.

two hypotheses separately, looking at both the direct impact on overall profitability as well as the impact on intermediate measures of profitability specific to each channel. When the two arguments are allowed to co-operate, they explain most of the variation in overall profitability (sixth section). The last section concludes.

## Data

All data are sectoral, provincial or nationwide official aggregate data on industrial SOEs with independent accounting system, i.e., do not include the small share of industrial SOEs with dependent accounting system and other non-enterprise industrial state-owned units, for which no detailed data are available.<sup>11</sup> When comparisons are drawn to enterprises in other forms of ownership, these, similarly, include only enterprises with independent accounting system.<sup>12</sup> (Only for provinces, and only for the variable Gross Output Value of Industry (GOVI), are data on truly all enterprises, comprising different

<sup>11</sup> A comparison between industrial SOEs with independent accounting system and all industrial SOEs is feasible based on Gross Output Value of Industry (GOVI). In 1978, industrial SOEs with independent accounting system produced 96.44% of the gross output value of all industrial state-owned units, in 1997, 95.97%; this share was constant at 96% to 97% in the two decades in between. (Calculated from *Gaige kaifang shiqi nian de zhongguo diqu jingji* [17 Years of Reform and Opening in China's Regional Economy] (Beijing: Zhongguo Tongji Chubanshe, 1996), p. 146; *Zhongguo tongji nianjian 1998*, pp. 435 and 454; *Zhongguo tongji nianjian 1997*, p. 413.) The limitation to industrial SOEs with independent accounting system is common practice in the literature. See, for example, Gary H. Jefferson and Thomas G. Rawski, 'Enterprise Reform in Chinese Industry', or Nicholas R. Lardy, *China's Unfinished Economic Revolution* (Washington, D.C.: Brookings Institution Press, 1998).

<sup>12</sup> The data on these enterprises in other ownership forms cover those enterprises located on township tier and above. All SOEs are, by definition, located on county tier and above.

For comparison, in 1979, the first year for which data are available, industrial SOEs accounted for 81.88% of the gross output value of all industrial enterprises with independent accounting system on township tier and above. In 1997, this share was 40.76%. All industrial enterprises with independent accounting system accounted for 91.94% of GOVI in 1979; this share dropped continuously to 59.79% in 1995, and rose again slightly to 60.10% in 1997. (Calculated from *Gaige kaifang*, p. 146; *Zhongguo tongji nianjian 1992*, p. 406; and *Zhongguo tongji nianjian 1998*, pp. 433 and 444.)

ownership sub-categories, available.) Sectoral and provincial data for most variables are available since 1986. Due to a major statistical break in the most recent data, for 1998, the analysis ends in 1997.<sup>13</sup>

The most common profitability measure in the literature is profit and taxes per current and net fixed assets.<sup>14</sup> This indicator is unsuited for two reasons. First, it compares apples to pears. Profit is the return to equity holders, *not* the return on debt (liabilities). Yet the sum of current and net fixed assets is approximately equal to total assets, which in turn are by definition equal to equity *plus* debt. If the denominator is total assets, then the numerator must be profit *plus* financial charges. Profit is the return to equity holders (on net worth), financial charges are the return on debt; profit plus financial charges are the return to equity and debt holders, i.e., the return on total assets.

Second, this profitability indicator reflects more than just economic performance. If the government changes the rates of circulating taxes, such as the value-added tax, the value of the profitability measure “profit plus taxes” changes. Thus if the government triples the rate of value-added taxes, “profitability” rises drastically. Yet a meaningful measure of profit should not be a function of tax rates. The proper numerator is profit (*lirun*), which by definition includes income taxes only. Thus changes in income tax rates, correctly, do not affect profit. Neither, correctly, do changes in circulating taxes.

Furthermore, Barry Naughton as well as Fan Gang and Woo Wing-Thye view the official indicator “profit and taxes relative to funds” (*zijin lishui lu*) as measuring “profit plus taxes per current and net fixed assets” (or, equivalently, “profit plus taxes per working capital and net fixed assets”), which before 1992 it is not; a severe statistical break then occurs between 1991 and 1992.<sup>15</sup> Before 1992, net fixed

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<sup>13</sup> Up to and including 1997, data on industrial SOEs excluded both state-controlled share-holding companies as well as industrial SOEs with dependent accounting system and other non-enterprise industrial state-owned units; since 1998 these are all included. Likewise, while the detailed official pre-1998 data on all industrial enterprises covered all industrial enterprises with independent accounting system on township tier and above, 1998 data, in contrast, cover all industrial SOEs plus all other industrial enterprises with annual sales volume above 5m yuan. (Share-holding companies were always included in all industrial enterprises with independent accounting system.)

<sup>14</sup> See, for example, Barry Naughton, ‘Implications of the State Monopoly’, Gary H. Jefferson and Thomas G. Rawski, ‘How Industrial Reform Worked’, or Fan Gang and Woo Wing-Thye, ‘State Enterprise Reform’.

<sup>15</sup> The values of the “profit rate” used in both papers are identical to the official “profit and taxes relative to funds” in the *Zhongguo tongji nianjian* of the corresponding years.

assets were measured at year-end values, since then at average annual values. Before 1992, current assets (or working capital) were measured as average annual *fixed-quota* working capital (about half of all working capital, or current assets), since then as average annual *total* working capital.<sup>16</sup>

The most appropriate profitability measure is simply profit per equity, measuring the return obtained by the owners of the firm. Profit is the gross profit of profitable enterprises minus the losses of loss-making enterprises. Profit per equity can be calculated for the years since 1993 (equity data are only available for the years since 1993).<sup>17</sup>

Since profit per equity can only be calculated for the years since 1993, a second indicator is needed for earlier years. This second indicator is losses of loss-making enterprises relative to profit of profitable enterprises, i.e., losses per gross profit. While profit per equity focuses on the return to the corresponding source of funds, losses per gross profit splits profit into its two sub-categories and standardizes one by the other. It is an extremely sensitive measure of profitability across an aggregate industrial sector; if profit of both loss-making and profitable enterprises decreases, the numerator rises and the denominator falls, yielding a sharp increase in the indicator. Loss data are available for the years 1986 through 1991 and 1995; 1995 data are from the 1995 industrial census with a sectoral classification that differs from that used in the earlier years.<sup>18</sup>

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<sup>16</sup> The statistical break in 1992 does not affect Barry Naughton's conclusions as all his data are pre-1992. Fan Gang and Woo Wing-Thye ignore the statistical break and directly compare the official data of 1989 and 1992. With 1992 data being based on an approximately one third larger denominator, "profit rates" obviously must decline. Fan Gang and Woo Wing-Thye's rejection of the competition hypothesis based on such facts as that in four out of five cases where the SOE market share was unchanged between 1989 and 1992, the "profit rates" were lower in 1992, thus is questionable.

<sup>17</sup> An equally valid indicator is profit plus financial charges per total assets. In this case the denominator comprises all sources of funds, and the numerator the absolute return on all sources of funds, i.e., the return to equity holders as well as the return to liability holders. Asset data are available since 1993, but sectoral and regional data on financial charges are only available for 1995.

<sup>18</sup> Up to 1992, SOE data on 30 industrial sectors are available (but no loss data in 1992), since 1993 on 39 industrial sectors, and in the 1995 industrial census (for 1995) on 37 industrial sectors; the sectoral classification up to vs. after 1992 match only in part. (For the *Industrial Census 1995* data see *Zhonghua renmin gongheguo 1995 nian di san ci quanguo gongye pucha ziliao huibian* [*The data on the third national census of the People's Republic of China in 1995*] (Beijing: Zhongguo Tongji Chubanshe, 1997), three volumes.) The 37 industrial sectors covered in the 1995 industrial census in terms of value-added accounted for 99.26% of the nationwide SOE total. The 39 industrial sectors covered in the statistical yearbooks (*Zhongguo tongji nianjian*) for the years since 1993, in 1995 accounted for

## **Competition and Excessive Labor Remuneration Are Not Competing Hypotheses**

According to the competition hypothesis, monopoly rents in industrial SOEs are being eroded as the economy is being liberalized and enterprises in other ownership forms begin to compete with SOEs. In contrast, the excessive labor remuneration hypothesis claims that profit in SOEs is being eroded due to excessive labor remuneration. Yet the two causes affect the profit rate through different channels and can therefore be intercepted by different intermediate profitability measures.

The competition hypothesis comes first. An aggregate industry in a perfectly competitive economy exhibits constant returns to scale due to free entry; an existing firm can always be replicated. In the absence of significant technological progress this implies a constant ratio of output per capital, or value-added per total assets. If the industry is not perfectly competitive but enjoys a monopoly position, new entry is likely to erode sales prices. But a decline in sales prices correspondingly reduces value-added, while total assets, at least in the short run, remain unchanged or do not fall by as much as value-added.<sup>19</sup>

In the long run, as competition continues to erode monopoly rents, firms could choose not to respond to the competitive pressure and produce the same volume of physical output (at lower sales value) with the same volume of assets. Value-added per assets falls. Or the decrease in prices to equal minimum average costs could go hand in hand with an expansion of capacity and output. While the increase in fixed assets (capacity expansion) may occur at newly competitive prices in the industry

99.40% of total industrial SOE value-added. (The two additional industrial sectors are “other mineral mining and processing” and “other manufacturing.”) If the 1995 sectoral classification is reduced to the 1986 sectoral classification, the sectors included in the old classification scheme accounted for 95.44% of total industrial SOE value-added in 1995.

<sup>19</sup> Looking at individual asset items, the value of the following items will not change when product prices change: accumulated inventories (budgeted at past production costs), accumulated accounts receivable, cash and current account deposits, and accumulated fixed assets. Newly incurred accounts receivable may change in accordance with price changes, and additions to inventories and fixed assets may reflect new prices, but these together account for only one quarter of all assets.



creating these producer goods, the previously accumulated fixed other assets would, given accounting practices, still be valued at their original price minus depreciation, as would be most other assets; *all* value-added, on the other hand, is valued at current, newly competitive prices. Value-added relative to assets again falls. Value-added per assets can thus serve as an intermediate profitability indicator measuring the impact of competition.

The labor remuneration hypothesis, on the other hand, reflects an issue of distribution. How is the given value-added, or net output (value-added net of depreciation) distributed between labor and capital? The labor share and capital share of value-added in the enterprise accounts add up to one, if the capital share is taken to include not only the return to equity (namely, profit) but also depreciation, indirect taxes and a few other items.<sup>20</sup> The direct antagonism between labor and profit recipients holds as long as depreciation, indirect taxes and these other items all claim a constant share of value-added. Profit per value-added can thus serve as an intermediate profitability indicator measuring the impact of distributive issues.

Fan Gang and Woo Wing-Thye's comparison of the rise in profit vs. labor remuneration, both relative to the rise in net output value, captures this distributive fight. Competition directly impacts on total net output (or value-added) available for distribution. The distributive fight is about how to split this net output value between labor and equity holders. The argument that excessive labor remuneration drives down profit need not rule out that competition is reducing monopoly rents by reducing the pie available for distribution in the first place.

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<sup>20</sup> Value-added consists of four components, labor remuneration (including wages and salaries, pensions, insurance and welfare payments), depreciation, indirect taxes, and the residual operating surplus. The operating surplus calculated as a residual of value-added is the most comprehensive measure of return on output (rather than return on funds); it can be linked to the accounting profit through a number of steps. Thus profit equals the operating surplus (i) minus subsidies for losses, (ii) plus labor remuneration out of profit, (iii) plus that share of other business profit that is not included in the enterprises' value-added, (iv) plus four types of administrative charges, (v) minus adjustments for imputations on inventories, (vi) plus investment returns, (vii) plus net non-business revenue; data on none of these items are available. For details on the derivation of this link see Carsten A. Holz, 'Long Live China's State-owned Enterprises: Deflating the Myth of Poor Financial Performance' (Working Paper, Cornell University and Hong Kong University of Science & Technology, 1999).

Competition can impact on the distributive fight if labor remuneration is largely exogenously given. A change in net output value (due to competition) could impact on the distribution of net output value if the quantity of labor employed and pure wages are independent of the output value; a reduction in output value while the wage bill remains constant squeezes the residual profit. But bonus payments and non-wage labor remuneration could be highly sensitive to the value of output and thus more than make up for rigid employment and wages.

Competition can also impact on the distributive fight via depreciation, which constitutes one of the competing claims on value-added. If the value of fixed assets as well as the depreciation rate were not to change over time, depreciation would be constant. A decrease in value-added per assets (due to increasing competition) then implies an increase in depreciation per value-added. But an increase in depreciation per value-added reduces the residual profit per value-added. The potential impact via depreciation on residual profit does not replace the excessive labor remuneration argument, rather, it completes the list of different competing claims on value-added.

Unless labor remuneration is independent of value-added or the share of depreciation in value-added changes significantly, the two channels through which competition and labor remuneration affect profit are distinct. A decline in profit per equity then can be caused by both a decline in monopoly rents as well as excessive labor remuneration. The following section looks at the impact of competition on different measures of profitability. The section thereafter focuses on the distributive fight. The two potential causes of the decline in profitability are then allowed to co-operate in explaining overall profitability.

### **Competition as Uni-causal Explanation of Profitability**

Barry Naughton posited that an increase in competition in those sectors where allowed and feasible invariably led to a reduction in profit rates, thus presumably reducing if not eliminating monopoly rents. Yet an alternative implication of competition could be that it encourages SOEs to improve their performance. Thus Thomas G. Rawski writing about SOE productivity notes that “the improved performance of Chinese industry is the result of increased competition and growing financial pressures that have accompanied a gradual and still incomplete shift from a planned economy to a market economy.”<sup>21</sup> SOEs may also not have earned monopoly profits to begin with. The traditional planning system did not equate marginal costs to marginal revenue when setting prices, but based its price calculations on average costs and the desired, a priori given surplus. Profit (surplus) thus was an industry-specific, discretionary variable.<sup>22</sup> The entry of new firms following industrial liberalization then could be accompanied by a rise in profitability from artificially depressed to sustainable industry-wide profitability levels.

Competition unquestionably increased. With the abandonment of production and distribution quotas in most sectors, SOEs became free to compete on the market. The past tendency towards local self-sufficiency, favored by a central planning apparatus that could handle no more than a few major enterprises and products, ensured that SOEs in different localities produced similar products. In the reform period, these SOEs began to compete with each other. Competition also came from the growing rural collective-owned sector, and by the early 1990s from a budding private sector. As import tariffs fell, foreign companies joined in.

#### *Relationship between market share and overall profitability (1986 vs. 1991 vs. 1995)*

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<sup>21</sup> See Thomas G. Rawski, ‘Chinese Industrial Reform: Accomplishments, Prospects, and Implications’, *American Economic Review* 84(2), (May 1994), pp. 271-5.

<sup>22</sup> See Cheng Chu-yuan, *China’s Economic Development: Growth and Structural Change* (Boulder, Colorado: Westview Press, 1982), Chapter 8. If average costs were equal to marginal costs, as is the case with a constant returns to scale technology, then a constant surplus relative to the value of output is equal to mark-up pricing.

If the growth of non-SOE industrial enterprises increases competition and thereby reduces SOE profitability, then the change in the market share of SOEs should be positively correlated with SOE profitability. Thus a decrease in the SOE market share in a particular industrial sector or a particular province should go hand in hand with a relative increase in losses per gross profit, the profitability measure that can be calculated for the years 1986 through 1991 as well as for 1995. Similarly, a decrease in the SOE market share should be positively correlated with a relative decrease in profit per equity, the profitability indicator available for the years since 1993.

The data at first sight confirm the hypothesis that competition erodes, rather than improves industrial SOE profitability. Scattergrams for 26 sectors (Figure 1) and 29 provinces<sup>23</sup> (Figure 2) show that a reduction in the share of SOEs with independent accounting system in Gross Industrial Output Value of Industry (GOVI) of all enterprises with independent accounting system between 1986 and 1995 in fact implied an increase in losses per gross profit. (Lacking value-added data for the years prior to 1991, GOVI is used to measure the market share. The choice of the years 1986 and 1995 reflects the desire to cover the longest time span possible given data availability.) The sectoral correlation coefficient of -0.6106 is significant at the 1% level, the regional correlation coefficient of -0.4036 at the 5% level.

Insert Figure 1 and Figure 2 about here

If the period is split into two sub-periods, 1986 through 1991, and 1991 through 1995, the signs of the correlation coefficients do not change, but in the sectoral analysis the significance of the relationship

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Monopoly pricing can be viewed as mark-up pricing only if the mark-up is a particular function of the elasticity of demand. Yet the size of the mark-up in a socialist economy is a political decision; the mark-up could even be negative.

<sup>23</sup> Independent data for Hainan Province are available beginning in 1988 only. For the years 1988 through 1991 and 1995, Hainan Province was therefore folded back into Guangdong Province (which it is part of in the 1986 and 1987 data).

Similarly, up to 1996 Chongqing Municipality is part of Sichuan Province. Since 1997, the Chongqing data in the official statistics are reported separately. In order to have a consistent time series, 1997 Chongqing data below were folded back into Sichuan Province.

disappears in the earlier period, and in the provincial analysis in both periods. Similarly, the relative change in SOE profit per equity between 1993 and 1997 is not significantly correlated with the relative change in the SOE value-added share either across sectors or provinces.

This suggests that the overall pattern evident in Figure 1 and Figure 2 requires further examination. Regressing the relative annual change in losses per gross profit against an intercept, year dummies, and the relative annual change in the SOE market share in the period 1987 through 1991 yields a largely insignificant relationship across sectors. The results for different measures of the market share are reported in Table 1. (The choice of dependent as well as independent variables is limited only by data availability.) The same insignificance is obtained independent of whether the regression is run with annual observations across all four years with year dummies, or individually for each year. Across provinces, results depend on the exact measure of the market share included in the particular regression, and tend to be significant for the years 1989 and 1990 with the correct sign; the lower the market share, the higher losses per gross profit.

Insert Table 1 about here

For the years after 1991 no loss data are available (except for 1995), and profitability is measured as profit per equity. Regressing the annual relative change in profitability against an intercept, year dummies, and the annual relative change in different measures of the market share yields no significant relationship across sectors, and for some measures of the market share a significant relationship across provinces. Competition by the 1990s thus has no clear-cut impact on SOE overall profitability, and in the period 1987 through 1991 the SOE market share only matters for SOE overall profitability in the

regional analysis of the years 1989 and 1990.<sup>24</sup> But overall profitability may not be the right measure for the impact of competition on enterprise financial performance.

### *Impact of competition on production return*

As argued above, if competition erodes monopoly profits, then it does so by lowering the price at which SOEs sell their goods. For a given volume of productive capacity, sales revenue and thereby value-added falls. A decrease in the market share of SOEs thus should yield a decrease in value-added per productive capacity. Indeed, between 1993 and 1997, the years for which the relevant data are available, an annual reduction in the market share implies a clear reduction in the value-added per total assets, both across regions and sectors. In other words, competition does have a tendency to lower sales prices and thus to eliminate monopoly rents. (See Table 2. The dependent variable and the market share are measured in growth rates in order not to allow a common trend to bias the results; the growth rates then cover the years 1994 through 1997.<sup>25</sup>)

Product prices are determined not only by supply factors (competition) but also by demand. The larger demand relative to supply, the higher the price, and therefore the larger the value a given amount

<sup>24</sup> Regression coefficients were also calculated for the annual relative change in the market share vs. the annual relative change in profitability within each individual sector (province) separately. For the years 1986 through 1991, SOE market share is measured in terms of GOVI of all industrial enterprises with independent accounting system on township tier and above in the particular sector (province); SOE profitability is measured as losses per gross profit. For the years 1993 through 1997 the market share is based on value-added, and the profitability indicator is profit per equity. Correlation coefficients across the years 1986 through 1991, and separately 1993 through 1997, are significant and of the correct sign in only a minority of all sectors (provinces), usually for about 10% of the sectors (provinces).

In the case of provinces, the market share can also be measured as the share of different ownership forms in truly all gross industrial output (GOVI) in the province, going beyond enterprises with independent accounting system on township tier and above. The market-share of individual-owned enterprises has a consistently negative impact on SOE profitability for about 1/3 of all provinces only in the 1980s, while the market share of collectively owned enterprises as well as of enterprises in other ownership forms has no clear correlation with SOE profitability ever. All the results reported in this footnote are similarly insignificant if the market share is lagged by one year.

<sup>25</sup> A second reason why the regression should be run in growth rates rather than absolute values is that different sectors have widely diverging ratios of value-added per assets due to *technological* differences. The same is true for provinces if their industrial structures differ. If the potential problem of a common time trend were ignored, a regression in levels thus should at least include sectoral/ provincial dummy variables. Running the sectoral as well as provincial regression in levels (with, as well as without sectoral/ provincial dummy variables) yields significant coefficients for the market share with the correct sign throughout.

of real output achieves on the market. The demand effect on value-added, however, could be negligible if high demand also implies higher material input prices. A provincial GDP deflator included in the provincial regression to capture province-specific demand pressure is significant (with the correct sign), but its exclusion does not change the impact or significance of the market share.<sup>26</sup> Sector-specific price deflators are not available.<sup>27</sup> Year dummies were included in the regression to capture overall business cycle effects.

Sectoral (provincial) dummies included to capture any sector- (or province-) specific effect of, among others, different demand behavior across sectors (provinces), are mostly insignificant and do not change the sign or significance of the market share; the results reported in Table 2 therefore are for regressions without sectoral (provincial) dummies. If the regressions are run for each year individually, the market share has a positive, significant effect on the intermediate profitability indicator across sectors and provinces in all years, except in the year 1996 across sectors.

No value-added data for industrial SOEs across sectors or provinces are available for the 1980s. But for the 1990s, both the regional and sectoral analysis show that competition is driving down monopoly rents. Competition since the early 1990s exerts this distinct downward pressure not directly on overall profitability, but on the intermediate profitability measure that pertains to the particular channel through which competition can affect profitability.

### **Alternative Argument: Excessive Labor Remuneration**

<sup>26</sup> The provincial GDP deflator could also reflect average province-wide competitive pressures rather than demand pressure. If so, the degree of province-wide competition not only has the correct sign but furthermore is not at all correlated with competitive pressures in the industrial sector. The conclusion then is that monopoly rents in industry are reduced not only due to competition in industry but also due to competition in all sectors of the provincial economy; this latter implication of the GDP deflator interpreted as measure of competitive forces appears less plausible than the interpretation as general demand measure.

<sup>27</sup> The ex-factory price index is available for 14 categories of products, but these categories do not easily match the industrial sectors. Including in the regression the ex-factory price index for those industrial sectors where there is somewhat of a match with the price categories yields an insignificant price coefficient.

Fan Gang and Woo Wing-Thye as well as Jeffrey D. Sachs and Woo Wing-Thye propose excessive labor remuneration as alternative explanation for the ‘disappearing profits.’ Based on survey data from 300 large and medium-sized state enterprises for the years 1984 through 1988, Fan Gang and Woo Wing-Thye show that in the aggregate, total income rose faster than net output value. Their focus thus is on issues of distribution; if the net output value (i.e., value-added net of depreciation) is used for excessive labor remuneration, the residual profit is reduced.

Fan Gang and Woo Wing-Thye consider income both in form of direct income (cash income) and indirect income (income in kind):

- direct income: basic wages and various bonuses
- indirect income:
  - (i) collective consumption (kindergartens, hospitals etc.),
  - (ii) distribution of private consumer goods at the common level (furniture, clothes, grain, etc.) and at the elite level (banquets, travel, cars, etc.), and
  - (iii) housing.

Collective consumption is paid for out of the welfare fund. Distribution of private consumer goods at the common level is charged to the profit and loss account as material cost and non-production expenditure, while elite consumption enters net management costs. Housing is considered an investment in non-productive fixed assets.

The inclusion of investment in non-productive fixed assets (housing) in labor remuneration for the purpose of showing the impact on profit per value-added is logically not permissible. Increases in investment in non-productive fixed assets (housing) are not a profit and loss account item and thus cannot reduce profit. Rather, investment is financed *through* profit (or borrowing, or a new capital injection) and enters the balance sheet as an asset as well as an increase in retained earnings (or in liabilities or equity).



In the following, Fan Gang and Woo Wing-Thye's hypothesis is tested using first nationwide, then provincial data. The available nationwide data include wages and salaries and the social insurance and welfare fund. Wages and salaries comprise all direct income (official wages and salaries, plus bonuses) as well as some income in kind (what Fan Gang and Woo Wing-Thye term consumption at the common level). Social insurance and welfare funds finance the various uses that Fan Gang and Woo Wing-Thye describe as collective consumption, plus pensions, which by 1997 accounted for the majority of all social and welfare payments.<sup>28</sup> Official data thus cover all of Fan Gang and Woo Wing-Thye's relevant items except "elite consumption," which is hidden in net management costs. The calculations here in addition consider pensions as well as social welfare and medical expenses for pensioners. Although investment in non-productive fixed assets cannot technically enter the profit and loss account, it is also considered.

Table 3 presents the correlation coefficients between industrial SOE profit per value-added and various measures of industrial SOE labor income per value-added for the period 1983 through 1997, using annual data.<sup>29</sup> Wages as well as the social insurance and welfare fund are negatively correlated with profit at the 1% significance level throughout. Fan Gang and Woo Wing-Thye's hypothesis thus is confirmed. The results also hold for three 5-year sub-periods that reflect distinct stages in China's economic transition. Non-productive investment as well as its sub-category housing investment are not

<sup>28</sup> The social insurance and welfare fund for pensioners comprises pensions, resignation allowances, medical care expenses, funeral expenses and pensions for the family of the deceased, transportation subsidies, and heating subsidies. For current staff, the social insurance and welfare fund comprises a medical care allowance, expenses for recreational, sports and publicity activities, subsidies to collective welfare undertakings (such as public bathrooms or barber shops), expenses for collective welfare facilities (such as the purchase of cooking utensils for canteens), and various other expenses.

In 1997, 67.87% of all state-owned units' (SOU) social and welfare payments were expended on retired and resigned persons; pensions alone accounted for 58.45%, up from 34.57% in 1980. (*Zhongguo tongji nianjian 1999*, p. 764; *Zhongguo tongji nianjian 1998*, pp. 795 and 797) These data are available for all SOUs only.

<sup>29</sup> 1983 is the first year for which nationwide value-added can be constructed (see notes to Table 3). Profit, wage and value-added data are for all industrial SOEs with independent accounting system, while all other data are for all industrial state-owned units (SOUs). The difference between industrial SOEs and industrial SOUs in terms of output is small, as pointed out in note 11. State-controlled share-holding companies are not included in the profit data before 1998. It is unlikely that the other variables include state-controlled share-holding companies; if they did, this would affect the years since 1994 only.

correlated with profit per value-added (except non-productive investment in the 1983-87 sub-period), as could be expected given that such expenditures do not reduce profit but reflect a use of profit. Absolute values rather than growth rates are used since profit and labor remuneration are both expressed as a share of value-added, which by definition is profit and labor remuneration plus depreciation, indirect taxes, and a few other items. Any trend is thus possible only within strict limits (shares cannot exceed 0 and 1).<sup>30</sup>

The significant relationship between profit per value-added and labor remuneration can also be confirmed using provincial wage and salary data. (See Table 4. Wages and salary data are the only type of provincial labor remuneration data available; sectoral data on labor remuneration are not available.) Wages and salaries per value-added have a highly significant negative impact on profit per value-added in the 1990s. This is true across all regions; year dummies, if included, are insignificant.

Insert Table 3 and Table 4 about here

But the distributive fight is not limited to labor remuneration. Depreciation may also play an important role in that profit is the residual of value-added after subtracting labor remuneration, depreciation, indirect taxes and a few other items. Fixed assets relative to value-added have increased over time, implying that depreciation per value-added increased. (Indirect taxes as share of value-added have remained constant over time, and no data are available on the other items.)

Lacking data on depreciation, it is assumed that the depreciation rate is constant. This implies that fixed assets are a constant multiple of depreciation. The share of depreciation in value-added then is proxied by the ratio of average annual fixed assets to value-added. Table 4 shows that adding fixed

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<sup>30</sup> If correlation coefficients are calculated for growth rates (i.e., growth rate of profit per value-added vs. growth rate of measure of labor remuneration per value-added), the negative correlation persists, but the significance disappears with only two exceptions. In growth rates, profit per value-added is significantly correlated with both non-

assets per value-added to the regression explains further variation in profit per value-added. The signs of the individual coefficients are correct (negative), and their significance level is high throughout. The sign and significance of the coefficient of labor remuneration remain unchanged.<sup>31</sup>

There is a possibility that labor remuneration in turn can be explained by competition; competition reduces the value-added to be distributed, and if labor remuneration is independent of value-added, the decrease in value-added together with the constant labor remuneration will *ceteris paribus* result in a decrease in profit per value-added. But the market share (measured as the SOE share in the value-added of industrial enterprises with independent accounting system) is not correlated with profit per value-added across provinces and years.<sup>32</sup> Neither does the market share exert any direct effect on profit per value-added when other variables are controlled for (second last column of Table 4).<sup>33</sup>

Fan Gang and Woo Wing-Thye view profit vs. labor remuneration as a distributive fight and then correctly measure this distributive fight via the share of profit in net output value (or value-added). But profit per value-added is an imperfect indicator of overall profitability. For example, if the rates of return on debt and equity were equal and constant, and the gearing ratio (liabilities to equity) increased while total assets (equal to liabilities plus equity) remained constant, then profit per equity would, correctly, remain unchanged. Yet profit per value-added declines. It declines because the higher volume of interest payments to creditors reduces value-added. And profit is the residual of value-added after subtracting labor remuneration, depreciation, indirect taxes and a few other items. If all the non-profit items in value-added stayed constant—and there is no reason why they should change in response to a change

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productive investment (5% significance level) and with wages plus social funds plus non-productive investment (10% significance level), but only in the period 1983 through 1987.

<sup>31</sup> As in the case of simple correlation coefficients (Table 3), regressions run in growth rates yield largely insignificant coefficients.

<sup>32</sup> The same lack of correlation is obtained if the two variables are measured in growth rates. The correlation coefficient between the market share and profit per value-added in levels across provinces in the years 1993 through 1997 is -0.1268; for the respective growth rates it is 0.1209. The market share is similarly uncorrelated with wages per value-added, both in levels and growth rates (-0.1261 and -0.1071).

<sup>33</sup> If no regional distinctions are made for any of the three independent variables (wages per value-added, fixed assets per value-added, and the SOE market share) in the last regression reported in Table 4, the residuals are very far

in the gearing ratio—then the residual profit falls exactly by the reduction in value-added, and it falls by relatively more than the denominator value-added (which is the reduced profit plus the sum of all other, unchanged items in value-added).

The impact of labor remuneration on overall profitability properly measured as profit per equity is ambiguous. Looking at simple correlation coefficients, profit per equity for the years 1993 through 1997 is not significantly correlated with the two variables for which 1993 through 1997 nationwide data are available, wages and salaries, and the social insurance and welfare fund. (See last column in Table 3.) Once profit per equity, on the other hand, is regressed across provinces on one item within labor remuneration, namely wages per value-added, and in addition on average annual fixed assets per value-added, the coefficients are of the correct (negative) sign and significant.<sup>34</sup> (See last column in Table 4; the sign and significance level of the coefficient of wages and salaries per value-added remain unchanged if fixed assets per value-added are omitted). This would suggest that wages and salary payments by themselves, as sub-category of labor remuneration, have a significant impact on the overall profitability indicator profit per equity. The final step is to allow both hypotheses to compete directly with each other in explaining overall profitability.

### **Explaining Overall Profitability**

Competition and distributive issues both have a clear effect on their respective intermediate profitability indicators. Table 5 shows the results when overall profitability (profit per equity) is regressed on the two intermediate profitability indicators in the years 1993 through 1997, for which sufficient data are available. Profit per equity thus is regressed on value-added per assets (the

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from normally distributed; after removing the worst, approximately one dozen outliers the market share is still insignificant. Including year dummies in the regression reported in the table does not change the results.

intermediate profitability indicator for competition) and profit per value-added (the intermediate profitability indicator for the distributive fight).

Insert Table 5 about here

The two independent variables together explain a very large share of the variation in profit per equity. The coefficients carry the correct sign in that the weaker competition and the lower the share of labor remuneration and depreciation in value-added, the higher is profit per equity. The results obtain independent of whether the regression is run across sectors or provinces, in levels or in growth rates. Similarly, if the regressions are run for each year individually the same results obtain.<sup>35</sup>

The decline in profitability between 1993 and 1997 is not restricted to industrial SOE. In all industrial enterprises (with independent accounting system on township tier and above) the return on equity decreased by 5.31 percentage points; in industrial SOEs by 5.61 percentage points, minimally above the average. (See Table 6.) Yet in 1993 the yield on equity in industrial SOEs was only one half of that in enterprises in other ownership forms. The absolute decline by 5.61 percentage points between 1993 and 1997 brought the yield down to a meager 2.09%, while it was still in the 7-10% range for other enterprises.

Insert Table 6 about here

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<sup>34</sup> In growth rates, neither correlation coefficients nor regression coefficients are significant.

<sup>35</sup> As value-added per assets may differ across sectors and provinces, sectoral and provincial dummies could be included in the regressions. An F-test suggests that dummies should be included in the regressions in levels but not in the regressions in growth rates. If provincial dummies are included in the regression across provinces (in levels), the coefficient signs and significance levels are as reported in Table 5 for the regression without provincial dummies. If sectoral dummies are included in the regression across sectors (in levels), the coefficient signs and significance levels are as reported in Table 5 for the regression without sectoral dummies except for profit per value-added, which turns significant at the 10% level only.

The comparison is inequitable in as far as industrial SOEs pay the highest sales-related taxes and fees; yet the difference to industrial enterprises in other ownership forms is not large enough to justify the poor performance of industrial SOEs.<sup>36</sup> (See last column in Table 6.) Similarly, SOEs are likely to face a comparatively larger social security burden and more infrastructure tasks than other enterprises. On the other hand, industrial SOEs have access to highly subsidized loans. The net overall effect of the different factors on industrial SOE profitability compared to the profitability of industrial enterprises in other ownership forms may be impossible to determine. What is unambiguous, however, is the fact that profitability between 1993 and 1997 declined across enterprises in all ownership forms, suggesting that profitability suffered across the whole economy due to competition and/or excessive labor remuneration.

## **Conclusions**

The discussion of whether competition or excessive labor remuneration have driven down SOE profitability is resolved once it is recognized that the two causes affect overall profitability primarily through different channels. Competition affects the price at which a product is sold and thus value-added. Labor remuneration affects the residual profit available out of a given value-added. Neither competition nor labor remuneration have an unambiguous direct impact on overall profitability. But investigating the two channels separately shows that competition clearly affects the intermediate profitability indicator value-added per assets in the 1990s (the years for which the necessary data are available), while distributive issues have played a role in the decline of the intermediate profitability indicator profit per value-added throughout the reform period. Once allowed to jointly impact on overall

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<sup>36</sup> Total taxes equal (i) value-added taxes plus (ii) sales-related taxes and fees plus (iii) corporate income taxes. Value-added taxes do not enter the profit and loss account. Corporate income taxes are included in profit. I.e., the profit reported is not net of income taxes, but net of the sales-related taxes and fees which are comparatively large for SOEs.

profitability, these intermediate profitability indicators explain much of the variation in profitability across sectors and regions between 1993 and 1997. The competition hypothesis and the excessive labor remuneration hypothesis thus are not competing with each other, but complementary.

While the decline in the return on equity during the 1990s is similar across all ownership forms, industrial SOEs are hurt most because they are the enterprises that started out with the lowest profit rate. The return on equity has fallen so close to zero, that the state is virtually providing capital to its SOEs free of charge. If profitability deteriorates further, the state will take a net loss on its assets. The low profitability rates furthermore are averages that hide wide differences between individual industrial SOEs. While well-performing industrial SOEs are likely to perform on par with enterprises in other ownership forms, some industrial SOEs are highly loss-making and kept alive solely due to their ownership form.

Industrial SOEs are unlikely to see their fortunes improve on either the competition or the labor remuneration front. In late 1998 the government reverted to direct administrative price determination for selected industrial products in order to prevent what was viewed as “malignant” (*e’xing*) competition.<sup>37</sup> This may improve profitability in some sectors, but unless the government is prepared to return to economy-wide price controls it is unlikely to make much difference across the aggregate of all industrial SOEs. Labor remuneration is increasingly market-determined, leaving few options on how to distribute value-added in an enterprise-specific bargaining round.

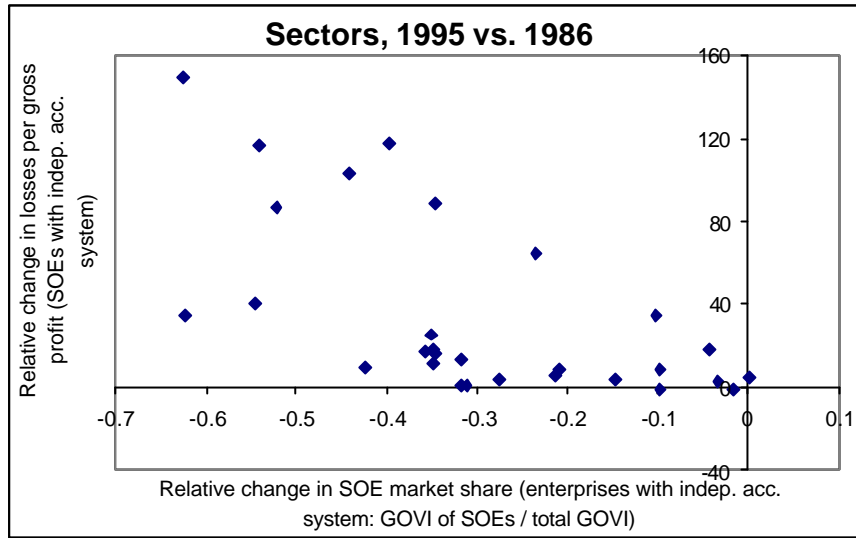
Since 1998 the government has also been asking for a reduction in the number of industrial SOEs as well as in industrial SOE employment. Industrial SOEs with high production costs are forced to close.

<sup>37</sup> The government interfered in the price determination process in order to prevent the sale of products below production costs, and thus the loss of state assets. If the original price cuts were pure marketing measures, the temporary respite may yet help. If the original price cuts, however, were triggered by lower production costs in non-state owned enterprises, the government would have to return to permanent price administration to help industrial SOEs. The measures were hotly debated in China itself. The Economic and Trade Commission first issued a regulation focusing on price-fixing through sectoral associations. The State Development and Planning Commission, voices within which first objected to any price-fixing, then promoted a primary role for the traditional price administration bureaus. See, for example, *Xinbao* [Hong Kong Economic Journal] 10 September 1998, 24 September 1998, 8 December 1998, and 5 August 1999, or *China News Digest*, an internet news source, 11 November 1998.

Underemployed labor is being shed. Both measures increase aggregate industrial SOE profitability. Yet if competition continues to exert downward pressures on product prices and the opportunity costs of labor continue to rise, these once-off measures will provide no more than a temporary respite.

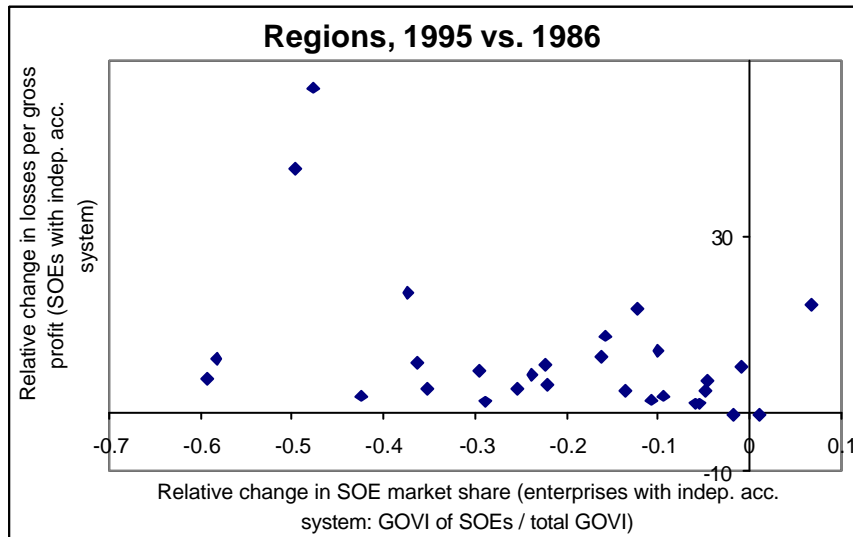






Sources: *Zhongguo tongji nianjian 1987*, pp. 311, 315, 321, and 323; *Industrial Census 1995*, Vol. 2, pp. 16ff. (GOVI for 1987 of both SOEs and all enterprises was derived from “profit and taxes per GOVI” and “profit and taxes.”) Since the sectoral classification changed in 1993, the 1995 sectoral classification was reduced to the 1986 sectoral classification, ignoring those sectors which were not included in 1986.

**Figure 1. Impact of Competition on Industrial SOE Profitability Across Sectors, 1986-1995**



Sources: *Zhongguo tongji nianjian 1987*, pp. 313, 317, and 322f.; *Industrial Census 1995*, Vol. 3, pp. 412ff. (GOVI for 1987 of both SOEs and all enterprises was derived from “profit and taxes per GOVI” and “profit and taxes.”) Hainan Province in all years is part of Guangdong Province.

**Figure 2. Impact of Competition on Industrial SOE Profitability Across Provinces, 1986-1995**

**Table 1. Significance of Competition in Explaining Industrial SOE Profitability**

Independent variables: annual growth rate of the market share (also intercept and year dummies, with their coefficient signs/ significance level not reported)	Dependent variable:			
	Across provinces: annual growth rate of		Across sectors: annual growth rate of	
	Losses / gross profit	Profit / equity	Losses / gross profit	Profit / equity
(1) Share of SOEs with independent accounting system in GOVI of all enterprises with independent accounting system on township tier and above	1987-1991: 0 1987, 1988: 0 1989: - **; 1990: - *** <i>1991: + **</i>	1994-1997: + *** individual years: 0	1987-1991: 0 1987, 1988, 1989, 1991: 0 1990: - **	1994-1997: 0 individual years: 0
(2) Share of industrial SOEs with independent accounting system in value-added of all enterprises with independent accounting system on township tier and above		1994-1997: + ** individual years: 0		1994-1997: 0 individual years: 0
(3) Share of industrial SOEs with independent accounting system in provincial industrial value-added		1994-1997: 0 1994: 0 1995, 1996: + *** <i>1997: - *</i>		
(4) Share of all SOEs, COEs, IOEs or enterprises in other ownership forms (“Other”) in economy-wide GOVI	none significant except SOEs 1989-1991: - *** SOEs 1989: - ** SOEs 1990: - *** COEs 1989-1991: + ** COEs 1989: + ** IOEs 1989: + ***	none significant except: SOEs 1996: + ** <i>COEs 1995: + *</i> COEs 1997: - * Other 1994: - * <i>Other 1996: + **</i>		

Significance levels: \*\*\* 1%, \*\* 5%, \* 10%, where - denotes a negative relationship, and + a positive relationship. 0 implies that there exists no significant relationship at the 10% level. Regressions results in which the market share coefficient carries the “wrong” (significant) sign are in italics.

The regression is: profitability measure = intercept + coefficient \* market share + coefficients \* year dummies. Including sectoral and provincial dummies yields no important differences. If a Jarque-Bera test indicated that the residuals are not normally distributed, outlier observations were removed after a visual inspection of the residuals. The effect of removing outliers on coefficient signs and significance levels is small throughout.

Regressions with the growth rate of profit per equity as dependent variable cover the years 1994 through 1997. Those with the growth rate of losses per gross profit as dependent variable cover the years 1987 through 1991, except when the relative shares in economy-wide GOVI are used as market shares (fourth line), in which case the data cover only the years 1989 through 1991.

GOVI denotes Gross Output Value of Industry, COEs collectively-owned enterprises, and IOEs individually-owned enterprises.

Sources: *Zhongguo tongji nianjian*, all annual issues 1987 through 1998; *Gaige kaifang*.

**Table 2. Competition and Profitability of Industrial SOEs**

	Dependent variable: annual growth rate of value-added per total assets	
	Provinces: SOEs <sup>a</sup>	Sectors: SOEs <sup>b</sup>
Time period	1994-1997	1994-1997
Number of observations	115	148
R <sup>2</sup>	0.7538	0.3482
Adjusted R <sup>2</sup>	0.7425	0.3300
Prob(F-statistic)	0.0000	0.0000
Intercept	***-1.1247 (-5.7893)	***-0.0619 (-2.7271)
Annual growth rate of market share:		
(1) value-added: SOEs / total provincial industry	***0.7512 (16.1184)	
(2) value-added: SOEs / all industrial enterprises with independent accounting system		***0.5898 (5.3710)
Provincial GDP deflator	***0.9904 (5.8971)	
Year dummies	1995 ***1996 ***1997	***1995 ***1996 *1997
If the regression is run for each year individually, against the growth rate of the market share (and inflation in the case of provinces), the growth rate of the market share is significant at the ... level in the year ... (with ... sign)	***1994(+) ***1995(+) ***1996(+) ***1997(+)	**1994(+) ***1995(+) 1996 ***1997(+)

Significance levels: \*\*\* 1%, \*\* 5%, \* 10%. Numbers in parentheses are t-statistics.

a, b A Jarque-Bera test indicates that at the 10% significance level the residuals are not normally distributed. After visual inspection of the residuals, outlier observations were removed and the results without these outliers are reported here. (After removal of these outliers, the residuals were normally distributed. The coefficients in the regressions with or without outliers differ slightly; the coefficient signs and significance levels are the same.)

a Outlier observations 1, 25, 115, 118, and 120 were removed and the results without these outliers are reported here. In the individual annual regressions, observation 1 was omitted in the 1994 regression.

b Outlier observations 3, 17, 36, 38, and 84 were removed and the results without these outliers are reported here. In the individual annual regressions, the same observations as well as observation 123 were omitted in the 1994 and the 1996 regression. On three further observations insufficient data are available.

The regressions were run in a number of variations. Including provincial dummies or sectoral dummies invariably does not change the sign and significance level of the coefficient of the market share. Using the share of industrial SOEs in the value-added of all industrial enterprises with independent accounting system as market share measure in the first regression also does not change the results.

The provincial GDP deflator was constructed from current GDP data and real growth rates. It covers the whole provincial economy, not only industry.

Sources: *Zhongguo tongji nianjian*, all annual issues 1987 through 1998; *Gaige kaifang; Zhongguo guonei shengchan zongzhi hesuan lishi ziliao 1952-1996 (zhaiyao)* [*Historical Data on China's Gross Domestic Product 1952-1996 (Abstract)*] (Beijing: Zhongguo Tongji Chubanshe, 1998).

**Table 3. Correlation Coefficients of Profit Vs. Labor Remuneration in Industrial SOEs**

Per value-added:	Data availability	Profit per value-added				Profit / equity 1993-97
		1983-97 [92]	1983-87	1988-92	1993-97	
Wages (and salaries)	1983-97	***-0.8981	***-0.9355	***-0.9455	** -0.8603	-0.68284
Social (and welfare) fund	1983-97	***-0.9575	***-0.9653	***-0.9236	***-0.9864	-0.18639
Non-productive investment	1983-92	-0.2693	***-0.9526	-0.2184	n.a.	n.a.
Housing investment	1983-92	-0.4298	-0.4327	-0.5758	n.a.	n.a.
Wages + social fund	1983-97	***-0.9257	***-0.9563	***-0.9421	***-0.9123	-0.5487
Wages + social fund + non-productive inv.	1983-92	***-0.8758	***-0.9866	-0.6540	n.a.	n.a.

Significance of correlation coefficients (using an F-test): \*\*\* 1%, \*\* 5%, \* 10%.

Sources:

Wages and salaries: *Zhongguo tongji nianjian 1992*, p. 124; *Zhongguo tongji nianjian 1993*, p. 126; *Zhongguo tongji nianjian 1994*, p. 116; *Zhongguo tongji nianjian 1999*, pp. 144 and 164. Data for 1994 through 1998 are calculated as the sum of the number of SOE employees in the sectors (i) mining and quarrying, (ii) manufacturing, and (iii) production and supply of electricity, gas and water, each times the average wage per SOE employee in that sector. 1993 data calculated via the average wages in the three categories that constitute industry differs by 3.57% from the total industrial wage bill data last available for 1993.

Wages and salaries comprise formal wages, bonus payments, and payments in kind.

Social (insurance) and welfare fund: *Zhongguo tongji nianjian 1986*, p. 666; *Zhongguo tongji nianjian 1987*, p. 690; *Zhongguo tongji nianjian 1988*, p. 204; *Zhongguo tongji nianjian 1989*, p. 151; *Zhongguo tongji nianjian 1990*, p. 805; *Zhongguo tongji nianjian 1991*, p. 788; *Zhongguo tongji nianjian 1992*, p. 806; *Zhongguo tongji nianjian 1993*, p. 805; *Zhongguo tongji nianjian 1994*, p. 662; *Zhongguo tongji nianjian 1995*, p. 686; *Zhongguo tongji nianjian 1996*, p. 734; *Zhongguo tongji nianjian 1997*, p. 747; *Zhongguo tongji nianjian 1998*, p. 796; *Zhongguo tongji nianjian 1999*, p. 763. For all years, social insurance and welfare funds of all state-owned units (SOUs) are available; for 1985 through 1998 the share going to retired and resigned former staff and workers is also available. For industry in the years 1986 through 1997, social insurance and welfare expenses for current staff and workers are available, but not for retired staff and workers; it is assumed that the share of these current industrial staff and workers' social insurance and welfare expenses in total SOU current staff and workers' social insurance and welfare funds also holds for the retired and resigned former staff and workers in industry in this period. For 1985, the value of total industrial social insurance and welfare funds is available. Its share in total SOU social insurance and welfare funds is applied to the total SOU values in 1978 through 1984 to derive the industry values.

Non-productive investment and housing investment: *Zhongguo guding zichan touzi tongji ziliao 1950-1985 [China Investment in Fixed Assets Statistics 1950-1985]* (Beijing: Zhongguo Tongji Chubanshe, 1987), pp. 15, 16, and 20; *Zhongguo tongji nianjian 1986*, p. 447; *Zhongguo tongji nianjian 1987*, p. 473; *Zhongguo tongji nianjian 1992*, p. 150; *Zhongguo tongji nianjian 1993*, pp. 150f. The data cover total investment by all SOUs as well as in industry only, and non-productive and housing investment in all SOUs; it is assumed that the shares of non-productive and housing investment in total investment in industry are the same as the economy-wide average. The growth rates for industry and the whole economy thus are the same. Data are only available for the years 1981 through 1992.

Profit: *Zhongguo tongji nianjian 1998*, p. 461.

Value-added: *Zhongguo tongji nianjian 1987*, p. 317; *Zhongguo tongji nianjian 1988*, pp. 320 and 377; *Zhongguo tongji nianjian 1989*, pp. 292 and 324; *Zhongguo tongji nianjian 1990*, pp. 419 and 421; *Zhongguo tongji nianjian 1991*, pp. 399 and 401; *Zhongguo tongji nianjian 1992*, p. 420; *Zhongguo tongji nianjian 1993*, p. 426; *Zhongguo tongji nianjian 1994*, p. 388; *Zhongguo tongji nianjian 1995*, p. 393; *Zhongguo tongji nianjian 1996*, p. 418; *Zhongguo tongji nianjian 1997*, p. 428; *Zhongguo tongji nianjian 1998*, p. 448; *Zhongguo tongji nianjian 1999*, p. 432. Official value-added data are only available since 1992. Value-added is by definition equal to, and for 1986 through 1991 therefore calculated as, net product plus depreciation (same sources as value-added). Value-added for 1983 through 1985 is calculated as net product (available first in 1983) plus estimated depreciation. Depreciation was estimated as 0.0615 \* net value of year-end fixed assets. The value 0.0615 is the mean value calculated from the ratio of depreciation to year-end net fixed assets for the years 1986 through 1991 (the range is 0.0597 to 0.0623%). With labor remuneration measured per value-added, the earliest ratios available are those of 1983.

**Table 4. Labor Remuneration and Profitability of Industrial SOEs Across Provinces, 1993-1997**

Time period	Profit per value-added							Profit per equity
	1993-97 <sup>a</sup>	1993-97 <sup>a</sup>	1993-97 <sup>a</sup>	1993-97 <sup>b</sup>	1993-97 <sup>c</sup>	1993-97 <sup>c</sup>	1993-97 <sup>d</sup>	1993-97 <sup>e</sup>
Number of obs.	144	144	144	137	142	142	145	143
R <sup>2</sup>	0.3850	0.4416	0.4648	0.6554	0.6396	0.6445	0.6212	0.5961
Adjusted R <sup>2</sup>	0.3806	0.4296	0.4373	0.6502	0.6236	0.6202	0.6157	0.5904
Prob(F-statistic)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Intercept	***0.2898 (11.5317)	***0.2882 (11.9348)	***0.2818 (11.3983)	***0.2952 (14.6597)	***0.2819 (13.2432)	***0.2855 (13.2417)	***0.2669 (6.9721)	***0.1793 (14.4206)
Wages and salaries per value-added	***-0.7927 (-9.4277)			***-0.3412 (-3.7457)				***-0.2728 (-5.1027)
Fixed assets per value-added				***-0.0619 (-8.8639)				***-0.0278 (-7.0338)
Wages and salaries per value-added, region 1, 2, 3 <sup>f</sup>		each region: *** (-)	each region: *** (-)		region 2 and 3 ***(-)	region 2 and 3 ***(-)	region 2 and 3 ***(-)	
Fixed assets per value-added, region 1, 2, 3 <sup>f</sup>					region 1 and 3 ***(-)	region 1 and 3 ***(-)	region 1 and 3 ***(-)	
Year dummies 1994, 1995, 1996, 1997			none significant			none significant		
SOE share in value-added of all ent. with indep. acc. system, region 1, 2, 3 <sup>f</sup>							none significant	

Significance levels: \*\*\* 1%, \*\* 5%, \* 10%. (-) denotes a negative coefficient sign. Numbers in parentheses are t-statistics.

a, b, c, d A Jarque-Bera test indicates that the residuals are not normally distributed. After visual inspection of the residuals, some outlier observations were removed and the results without these outliers are reported here. After removal of these outliers, the residuals were normally distributed. The coefficients in the regressions with or without outliers differ slightly; the coefficient signs and significance levels are always the same. In particular, the following outliers were removed: (a) 1, 13, 118, 141, 148; (b) 1, 8, 13, 25, 61, 69, 71, 72, 79, 103, 118, 133, 145; (c) 1, 8, 13, 25, 118, 133, 145; (d) 1, 13, 25, 145; (e) 1, 8, 13, 38, 54, 84.

f Region 1 (coastal region): Beijing, Tianjin, Hebei, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, Guangxi, Hainan.  
Region 2 (interior central region): Shanxi, Neimenggu, Jilin, Heilongjiang, Anhui, Jiangxi, Henan, Hubei, Hunan.  
Region 3 (interior Western region): Sichuan (including Chongqing), Guizhou, Yunnan, Tibet, Shaanxi, Gansu, Qinghai, Ningxia, Xinjiang.  
(The individual regional coefficients are not reported as they are very similar to those where no regional distinction is made.)

The regression results are the same in terms of coefficient signs and significance levels if wages per value-added are distinguished by year (with or without regional dummy variables). Regressing profit per value-added against thirty provincial dummies and wages per value-added (alternatively, distinguished according to year, or including year dummies) yields significant coefficients not only for wages per value-added, but also for a large majority of provinces.

Sources: *Zhongguo tongji nianjian*, all annual issues 1994 through 1998. On the wage (and salary) data also see notes to Table 3. Fixed asset values are annual average values.

**Table 5. Impact of Competition and Distributive Issues on Profitability of Industrial SOEs, 1993-97<sup>a</sup>**

	Profit per equity		Growth rate of profit per equity	
	Sectors	Provinces	Sectors	Provinces
Number of obs.	194	149	153	118
R <sup>2</sup>	0.4289	0.9173	0.9366	0.9873
Adjusted R <sup>2</sup>	0.4229	0.9162	0.9358	0.9871
Prob(F-statistic)	0.0000	0.0000	0.0000	0.0000
Intercept	***-0.0877 (-7.9306)	***-0.0551 (-9.0968)	***0.2958 (2.5980)	***-0.0049 (-0.0943)
Value-added per assets	***0.5804 (10.1782)	***0.3767 (10.4336)		
Profit per value-added	***0.0271 (2.0683)	***0.4213 (23.8978)		
Growth rate of value-added per assets			***2.9839 (5.3026)	***0.6210 (1.7532)
Growth rate of profit per value-added			***1.0576 (46.4244)	***0.9255 (94.1733)
If the regression is run for each year individually, the coefficient signs and significance levels are the same except	profit per value-added insignificant in 1995	no exception	growth rate of value-added per assets not significant in 1994 and 1997	growth rate of value-added per assets not significant in 1995 and 1996

Significance levels: \*\*\* 1%, \*\* 5%, \* 10%. Numbers in parentheses are t-statistics.

a Based on a Jarque-Bera test, the residuals in none of the regressions are normally distributed. Identifying outliers (by calculating studentized residuals, dfbetas, and dffits) and removing them does not always guarantee normally distributed residuals in a reduced regression; visual inspection of the residuals in the regression with all observations and the removal of about one dozen outliers or more will yield normally distributed residuals in a reduced regression. The size of the coefficients in a regression without outliers is very close (usually within single-digit percentage points) to those reported in the table for the regressions with all observations, only the t-statistics and the R<sup>2</sup> value are still higher if outliers are removed. The results reported in the table are those using all observations, i.e., not removing outliers, because the number of outliers to be identified in a visual inspection of residuals is large and a cut-off point not easy to determine.

Running the regression for each year individually yields normally distributed residuals, except in a few cases where removal of a very small number of outliers, typically one to three, is suggested by the Jarque-Bera test and was undertaken. Coefficient signs and significance levels in the individual annual regressions are exactly the same as reported here for the regressions comprising all years and observations, with the only exceptions noted in the last row of the table.

Sources: *Zhongguo tongji nianjian*, all annual issues 1994 through 1998.



**Table 6. Profitability of Industrial Enterprises Across Different Ownership Forms**

	Profit / equity						Sales-related taxes+fees per equity, 1997
	1993	1994	1995	1996	1997	1997 minus 93	
Nationwide total	0.0996	0.0825	0.0595	0.0470	0.0465	-0.0531	0.0342
SOEs	0.0770	0.0672	0.0410	0.0224	0.0209	-0.0561	0.0442
COEs	0.1391	0.1086	0.0923	0.0971	0.0949	-0.0442	0.0381
Share-holding enterprises	0.1539	0.1334	0.1027	0.0811	0.0806	-0.0733	0.0161
Non-Chinese foreign-funded ent.	0.1557	0.1315	0.0854	0.0743	0.0707	-0.0850	0.0151
HK, MC and Taiwanese ent.	0.1270	0.0479	0.0619	0.0597	0.0622	-0.0648	0.0086
Rest	0.1442	0.0982	0.0849	0.0950	0.0815	-0.0627	0.0302

Sources: *Zhongguo tongji nianjian 1994*, p. 381; *Zhongguo tongji nianjian 1995*, p. 391; *Industrial Census 1995*, pp. 50 and 52; *Zhongguo tongji nianjian 1997*, pp. 426f; *Zhongguo tongji nianjian 1998*, pp. 444-7.