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How Uncompetitive is the State-Owned Industrial Sector in China

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How Uncompetitive is the State-Owned Industrial Sector in China?[†]

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Abstract

The profitability gap between state-owned enterprises and the non-state industrial sector in China is significant. Using a highly-disaggregated database of China's industry in 2003, we estimate an average return to capital in state-owned enterprises about 9% that of foreign-invested firms, and about 59% of the return to capital in all non-state-owned industrial enterprises. Capital return differences are mainly driven by productivity differences, but the negative impact on SOEs' rental rates of a relatively integrated labor market is not negligible. The rental rate gap is much higher in sectors that represent a small share in SOEs' output and assets, meaning that the capital subsidies granted by the government have not biased SOEs' production structure toward industries with greatest profitability gap. The inefficiency cost of distortions in relative factor prices is estimated between 5% and 8% of total industrial output.

JEL: F15, O1, P3, P42.

Key Words: China, SOEs profitability, Rental Rate Gap, Productivity Differences.

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1. Introduction

The under performance of State-owned industrial enterprises relative to the non-state-owned sector in China during the reform period –measured both in terms of profitability and productivity– is crucial to understanding not only the transition process but also the current situation of the financial system in China. As documented by many authors, Chinese State-owned enterprises (SOEs) have had lower rates of productivity growth than other domestic non-state-owned enterprises, as well as than foreign-invested enterprises (FIEs).¹ Low productivity leads to low profitability by SOEs, as they can not compete with productivity-advanced non-state-owned enterprises in domestic factor markets. Consequently, subsistence of the state sector has been supported by preferential access to credit from state-owned banks, as Brandt and Zhu (2000) document. The capital subsidy policy assures net rental rate equalization while sustaining gross differences in capital returns across different types of firms. Aware of the risk of massive unemployment associated with the reallocation of factors from low- to high-productivity firms, capital subsidies support the allocation of capital toward firms and sectors with low capital return, at the expense of a suboptimal allocation of resources. To minimize the welfare and financial costs of the subsidies and to speed up the transition process, Chinese authorities have implemented a series of reforms to SOEs in order to enhance their competitiveness, by improving corporate governance and by focusing on large, presumably more efficient SOEs.²

After more than two decades of reforms, it is important to evaluate the current competitive position of SOEs relative to the non-state-owned sector. Using a highly

¹ See Sun *et al.* (1999), Jefferson *et al.* (2000), Jefferson *et al.* (2003), Zheng *et al.* (2003) and Claro (2005a).

² See Qian (1996) and Lin *et al.* (1998).

disaggregated database for the industrial sector in China for 2003 from China's Market Yearbook (2005), we estimate the rental rate gap between SOEs and non-state-owned enterprises across 454 4-digit industries. The corner stone of the analysis is that coexistence of firms with different productivity is reflected in differences in capital returns for observed cross-firm differences in average factor productivity and labor costs. The rental rate gap is estimated as the difference in the gross return to capital between SOEs and non-state-owned enterprises consistent with zero profits for all firms within each industry. The estimates of relative profitability allows us to: a) evaluate the performance of SOEs relative to the non-state-owned sector within each industry, b) calculate the deadweight cost –measured as percentage of total industrial output- of the misallocation of resources, and c) decompose the rental rate gap into its main determinants, i.e., technology differences, scale differences and factor intensity differences.

The results reveal that rental rate differences between SOEs and other non-state firms are significant. On average, the return to capital in SOEs is about 9% of the return to capital in FIEs, while it is about 59% of that of an aggregate of the non-state-owned industrial sector (NSOs) that comprises FIEs as well as domestic non-state-owned enterprises. However, there is wide dispersion across sectors. SOEs have a negative return to capital in about 50% of the industries, but these industries represent a small share of SOEs revenues and employment. In other words, the rental rate gap is greater in industries that represent a relatively small share of SOEs production, as well as in industries where SOEs market share is low. The deadweight loss of factor misallocation fluctuates between 5% and 8% of total industrial output. This represents the once-and-

for-all gain in industrial production of removing the capital subsidies and allowing factors to reallocate toward high capital-return industries. Capital return differences are mainly explained by technology differences, but the negative impact on SOEs' rental rates of a relatively integrated labor market is also relevant, specially in labor-intensive sectors. On average, the role of differences in scale economies play a secondary role. Although technology differences are revealed to be higher in capital-intensive sectors, this effect is compensated by the negative impact on SOES profitability in labor-intensive industries of a high relative cost of labor compared to non-state firms. Overall, there is no clear pattern of the rental rate gap across sectors with different factor intensities.

The rest of the paper is divided in the following manner. The section describes the data. Section 3 develops the methodology used to measure rental rate and productivity differences. Section 4 presents the empirical estimations, and section 5 offers some conclusions and policy implications.

2. The Data

The data is from the industrial statistics of the 2005 China Markets Yearbook, which reports highly disaggregated data on industrial performance for each 454 4-digit industrial sector of China's National Economy Classification Standards in 2003. These sectors correspond roughly to the 4 digit SIC US industry classification. The yearbook reports data on aggregate employment, revenues, profits, total assets, return on assets, return on equity and labor productivity (value-added per worker) for each 4-digit sector. The same data is reported in each sector for three types of firms, namely State-owned, Collectively-owned, and Foreign and Overseas-funded enterprises. The sample covers all

state-owned enterprises and non-state-owned enterprises with annual sales over 5 millions Yuan (above designated size).

Table 1 reports a summary of the data without distinguishing for firm ownership. The database comprises 188,751 firms belonging to 454 industrial sectors, 18 of which belong to the Mining and Forestry category, 8 to Electricity and Heating Production and Supply, while the rest are Manufacturing sectors. Total employment is more than 54 million workers, and total revenues are almost 13.7 trillion Yuan, representing about 70% of total industrial production. The difference is explained by production of non-state-owned enterprises with sales below 5 million Yuan.

[Insert Table 1]

Table 2 reports similar statistics for different types of firms. In Mining and Forestry as well as in Manufacturing the foremost important group is Other, that comprises Joint-ownership enterprises, Limited Liability enterprises and Share-holding Corporations. In Electricity and Heating Production and Supply, state-owned enterprises are the dominant players. For those firms for which ownership is reported, FIEs are dominant in Manufacturing, with revenues more than 3 times higher than SOEs' and with employment twice as high as in SOEs. Overall, SOEs have low return on assets and equity compared to all other firms in all industries, confirming that profitability of state-owned enterprises is the lowest among Chinese industrial firms. Also, SOEs show consistently low levels of labor and assets productivity compared to FIEs (both measured using value-added and total revenues), but the comparison with other non-state-owned domestic enterprises yields less clear-cut conclusions. Overall, the productivity gap and

the profitability gap between SOEs and the non-state-owned industrial sector are evidence of the low performance of the state-owned sector in China.³

[Insert Table 2]

Sector-specific data reveal several interesting patterns. First, as expected, SOEs consistently have a lower return to assets and equity than FIEs. Panel A in Figure 1 plots the difference between FIEs' and SOEs' return on assets for 440 4-digit industries for which data on assets' return are available for SOEs and FIEs. In all but 43 sectors FIEs have a greater return on assets than SOEs, confirming that low SOEs' profitability is a widespread phenomenon across industrial sectors.⁴ However, this result weakens significantly when SOEs are compared to NSOs; in 190 out of 447 sectors the return on assets in SOEs is greater than in NSOs (Panel B). A second feature of the data is that differences in assets' returns or equity returns are orthogonal to factor intensities. In other words, the profitability gap between SOEs and FIEs or NSOs is evenly distributed across sectors with different factor intensities.

[Insert Figure 1]

3. The Model

Consider a small economy that produces i tradable goods using two factors, i.e., labor L and capital K . Within each industry two types of firms coexist: state-owned and non-state-owned enterprises (denoted with a $*$). Capital is mobile internationally, and its opportunity cost is r^* . Labor is mobile across sectors and firms domestically, but it is immobile internationally.

³ See Holz (2003) for an in-depth analysis of the performance of Chinese industrial SOEs.

⁴ Similar results hold if we compare return on equity.

Production functions are such that factor F ($F = L, K$) requirements per unit of output are $a_{Fi}^n = a_{Fi}^n(v_i^n, Q_i^n, D_{Fi}^n)$ where v_i^n is the vector of factor prices faced by type n firms (state-owned and non-state-owned firms) in industry i , Q_i^n is output (measuring potential scale effects) and D_{Fi}^n stands for an exogenous factor-specific technological component. Therefore, factor requirements across firms within any industry may differ for three reasons: Differences in relative factor prices, exogenous technological differences or differences in the scale of production in the presence of scale economies. If production functions are homothetic, labor and capital requirements per unit of output of state-owned producers in sector i can be written as:⁵

$$a_{Li} = a_{Li}^* \cdot (1 + \delta_{Li}) \cdot l_i(\omega_i) \cdot E_i \quad (1)$$

and

$$a_{Ki} = a_{Ki}^* \cdot (1 + \delta_{Ki}) \cdot k_i(\omega_i) \cdot E_i, \quad (2)$$

where δ_{Fi} is the factor-specific technology gap across firms in industry i . If $\delta_{Fi} > 0$ it means that state-owned firms require more units of factor F per unit of output than non-state firms after controlling for factor price differences and scale effects. $l_i(\omega_i)$ and $k_i(\omega_i)$ measure the adjustment in average factor productivity associated with differences in relative factor prices ω_i where $\omega_i = (w/r)_i / (w/r)_i^*$, with $\partial l_i(\omega_i) / \partial \omega_i < 0$, $\partial k_i(\omega_i) / \partial \omega_i > 0$ and $l_i(1) = k_i(1) = 1$. Ceteris paribus, if state firms face a high relative cost of labor compared to non-state producers, i.e., $\omega_i > 1$, labor productivity is higher in the former while the opposite happens with capital productivity.

⁵ See Antweiler and Trefler (2002) for a similar derivation of relative factor demands. In their case, the exogenous technological parameter is associated with differences in efficiency units of factor supplies. However, they do not account for differences in relative factor prices.

The scale effect is captured for by $E_i = E_i(Q_i/Q_i^*)$. Assuming that scale economies, if exist, are external to the firm, their impact on relative factor productivity depends on the scope of the scale effect. If sectoral scale effects are national, scale economies do not introduce any cost gap between state- and non-state firms, meaning that $E_i = 1$. Alternatively, if the scope of the scale effect is limited by the ownership structure, i.e., SOEs' productivity is affected by total production of state firms in each sector while non-state-owned firms' productivity depends upon their total production, $E_i' < 0$ with increasing returns to scale and $E_i' > 0$ with decreasing returns to scale. In the empirical section we analyze both scenarios. With scale economies, the entire productivity gap, that is, the part of differences in average factor productivity that is not explained by differences in relative factor prices— is attributed to technology differences, while with scale economies we can distinguish between genuine technology differences and the scale effect.

The assumption that scale economies are external to the firm is consistent with perfect competition and zero profits.⁶ Therefore, Regardless of the source of productivity differences, production of firm type n in industry i will take place if the following zero-profit condition holds:

$$p_i^* = a_{Li}^n w_i^n + a_{Ki}^n r_i^n, \quad (3)$$

where p_i^* is the international price of good i , w_i^n and r_i^n are gross factor prices (those paid by the firm). Combining (3) for state-owned and non-state-owned enterprises in industry i we obtain the following condition for production of both types of firms:

⁶ See Helpman and Krugman (1985).

$$1 = \frac{w_i}{w_i^*} \cdot \left[\theta_{Li}^* \cdot \frac{a_{Li}}{a_{Li}^*} + \frac{\theta_{Ki}^*}{\omega_i} \cdot \frac{a_{Ki}}{a_{Ki}^*} \right]. \quad (4)$$

Equation (4) determines the combinations of relative wages $\pi_i = w_i / w_i^*$ and relative rental rates $r_i / r^* = \pi_i / \omega_i$ consistent with zero profits in both types of firms for observed levels of labor and capital productivity as well as factor shares. For any π_i , expression (4) delivers a unique gross rental rate gap between state-owned and non-state-owned enterprises. Plugging (1) and (2) into (4) we can express the zero-profit condition for state-owned firms in industry i as:

$$1 = \pi_i \cdot E_i \cdot (1 + \delta_i) \cdot \chi_i(\omega_i), \quad (5)$$

where $E_i \cdot (1 + \delta_i)$ is the total-factor-productivity gap between state- and non-state enterprises in sector i , which has two components: The genuine technology gap identified as $(1 + \delta_i) = \theta_{Li}^* (1 + \delta_{Li}) + \theta_{Ki}^* (1 + \delta_{Ki})$ and the scale component E_i . The term $\chi_i(\omega_i) = (\theta_{Li}^* (1 + \delta_{Li}) l_i(\omega_i) \omega_i + \theta_{Ki}^* (1 + \delta_{Ki}) k_i(\omega_i)) / (\omega_i (1 + \delta_i))$ measures the impact on relative average costs between SOEs and non-state-owned firms of differences in relative factor prices.

Because production functions are homothetic, we can calculate $l_i(\omega_i)$, $k_i(\omega_i)$ and $\chi_i(\omega_i)$ based upon a constant-return-to-scale (CRS) unit cost function. After some algebra manipulation, a second-order Taylor approximation of non-state-owned enterprises' isoquant yields the following expressions for the adjustment in average factor

productivity in non-state firms after correcting for differences in relative factor prices with state-owned enterprises⁷:

$$l_i(\omega_i) = \frac{1 + \theta_{Li}^*(\omega_i - 1)}{1 + \theta_{Li}^*(\omega_i - 1) + \theta_{Ki}^*\sigma_i(\omega_i - 1)} \quad (6)$$

and

$$k_i(\omega_i) = \frac{1 + \theta_{Li}^*(\omega_i - 1) + \sigma_i(\omega_i - 1) + \theta_{Li}^*\sigma_i(\omega_i - 1)^2}{1 + \theta_{Li}^*(\omega_i - 1) + \theta_{Ki}^*\sigma_i(\omega_i - 1)}, \quad (6')$$

where σ_i is the elasticity of substitution between labor and capital in industry i (that is assumed similar across firms within each industry). Plugging (6) and (6') into (5) we get:

$$1 = \pi_i \cdot (1 + \delta_i) \cdot E_i \cdot \left(\frac{1 + \theta_{Li}^*(\omega_i - 1)}{\omega_i} \right) \cdot \left(1 + \frac{\theta_{Li}^*\theta_{Ki}^*(\omega_i - 1)(1 - \sigma_i)}{1 + \sigma_i(\omega_i - 1) + \theta_{Li}^*(\omega_i - 1)(1 - \sigma_i)} \cdot \frac{(\delta_{Li} - \delta_{Ki})}{(1 + \delta_i)} \right). \quad (7)$$

Expression (7) reveals the main determinants of differences in average costs across firms within each sector. The term π_i reflects the wage gap –for workers of similar characteristics– between state-owned and non-state-owned firms. A value of π_i smaller than 1 lowers average costs for SOEs relative to non-state firms. The term $E_i \cdot (1 + \delta_i)$ accounts for the total-factor-productivity gap (TFP). If $E_i \cdot (1 + \delta_i) > 1$ state-owned firms are productivity backward and they have higher average costs than non-state-owned producers. The TFP gap has two components: A genuine technological component $(1 + \delta_i)$ and a scale component E_i that measures the impact on average costs of differences in production in the presence of scale economies. With economies of scale,

⁷ Let $a_{Li} = L_i / Q_i$. Along an isoquant of a CRS production function, the change in labor productivity is given by $\hat{a}_{Li} = \hat{L}_i$ subject to $\hat{Q}_i = 0$. Totally differentiating labor productivity for changes in relative factor prices along a CRS production isoquant yields expression (6). The same logic applies to get (6').

$E_i > 1$ means that non-state firms have a cost advantage compared to SOEs because of their greater scale of production. Conversely, if SOEs penetration is high in increasing-return-to-scale sectors, their cost disadvantage relative to non-state producers is low relative to the average cost gap in CRS sectors.

The fourth term in the right-hand-side of (7) measures the impact on average costs of differences in relative factor prices, given π . The expression is greater than 1 if $\omega_i < 1$, which means that SOEs' average costs are higher than non-state-owned firms' average costs if the former face a relatively low cost of labor. The intuition for this result is better obtained assuming that $\pi_i = 1$. A value of $\omega_i < 1$ means that SOEs face a high cost of capital compared to non-state-owned enterprises, which raises average costs in the former. Conversely, average costs in SOEs are lower than in non-state firms if the former face a relatively low cost of capital, i.e., $r_i / r^* < 1$ which implies $\omega_i > 1$. This expression is increasing on θ_{Li}^* if $\omega_i > 1$, which means that the cost advantage for SOEs of a low return to capital is greater in capital-intensive industries, that is, in those sectors that use more intensively the relatively cheap factor.

The last term in the right-hand-side of (7) measures the effect of factor biased technology differences. If technology differences are Hicks neutral, i.e., $\delta_{Li} = \delta_{Ki}$ or if the production function is Cobb-Douglas, i.e., $\sigma_i = 1$, in which case all factor bias technology differences can be expressed as Hicks-neutral differences, this expression is equal to 1, and average cost differences between state and non-state firms are only affected by total-factor-productivity differences. However, if the elasticity of substitution differs from one and technology differences are not Hicks neutral, average costs are

higher in those firms that use intensively the more expensive factor. Differences in relative factor usage depend on the bias of the technology gap and the ability to substitute away from the expensive factor, given by σ_i . If technology differences are capital saving, i.e., $\delta_{Li} > \delta_{Ki}$, which means that state-owned enterprises use labor more intensively than non-state-owned firms, a high relative cost of labor ($\omega_i > 1$) hurts state enterprises if substitution possibilities are low. Conversely, as $\sigma_i \rightarrow \infty$ the average cost gap shrinks as SOEs shift toward the factor with lowest productivity gap.

Average cost equalization establishes a relationship between technology differences (both level and factor bias), scale differences and factor price differences. Manipulating (7) we obtain the following analytical solution for the rental rate gap between SOEs and non-state-owned firms as function of technology differences, scale effects, wage differences and factor shares:⁸

$$\frac{r_i}{r^*} = \left[\frac{1 - \theta_{Li}^* \cdot \pi_i \cdot (1 + \delta_i) \cdot E_i}{\theta_{Ki}^* \cdot (1 + \delta_i) \cdot E_i} \right]. \quad (8)$$

Implicit in (8) is the unitary capital subsidy consistent with net rental rate equalization. Expressed in terms of the gross return to capital in non-state-owned enterprises, the capital subsidy that compensates for gross rental rate differences in industry i is $s_i / r^* = 1 - r_i / r^*$. Expression (8) highlights the main determinants of rental rate differences, and hence capital subsidies. The rental rate gap is higher in industries with greatest productivity gap $(1 + \delta_i) \cdot E_i$, which could result from a high exogenous

⁸ This expression assumes $\sigma_i = 1$ that is required to obtain a unique solution for r_i / r^* . Unfortunately, imposing this assumption rules out the effect of factor bias technology differences on rental rate differences. However, none of the results of the paper vary if we consider values for the elasticity of substitution between labor and capital in the neighborhood of 1.

technological gap or from a scale effects that benefits non-state producers. Rental rate differences also increase with π_i . Labor market policies that introduce a wedge between SOEs and non-state firms' labor costs, i.e., $\pi_i < 1$, enhance the relative profitability of SOEs. Finally, rental rate differences are greater in labor-intensive sectors, i.e., $\partial(r_i / r^*) / \partial \theta_{Li}^* < 0$, if and only if $(1 + \delta_i)E_i \pi_i > 1$. The intuition for this is the following. If the productivity disadvantage is high enough, i.e., $(1 + \delta_i)E_i > 1 / \pi_i$, SOEs will face a high relative cost of labor compared to non-state producers, which means that the former have a greater cost disadvantage in labor intensive sectors. The opposite happens if $(1 + \delta_i)E_i < 1 / \pi_i$.

4. Empirical Estimation

The empirical section is divided into three parts. First, we estimate rental rate differences between state and non-state enterprises within each 4-digit industrial sector using (4). In the second part we estimate the welfare cost associated with factor price distortions. Finally, in section 4.3 we decompose gross rental differences into their components. The estimation of rental rate differences requires identifying the correct opportunity cost of capital in SOEs, which is difficult due to the heterogeneity of firms within the non-state sector and distortions in Chinese capital markets. Therefore, we compare SOEs with two benchmarks, namely FIEs and an aggregate of non-state-owned enterprises (NSOs) that includes FIEs as well as collectively owned, share-holding and private corporations.

4.1 Rental Rate Differences

The estimation of rental rate differences is based upon the estimates of ω_i from equation (4). For that, we use sectoral data on average labor and total assets productivity for SOEs, FIEs and NSOs.⁹ Data on FIEs' factor shares are not available at the 4-digit level; neither we have data on wage differences between state and non-state companies. For factor shares, we map the 4-digit SIC industry classification in the United States into the 4-digit Chinese industrial classification, assuming that factor shares in the United States are an adequate proxy for factor shares of foreign-invested enterprises in China.¹⁰ We focus on Mining, Forestry and Manufacturing sectors only because we do not have data on factor shares for Electricity, Gas and Water industries.

The use of U.S.-based data on factor intensities as a proxy for FIEs' or NSOs' factor intensities has two main weaknesses. First, factor intensities in U.S. industries may differ from those in China-based FIEs or NSOs due to differences in relative factor prices. However, it is factor shares and not factor intensities what matters in the estimation of ω_i , meaning that as long as the elasticity of substitution does not differ significantly from one, factor shares do not depend upon relative factor prices. In any case, as Figure 2 reveals, capital shares of U.S.-based 4-digit SIC industries are positively and significantly correlated with assets per worker in Chinese FIEs, suggesting that the mapping is adequate. Similar results hold with NSOs. A second problem follows from the fact that Hong Kong and Taiwan and not the United States are the main sources of foreign investment in China. Because there is no highly detailed data on factor shares

⁹ Measures of factor productivity are value-added per worker or value-added per total assets. None of the results change if we use output-based measures of factor productivity.

¹⁰ Labor share is measured as total labor payments to blue and white collars divided by sector value-added. The results do not vary significantly if labor share is measured using blue-collar workers only while white-collar workers are assigned to capital.

from countries other than the United States, we are restricted to use U.S. data. With these caveats in mind, we continue the analysis.

[Insert Figure 2]

Regarding wage differences, China Markets Yearbook does not report data on firm- and sector-specific wages. According to China's Statistical Yearbooks, industrial SOEs pay wages about 70% that of FIEs. However, there is evidence that non-wage benefits in SOEs are much higher than in FIEs. As Zhao (2001, 2002) shows, by mid 1990s unitary labor costs were very similar between SOEs and FIEs. When SOEs are compared against NSOs, wage differences vanish, although high non-wage benefits in SOEs suggest that unitary labor costs in SOEs are higher than in NSOs. Because detailed data for 2003 on labor cost differences are not available, we assume $\pi_i = 1$.

With the estimation of ω_i we can recover $r_i/r^* = 1/\omega_i$. Figure 3 plots the distribution of r_i/r^* when SOEs are compared with FIEs or NSOs.¹¹ When SOEs are compared against FIEs, the rental rate ratio is negative in approximately 50% of the industries. The mean level is 0.024 (median is -0.03), meaning that the average sector have a return to capital of only 2.4% of FIEs. The standard deviation is 1.98, and more than 97% of the industries have a value of r_i/r^* in the range (-4, 4). The distribution of r_i/r^* however overestimates the average rental rate ratio because SOEs revenues and employment is higher in industries with a relatively low rental rate gap. The weighted average of the rental rate gap is 0.09. When SOEs are compared against NSOs, the

¹¹ When SOEs are compared against FIEs we can estimate ω_i for 427 industries. Out of 444 sectors in Mining, Forestry and Manufacturing, I excluded 6 with negative value-added in SOEs or FIEs, 6 where SOEs are non-existent, and 5 where FIEs are non-existent. When SOEs are compared against NSOs, ω_i is calculated for 433 sectors.

distribution is shifted to the right, and r_i / r^* is positive in almost 65% of the industries. The average value is 0.198 (median 0.14), with a standard deviation of 0.75. The weighted value for r_i / r^* is 0.59.

[Insert Figure 3]

For expositional purposes and to avoid dealing with outliers, the rest of the analysis only considers industries with a rental rate ratio in a range within 2 standard deviations from the mean. This excludes 9 sectors from the sample when the comparison is made against FIEs, with a share in total industrial revenues and employment of 2.9% and 1.9% respectively.¹² When SOEs are compared against NSOs, the number of excluded industries is 23. Panel A of Figure 4 plots rental rate differences, i.e., $(r^* - r_i) / r^* = 1 - r_i / r^*$, between SOEs and FIEs against the difference in return on assets. The positive and significant correlation reveals that industries with a greater gap in the return on assets are also industries where the rental rate gap is greatest.¹³ Similar conclusions are obtained when we compare SOEs against NSOs (Panel B), revealing that the estimates of rental rate differences are reasonable.

[Insert Figure 4]

The rental rate gap $(r^* - r_i) / r^*$ shows no significant pattern across sectors with different factor intensities, in concordance with the sectoral distribution of differences in

¹² These sectors are Crude Petroleum and Natural Gas Extraction (0710; -8.4), Mining and Dressing of Chemical Material Ores (1020; 6.6), Other Canned Foods (1459; 4.8), Wood Chips Producing (2012; 7.29), Teaching Models and Realias (2413; -4.5), Clay Bricks, Tile and Construction Block (3131; 27.5), Water Turbine and Auxiliary Equipment (3514; 12.9), Mechanical Curing and Ward Nursing Apparatuses (3685; -8), and Railway Engines and Groups of Power-driven Vehicles (3711; -11.7). Four-digit industry codes and rental rate ratios in parenthesis. In terms of economic relevance, industry 0710 produces 2.4% of industrial output and employs almost 1% of total industry employment. All other industries have minor shares in total output and employment.

¹³ Similar results are obtained if $(r^* - r_i) / r^*$ is plotted against the gap in the return to equity.

profitability between SOEs and FIEs or NSOs, computed as differences in return on assets or equity. There is however a significant association between rental rate differences and SOEs' market shares: The rental rate gap is greatest in those industries in which SOEs market share is smallest. This result is stronger at the 2-digit level, which roughly corresponds to 3-digit ISIC classification codes. Figure 5 plots SOEs/NSOs rental rate ratio (r_i / r^*) against NSOs' market share, confirming that the capital return gap is greater in sectors where SOEs' penetration is small. A similar result holds when we compare SOEs against FIEs. Likewise, the rental rate gap is lowest in industries where SOEs' production is larger. In other words, rental rate differences are larger in industries where SOEs' revenues represent a small share in total SOEs' production. This is observed in Table 3, which reports (r_i / r^*) at the 2-digit level, as well as sector-specific market shares for each firm group and the share of each sectors' revenues in total SOEs', FIEs' and NSOs' revenues. This is consistent with the result that the weighted average of (r_i / r^*) is significantly greater than the unweighted value in all specifications.

[Insert Figure 5]

[Insert Table 3]

Industries with greatest penetration of FIEs and highest rental rate gap are textiles, apparel, footwear, furniture, papermaking and paper products, rubber products, transport equipment, computers, and office machinery. This is a very interesting result for two reasons. First, these are the industries with greatest Chinese penetration in world product markets, which is consistent with the evidence presented by Feenstra and Hanson (2004) that China's export performance is dominated by foreign-owned enterprises. The penetration of SOEs in these sectors is negligible. Second, the negative correlation

between rental rate differences and SOEs' market share suggests that FIEs have displaced SOEs in industries where the cost disadvantage of the latter is greatest. The policy of granting SOEs preferential access to the credit market has not biased the production structure of the state-owned sector toward industries with greatest rental rate differences, at least by 2003.

4.2 Quantifying the deadweight loss

The existence of cross-firm differences in capital returns reveals that Chinese industrial output would be enhanced by a reallocation of capital from low to high return-to-capital firms. As long as domestic wages are set by the competitiveness conditions of high-productivity firms in a multi-sector environment, the deadweight loss associated with capital subsidies is adequately measured by the output gains of shifting SOEs' capital (assets) to high-productivity firms with a capital return equal to r^* . The output gain, expressed as percentage of total industrial revenues, can be expressed as:

$$\hat{y} = \phi^s \cdot \sum_i \phi_i^s \cdot \left(\frac{r^* - r_i}{r^*} \right) \cdot \theta_{Ki}^* \cdot \frac{K_i^s}{K_i^*} \cdot \frac{Q_i^*}{Q_i^s}, \quad (9)$$

where ϕ^s is the share of SOEs' revenues in total industrial revenues, ϕ_i^s is the share of SOEs' revenues in industry i in total SOEs' industrial revenues, K stands for total capital (assets) and Q stands for total output (revenues). The * sign represents FIEs or NSOs depending upon the benchmark used to compare SOEs with. Expression (9) can be considered a lower bound for the output gains of factor reallocation because it rules out the possibility of factor movements across industries. This is because the empirical estimation is silent regarding factor price distortions across sectors.

Computing (9) yields a deadweight loss of 7.3% of total industrial production if the opportunity cost of capital in SOEs is adequately represented by the return to capital in FIEs, and 5.5% the return to capital in NSOs is used as benchmark.¹⁴ The difference is explained by the higher return to capital in FIEs compared to other non-state-owned domestic enterprises. Figure 6 plots the cumulative gain in industrial output following the reallocation of assets from SOEs to FIEs within sectors. For the sake of presentation, we exclude those industries with extreme factor returns. Overall, the output gains from factor reallocation are evenly distributed across sectors, reflecting the negative correlation between capital return differences and SOEs' assets. The only exception is industry 3721 (Integrated Automobiles). With a value for r_i/r^* of -0.16 and a share of 8.1% of total SOEs' industrial revenues, it explains 1.5 percentage points of the deadweight loss.

[Insert Figure 6]

4.3 Decomposing the Rental Rate Gap

For expositional purposes, we re-write expression (8):

$$\frac{r_i}{r^*} = \left[\frac{1 - \theta_{Li}^* \cdot \pi_i \cdot (1 + \delta_i) \cdot E_i}{\theta_{Ki}^* \cdot (1 + \delta_i) \cdot E_i} \right].$$

It proves useful to define the “neutral” rental rate gap as the value of r_i/r^* that does not account for differences in relative factor prices, i.e, $\pi_i = r_i/r^*$. The neutral rate, defined as λ_i is equal to:

¹⁴ The gains in industrial output of capital reallocation are 10.9% if we also consider sectors with extreme values for r_i/r^* . The larger gains from factor reallocation are dominated by industry 710 (Crude Petroleum and Natural Gas Extraction), which has a strongly negative capital return and it represents a large proportion of SOEs' assets. It accounts for more than 3 percentage-points of the total gain in industrial output.

$$\frac{r_i}{r^*} = \lambda_i = \frac{1}{(1 + \delta_i) \cdot E_i}. \quad (10)$$

Expression (10) represents the rental rate gap that adequately reflects the productivity gap. The expression does not include any term for sector-specific factor intensities, because these are relevant as long as $\omega_i \neq 1$. If $\omega_i \neq 1$ the rental rate gap depends upon the degree of integration in the labor market, measured by π_i . For example, with a relatively integrated labor market, i.e., $\pi_i \cdot (1 + \delta_i) \cdot E_i > 1$, the ratio of capital returns is lower than (10), meaning that SOEs' capital return absorbs a larger part of the burden of the productivity disadvantage compared to the wage rate. The impact of cross-firm differences in factor prices on r_i / r^* depends upon factor intensities. A high relative cost of labor has a greater negative impact on the profitability of productivity-backward SOEs in labor-intensive sectors.

To distinguish both components of rental rate differences, we estimate productivity differences between SOEs and non-state-owned producers within each sector. For that, we plug the estimates of ω_i into (6) and (6') to obtain sector-specific estimates for $l_i(\omega_i)$ and $k_i(\omega_i)$, which are used to compute $\chi_i(\omega_i)$. From (5) we recover the productivity term $(1 + \delta_i) \cdot E_i$. This procedure is only possible in those industries with $\omega_i > 0$. If the return to capital consistent with zero profits in SOEs is negative, the Taylor expansion of FIEs' and NSOs' isoquants for changes in relative factor prices is meaningless. Therefore, the term $\chi_i(\omega_i)$ can only be computed in industries where SOEs

face a positive wage-rental rate ratio.¹⁵ This is a restriction of the analysis, as we exclude from the analysis about 50% of the sectors when SOEs are compared with FIEs and about 35% of the industries if SOEs are compared against NSOs. However, these sectors represent a relatively small share in total SOEs' revenues.

Table 4 reports the rental rate gap between SOEs and both benchmarks for industries with $r_i / r^* > 0$. The first column compares SOEs and FIEs (204 sectors), the second column compares SOEs and NSOs (265 sectors), while the last two columns report the results for the common sample of industries in which the SOEs/FIEs and the SOEs/NSOs profitability gap is positive (185 sectors). Interestingly, we observe a significant convergence in the rental rate gap in both benchmarks, revealing that within the sample of industries with $r_i / r^* > 0$ FIEs and NSOs do not differ significantly in their average capital return, in contrast with evidence of the whole sample. The median rental rate gap is 0.36 when SOEs are compared against FIEs and 0.35 when SOEs are compared against NSOs.¹⁶ A comparison of median values for r_i / r^* in the common sample reveals that SOEs perform only slightly better when compared with NSOs than with FIEs.

[Insert Table 4]

The productivity gap $(1 + \delta_i) \cdot E_i$ is greater than one in almost all industries, confirming that SOEs have low productivity compared to FIEs and NSOs. Second, the

¹⁵ As discussed by Sinn (2002), high-enough productivity differences combined with capital subsidies can yield a negative gross cost of capital. This encourages the use of capital until its marginal productivity of capital is negative, and this is accompanied with a higher employment level. Because of the factor price distortion, the greater usage of labor is not associated with higher output, meaning that measures of average labor and capital productivity overestimate the true TFP gap. This explains why differences in average factor productivity might be bad predictors of total-factor-productivity differences.

¹⁶ I focus on the median rather than the average values because of the high standard deviation of r_i / r^* . However, none of the implications change significantly if we focus on average values.

productivity disadvantage of SOEs is similar when the comparison is made against FIEs and NSOs, confirming that within the restricted sample of $r_i/r^* > 0$, FIEs and NSOs do not differ significantly. The productivity gap between SOEs and non-state producers vary between 1.6 and 1.7, suggesting that the neutral rental rate gap is about 0.6. The lower profitability of SOEs is consequence of pressures toward labor cost equalization from labor market integration, which imposes most of the cost of productivity differences in the return to capital. Figure 7 plots for the SOEs/FIEs comparison r_i/r^* against the “neutral” rental rate gap λ_i in increasing order of r_i/r^* . Rental rate differences are mainly explained by productivity differences, and the bias in the profitability gap induced by sectoral differences in factor intensities has a secondary effect on r_i/r^* . (Similar conclusions are obtained for the SOEs/NSOs comparison.) For productivity-backward SOEs (those with $r_i/r^* < 1$), the high gross wage-rental rate ratio lowers the capital return beyond the level mandated by productivity differences, and the return to capital is lower compared to its neutral rate.

[Insert Figure 7]

When SOEs are compared against FIEs, the median level of r_i/r^* is 0.36 (average of 0.58), while the median value for λ_i is 0.60 (mean of 0.72), meaning that labor market integration lowers the gross return to capital in SOEs between 20% and 40% of the neutral level. As expected, this difference is higher in labor-intensive sectors. Figure 8 plots $\lambda_i - (r_i/r^*)$ against capital share in value-added. The negative and significant correlation reveals that the negative impact on capital return of labor market integration is greater in labor-intensive industries. For productivity backward SOEs

(those with $\lambda_i - (r_i/r^*)$ greater than zero), this bias could be as high as 50% of the foreign return to capital, and the average bias is 20% of r^* (median of 22%).

[Insert Figure 8]

A variance decomposition of r_i/r^* , i.e., $Var(r_i/r^*) = Var(\lambda_i) + Var(\lambda_i - (r_i/r^*)) - Cov(\lambda_i, \lambda_i - (r_i/r^*))$, reveals that 45% of the variance is explained by its neutral component λ_i , 13% by factor-price distortion component $\lambda_i - (r_i/r^*)$, and 42% by the covariance between both components, which is equal to -0.08. The negative and significant correlation between λ_i and θ_{Ki}^* in industries with $r_i/r^* < 1$ confirms that productivity differences are slightly greater in capital-intensive sectors, a finding consistent with the results reported in Claro (2005b) for the mid 1990s. Overall, there is no clear pattern of rental rate differences across sectors with different factor intensities, revealing that the negative impact on rental rates of productivity differences in capital-intensive sectors is compensated with a negative effect on rental rates of high relative labor costs in labor-intensive sectors.

Productivity differences can be further decomposed into its technology component $(1 + \delta_i)$ and the scale component E_i . Following Antweiler and Trefler (2002), we consider the following function for the scale effect: $E_i = (Q_i/Q_i^*)^{-\alpha_i}$ where Q_i refers to SOEs' revenues, Q_i^* refers to FIEs' or NSOs' revenues, and α_i is a scale parameter, with $\alpha_i > 0$ if there are economies of scale and $\alpha_i < 0$ if there are diseconomies of scale. If $\alpha_i = 0$ there are no scale effects and all productivity differences should be attributed to technology. We assume that the scope of the scale effects is limited by the ownership structure, so SOEs' productivity depends upon SOEs' output. Similar for FIEs and NSOs.

Antweiler and Trefler's estimates of α_i are for 3-digit ISIC categories, and we map them into 4-digit Chinese industry classification assuming that all 4-digit sectors that belong to the same 3-digit ISIC classification have the same scale parameter. Plugging (6) and (6') into (1) and (2) we obtain measures of the exogenous technology parameters δ_{Li} , δ_{Ki} and $(1 + \delta_i)$. The distributions of E_i , $(1 + \delta_i)$, δ_{Li} and δ_{Ki} are also reported in Table 4.

Technology differences have a clear capital-saving pattern ($\delta_L > \delta_K$), meaning that at similar relative factor prices, SOEs tend to choose a higher labor-capital ratio. This explains why SOEs' assets per worker are similar to those of FIEs and NSOs in spite of facing higher relative cost of labor. Also, the technology gap $(1 + \delta_i)$ is significantly greater than one in most industries, meaning that SOEs have lower technology than FIEs. Overall, the scale effect plays a secondary but non-negligible role in explaining both the size and sectoral distribution of the productivity gap, and it favors the non-state-owned sector due to the relatively low penetration of SOEs in IRS industries (see Figure 9). The higher penetration of the non-state-owned sector in IRS industries explains a small part of the average profitability gap of SOEs. On average, the rental rate gap between SOEs and the non-state sector that would prevail if scale effect were the only determinant of profitability differences would be about 0.92 (=1/1.09). This might explain a slow convergence of rental rates between SOEs and the non-state sector in spite of important reforms to SOEs. The possible technology gains by SOEs may have been countervailed by increasing integration in labor markets on the one hand and by increasing penetration of non-state-owned firms in IRS industries on the other hand.

[Insert Figure 9]

5. Conclusions

The capital return in the state-owned industrial sector in China is significantly lower than in non-state-owned firms. Aware of the uncompetitive position of SOEs, the government has granted SOEs capital subsidies to compensate for the gross rental rate gap and to assure net rental rate equalization. Also, it has promoted management and corporate governance reforms in order to improve SOEs productivity. The rental rate gap is large on average, and it is higher in sectors where SOEs' market share is relatively small, suggesting that the capital subsidy policy has not avoided the shrinkage of the most uncompetitive SOEs. Capital subsidies introduce factor price distortions across firms that impede the allocation of capital to the most profitable projects. We estimate that the deadweight loss of factor misallocation is between 5% and 8% of total industrial output. In other words, China's industrial output would be enhanced between 5% to 8% following the removal of capital subsidies.

The size of the rental rate gap is mainly determined by the technology disadvantage of SOEs. On average, technology differences mandate a ratio of state-owned to non-state-owned capital return about 66% that is equivalent to saying that it contributes to about 35 percentage points of the rental rate gap. However, rental rate differences also reflect the impact of a relatively high degree of labor market integration. Pressures toward labor-cost equalization between SOEs and the non-state sector introduce a higher burden on the return to capital compared to the scenario in which the productivity gap is evenly distributed across factors. This effect explains on average about 15 to 20 percentage points of the rental rate gap. The higher relative cost of labor widens the rental rate gap in labor-intensive sectors. However, productivity differences

are slightly higher in capital-intensive sectors. These two effects compensate each other, and there is no clear pattern of rental rate differences across sectors with different capital-intensities. Finally, the higher penetration of non-state-owned firms in increasing-return-to-scale sectors contributes to raising on average the rental rate gap in about 10 percentage points.

Although SOEs reforms may have contributed to rental rate convergence by improving their technology, high non-wage benefits in SOEs and the penetration of non-state firms in IRS industries play an offsetting effect on SOEs' capital return. The burden on the financial system of the capital subsidy policy, which represents between 1.5% and 3% of total assets of the financial system, is expected to increase with the opening of domestic product markets to non-state-owned producers, specially FIEs, unless technological improvement by SOEs are substantial or unless the burden of non-wage benefits is relaxed.

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Table 1
 Summary Statistics
 China Industry 2003
 Overall Data

Variable	Units	Sub-sector		
		Mining and Forestry	Manufacturing	Electricity and Heating Production and Supply
Number of 4-digit sectors	#	18	428	8
Total Number of Firms	#	6,459	174,542	7,750
Total Number of Employees	#	5,153,781	46,336,935	2,990,394
Total Revenue	Mil. RMB	649,213	11,865,438	1,177,843
Total Value Added	Mil. RMB	381,885	3,264,978	375,760
Total Profits	Mil. RMB	143,063	594,033	66,129
Total Assets	Mil. RMB	1,131,324	12,062,722	2,804,291
Total Equity ^a	Mil. RMB	594,352	4,923,737	1,087,690
Average Return on Assets ^b	%	12.65	4.92	2.36
Average Return on Equity ^c	%	24.07	12.06	6.08
Average Labor Productivity	Value-added per worker (000s RMB)	74.10	70.46	125.66
Average Assets Productivity	Value-added per assets (000s RMB)	337.56	270.67	133.99
Average Labor Productivity	Revenues per worker (000s RMB)	125.97	256.07	393.88
Average Assets Productivity	Revenues per assets (000s RMB)	573.85	983.65	420.01

Source: China Markets Yearbook 2005

Notes:

a: Equity = Assets minus Debt

b: Profits / Assets

c: Profits / Equity

Table 2
 Summary Statistics
 China Industry 2003
 By Type of Firm

Variable	Unit	Mining and Forestry				Manufacturing				Electricity and Heating Production and Supply			
		SOEs	FIEs	COEs	Other	SOEs	FIEs	COEs	Other	SOEs	FIEs	COEs	Other
Total Number of Firms	#	1,305	127	1,787	3,240	15,263	37,231	19,225	102,823	5,275	398	330	1,747
Total Number of Employees	000s	1,603.9	19.4	494	3,036.5	5,791.4	12,253.5	4,027.4	24,264.7	2,124.7	132.3	44.5	688.9
Total Revenue	Mil. RMB	104,614	16,831	45,679	482,088	1,220,088	4,109,516	759,373	5,776,461	775,085	123,984	10,579	268,195
Total Value Added	Mil. RMB	49,474	14,379	17,972	300,060	417,251	1,054,755	217,084	1,575,887	203,457	62,566	4,022	105,715
Total Profits	Mil. RMB	6,343	6,778	4,003	125,938	46,961	239,599	36,623	270,850	20,988	23,322	672	21,147
Total Assets	Mil. RMB	258,677	14,898	32,387	825,362	1,933,248	3,517,951	595,263	6,016,260	1,683,004	284,985	24,321	811,981
Total Equity	Mil. RMB	112,662	11,114	13,695	456,881	691,659	1,547,214	226,505	2,458,360	639,043	144,422	10,927	293,299
Average Return on Assets	%	2.45	45.50	12.36	15.26	2.43	6.81	6.15	4.50	1.25	8.18	2.76	2.60
Average Return on Equity	%	5.63	60.99	29.23	27.56	6.79	15.49	16.17	11.02	3.28	16.15	6.15	7.21
Average Labor Productivity	Value-added per worker (000s RMB)	30.85	740.37	36.38	98.82	72.05	86.08	53.90	64.95	95.76	473.04	90.40	153.45
Average Assets Productivity	Value-added per assets (000s RMB)	191.26	965.15	554.92	363.55	215.83	299.82	364.69	261.94	120.89	219.54	165.37	130.19
Average Labor Productivity	Revenues per worker (000s RMB)	65.22	866.66	92.47	158.77	210.67	335.37	188.55	238.06	364.80	937.39	237.77	389.29
Average Assets Productivity	Revenues per assets (000s RMB)	404.42	1129.78	1410.42	584.09	631.11	1168.16	1275.69	960.14	460.54	435.05	434.96	330.30

Source: China Markets Yearbook 2005

Table 3
Rental Rate Differences and Market Shares
2-digit Mining, Forestry and Manufacturing Sectors
China 2003

Code	Description	r/r^*		Sectoral Market Share (%) ^a			Share in Revenues (%) ^b		
		SOEs/FIEs	SOEs/NSOs	SOEs	FIEs	NSOs	SOEs	FIEs	NSOs
1300	Agricultural and side line food processing	-0.05	0.17	7.1	27.6	92.9	3.4	3.9	5.1
1400	Food producing	-0.01	0.30	6.6	39.0	93.4	1.2	2.1	1.9
1500	Beverage	-0.07	0.32	9.1	31.8	90.9	1.6	1.6	1.8
1600	Tobacco products processing	1.66	1.31	90.7	0.3	9.3	16.5	0.0	0.2
1700	Textile industry	-0.49	-0.16	5.8	23.3	94.2	3.5	4.3	6.6
1800	Textile clothes, shoes and hats	-0.46	-0.64	1.1	47.3	98.9	0.3	3.7	3.0
1900	Leather, furs, feather and related products	0.30	0.16	0.9	52.2	99.1	0.2	2.7	1.9
2000	Timber processing, bamboo, cane, palm fiber and straw products	-0.36	-0.14	5.3	26.5	94.7	0.4	0.6	0.8
2100	Furniture	-0.49	-0.54	1.0	50.6	99.0	0.1	0.9	0.6
2200	Papermaking and paper products	-0.50	0.23	5.5	32.7	94.5	1.1	1.9	2.2
2300	Printing and recording medium duplicating	-0.02	0.50	18.5	34.3	81.5	1.5	0.8	0.8
2400	Cultural, educational and sports articles	0.17	0.11	0.8	59.9	99.2	0.1	1.3	0.9
2500	Petroleum processing, coking and nuclear fuel processing	0.73	0.89	23.6	10.2	76.4	12.2	1.6	4.5
2600	Raw chemical material and chemical products	0.07	0.42	11.1	23.2	88.9	7.9	4.9	7.3
2700	Medical and pharmaceutical products	-1.01	-0.18	7.1	21.0	92.9	1.6	1.4	2.4
2800	Chemical fibre	0.10	0.23	3.1	20.1	96.9	0.4	0.7	1.3
2900	Rubber products	-0.91	-0.53	3.0	39.0	97.0	0.3	1.2	1.1
3000	Plastic products	-0.01	0.02	1.5	43.3	98.5	0.4	3.1	2.7
3100	Nonmetal mineral products	-0.78	0.07	7.0	17.3	93.0	3.1	2.2	4.6
3200	Smelting and rolling of ferrous metals	0.30	0.68	18.9	6.0	81.1	15.9	1.5	7.8
3400	Metal products	0.12	0.22	4.0	36.2	96.0	1.2	3.2	3.3
3500	Ordinary machinery manufacturing	-0.33	0.20	9.0	25.8	91.0	3.9	3.4	4.6
3600	Special equipment	-0.44	0.01	10.3	22.6	89.7	2.9	1.9	2.8
3700	Traffic and transport equipment	-0.83	0.13	18.1	43.2	81.9	15.0	10.7	7.8
3900	Electric machines and apparatuses	-0.15	-0.16	4.7	35.9	95.3	2.9	6.5	6.7
4000	Communication equipment, computer and other electronic equipment	-0.96	-0.98	1.5	78.6	98.5	1.9	30.2	14.6
4100	Instruments, meters, cultural and office machinery manufactures	-0.95	-0.69	3.3	68.7	96.7	0.4	2.5	1.4
4200	Craftwork and other manufactures	0.43	0.40	2.5	39.2	97.5	0.3	1.2	1.1

Notes:

a: 100 x Ratio of revenues of each firm group in total sector-specific revenues

b: 100 x Ratio of sectoral revenues in total revenues for each firm group

Table 4
 Productivity Differences, Technology Differences and Scale Effects
 Mining, Forestry and Manufacturing Sectors with r_i / r^*
 China 2003

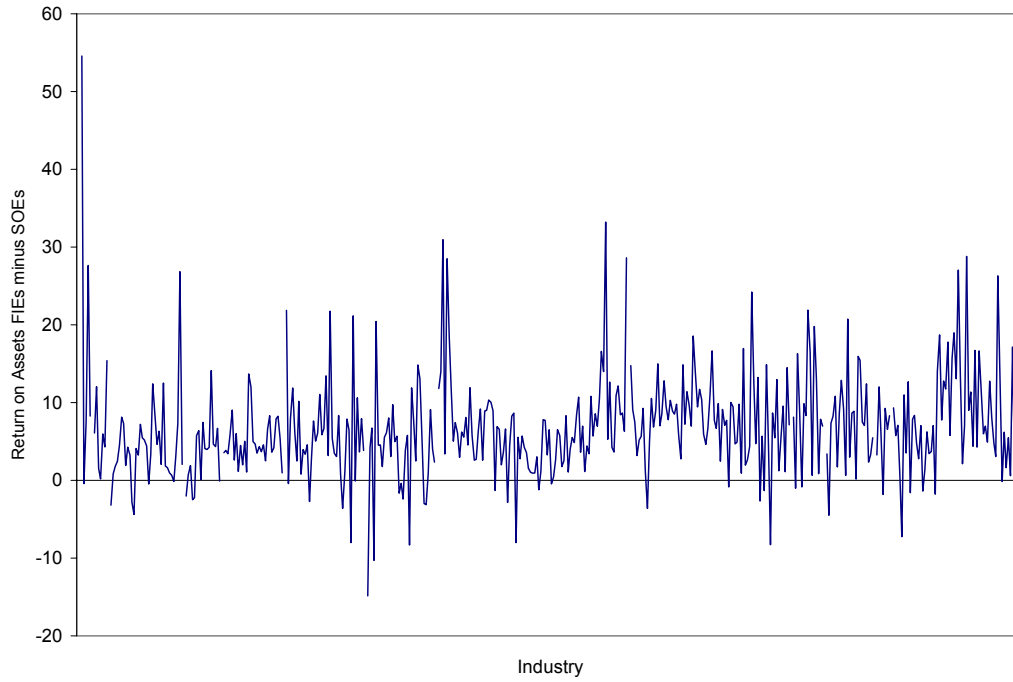
	SOEs/FIEs ^a	SOEs/NSOs ^a	SOEs/FIEs ^b	SOEs/NSOs ^b
# of Sectors	204	265	185	185
r_i / r^*				
Average	0.58	0.42	0.53	0.48
Median	0.36	0.35	0.36	0.45
Standard Deviation	0.62	0.32	0.53	0.30
Maximum	3.81	1.63	3.81	1.33
Minimum	0.00	0.00	0.00	0.00
$(1 + \delta_i)E_i$				
Average	1.77	1.83	1.80	1.68
Median	1.65	1.72	1.67	1.60
Standard Deviation	0.84	0.65	0.80	0.56
Maximum	5.76	4.32	5.76	3.61
Minimum	0.36	0.66	0.36	0.85
$(1 + \delta_i)$				
Average	1.70	1.63	1.72	1.50
Median	1.55	1.55	1.58	1.44
Standard Deviation	0.84	0.62	0.80	0.56
Maximum	5.76	4.32	5.76	3.92
Minimum	0.18	0.33	0.23	0.48
E_i				
Average	1.09	1.16	1.08	1.16
Median	1.00	1.09	1.00	1.07
Standard Deviation	0.25	0.24	0.22	0.25
Maximum	2.21	2.24	2.01	2.19
Minimum	0.40	0.34	0.40	0.34
δ_L				
Average	2.86	2.29	2.88	1.65
Median	1.60	1.60	1.69	1.12
Standard Deviation	4.24	2.69	4.17	2.00
Maximum	32.58	17.61	32.58	13.01
Minimum	-0.91	-0.63	-0.86	-0.63
δ_K				
Average	-0.11	-0.11	-0.07	-0.01
Median	-0.19	-0.13	-0.17	-0.01
Standard Deviation	0.51	0.44	0.52	0.43
Maximum	2.20	1.90	2.20	1.90
Minimum	-0.99	-0.99	-0.99	-0.99

Notes:

a: Includes sectors with $r_i / r^* > 0$ and within 2 standard deviations of the entire distribution of r_i / r^* .

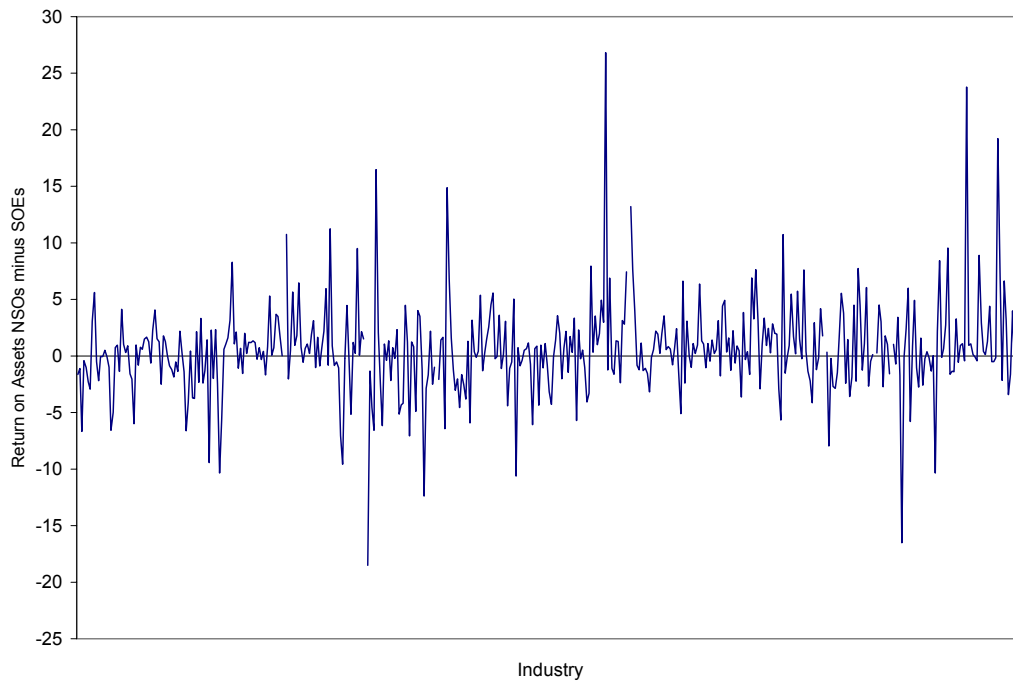
b: Includes sectors with $r_i / r^* > 0$ for FIEs and NSOs

Figure 1
Difference in Return on Assets
China Industry 2003
Panel A: FIEs minus SOEs



Note: 440 sectors.

Panel B: NSOs minus SOEs



Notes: 447 sectors.

Figure 2
Assets per Worker in FIEs and US SIC4 capital shares.
China 2003
Mining, Forestry and Manufacturing sectors

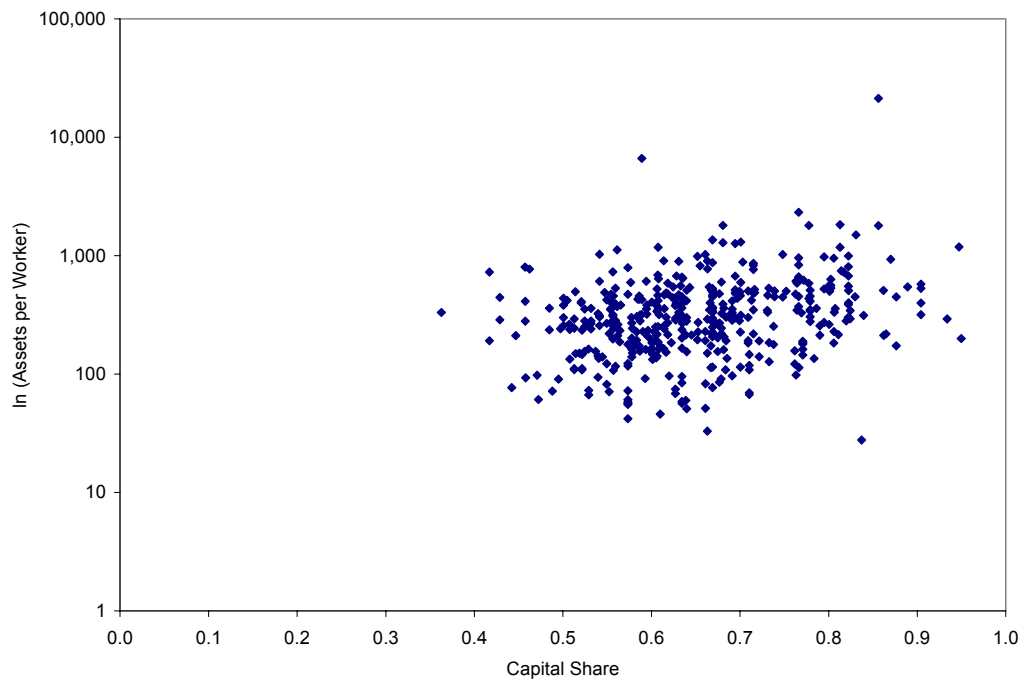
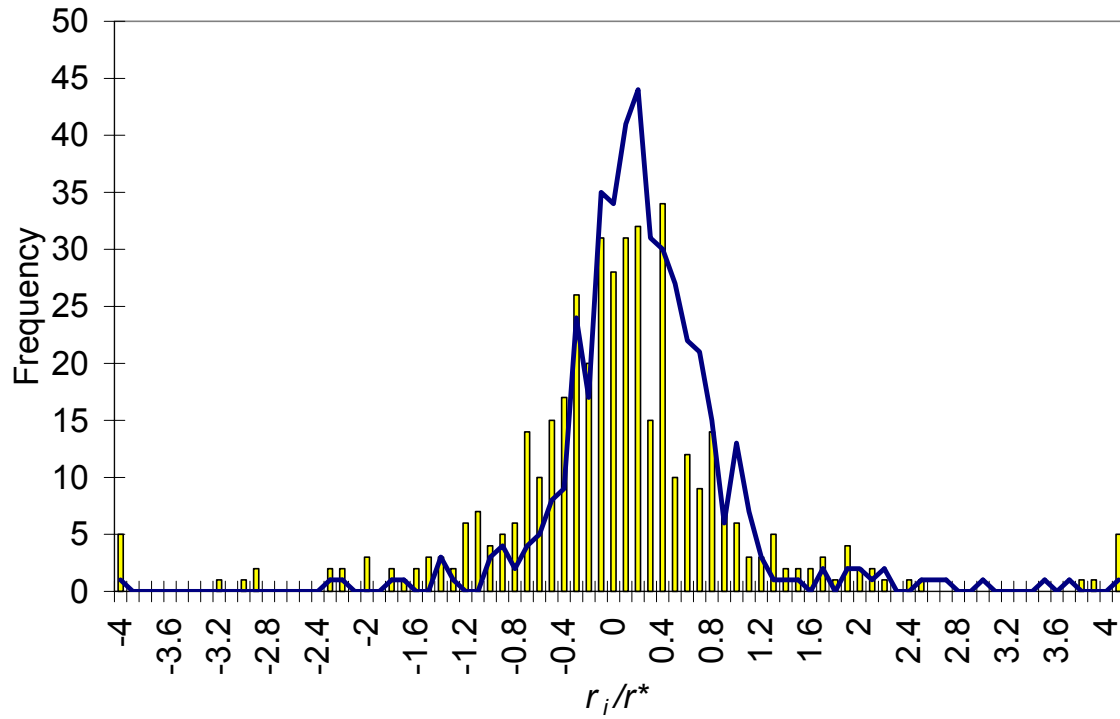


Figure 3
Distribution of Rental Rate Differences (r_i / r^*)
China 2003
Mining, Forestry and Manufacturing sectors



Notes:
Bars: SOEs/FIEs
Solid Line: SOEs/NSOs

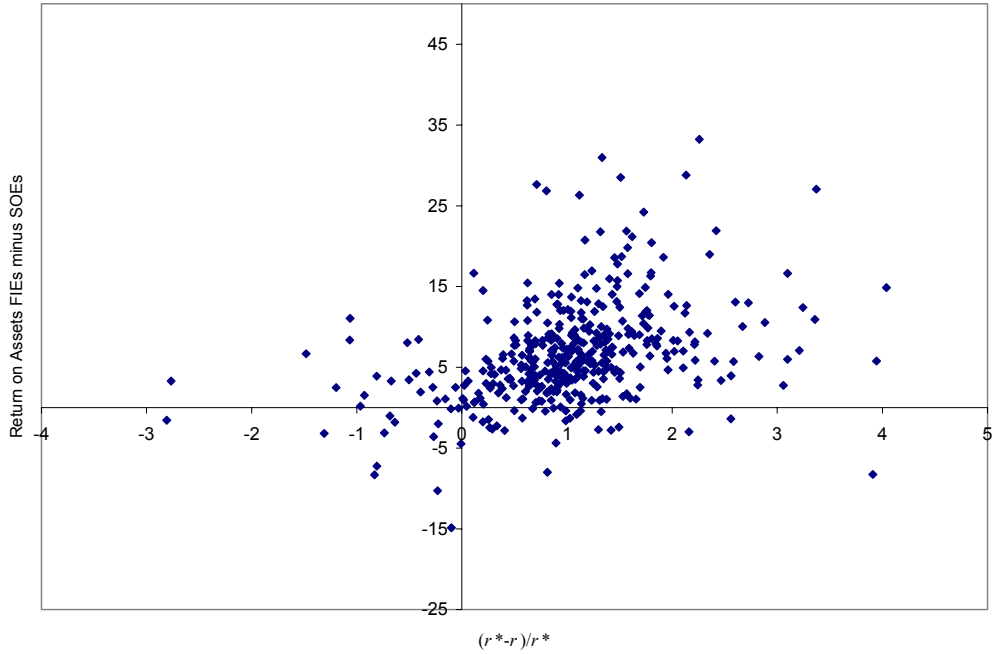
Figure 4

Rental Rate Differences $(r^* - r)/r^*$ and Profitability Differences

China 2003

Mining, Forestry and Manufacturing sectors

Panel A: SOEs against FIEs



Panel B: SOEs against NSOs

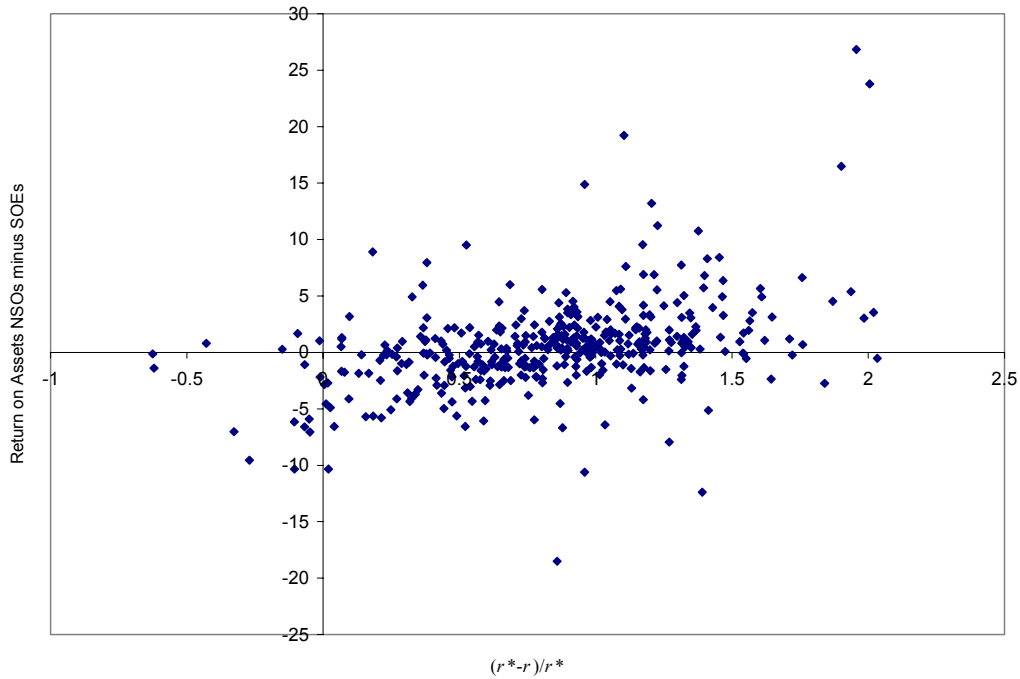


Figure 6
Cumulative Deadweight gains from capital reallocation

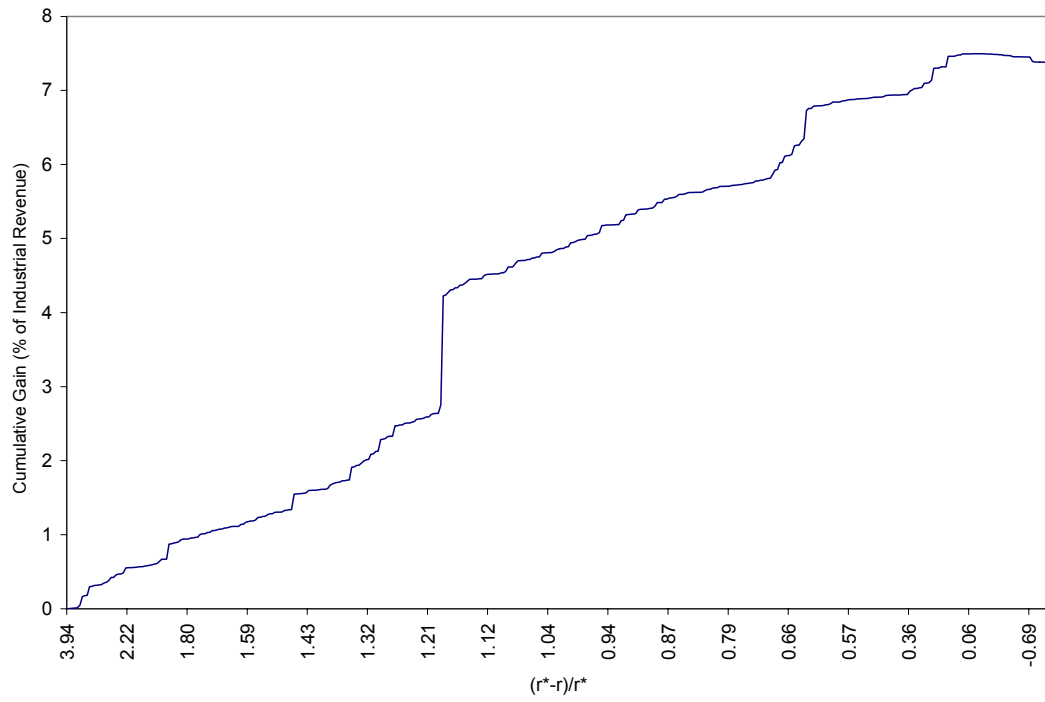
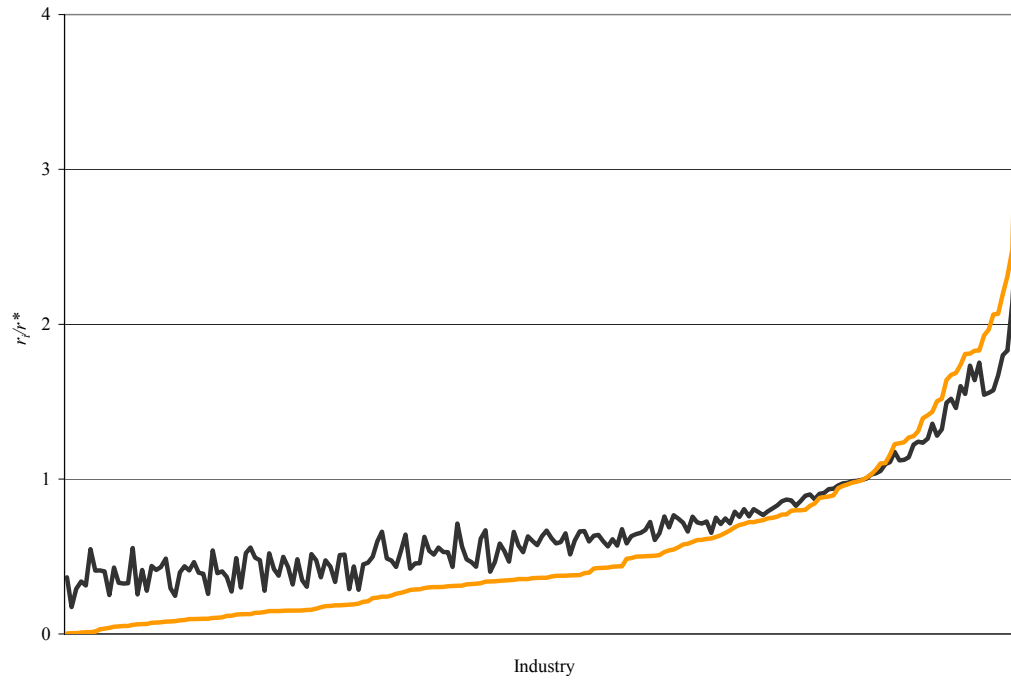


Figure 7
Decomposition of SOEs/FIEs Profitability Gap
China 2003



Note:
Dark Line: Neutral Rental Rate Ratio
Light Line: Observed r_i/r^*

Figure 8
Difference between Neutral and Effective Rental Rate Gap and Factor Intensities
SOEs versus FIEs
Mining, Forestry and Manufacturing
China 2003

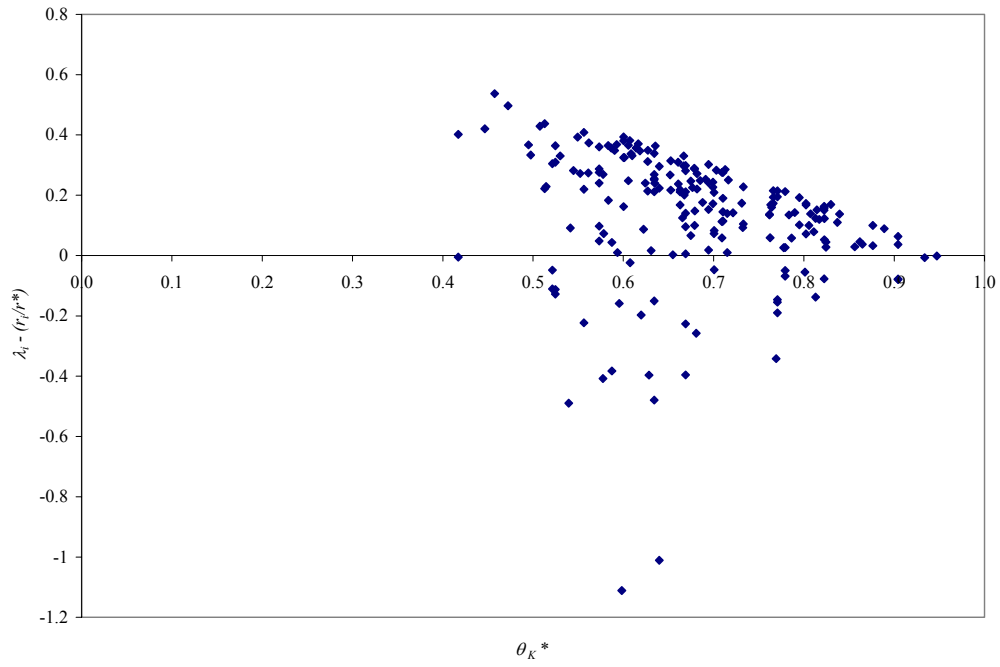


Figure 9
Histogram of Scale Effect E_i : SOEs/FIEs

