The Ownership School vs. the Management School of State Enterprise Reform: Evidence from China

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May 2001

Revised: January 2002

Abstract

There are two schools of thoughts on the important issue of reforming state-owned enterprises (SOEs). We call them the ownership school and the management school. The ownership school argues that the key to the reform is to diversify SOEs' ownership, including privatization, in order to eliminate government control of SOEs. The management school emphasizes the need to improve government's management of SOEs by, for example, granting SOE employees autonomy and profit incentives. Utilizing a data set of 680 SOEs in China, covering the period of 1980 to 1994, we test the relative effectiveness of these two kinds of reform measures. This is possible due to the fact that reform measures based on each of these two schools of thoughts were practised in China. Our results yield strong support for the ownership school while leaving very mixed evidence for the management school. Moreover, we find that the impact of ownership diversification was of the same order of magnitude on the economic performance of state enterprises as that of enhancing product market competition.

Keywords: State-Owned Enterprise, Privatization, Gradual Privatization, Managerial Reform, Enterprise Restructuring, Managerial Autonomy, and Managerial Incentives

1. Introduction

State-owned enterprises (SOEs), which refer to the enterprises with majority government ownership and under direct government control, continue to be difficult targets of reform in many economies under reform. In China, despite of many years of reform, SOEs are still drags on the economy by occupying 70% of bank credits, employing 50% of non-agricultural labor force, but producing less than 25% of total industrial output.[1]

Along with the long and difficult history of SOE reform, there have been continuous debates on strategies of SOE reform in the academic community. In the debates, two schools of thoughts stand out.[2] They have distinct explanations of the sources of the inefficiency of SOEs and the best approaches to reforming them. One school can be called the ownership school. According to this school, SOEs are intrinsically inefficient, since they are controlled by government agencies and government agencies are bad "owners", causing a litany of bad SOE behavior. One underlying theory of the ownership school is that government agencies have multiple objectives. Social efficiency or social welfare might be one of them, while taxation and employment are often other objectives. Having such complicated objectives, it is often argued, government agencies are incompetent owners of SOEs.

Thus, the key of the SOE reform, according to the ownership school, is to separate the government from the SOE. Privatization, broadly defined as a way for the

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[1] Although we are mostly concerned with SOE reform in transition economies, the same issue is also of great importance in OECD countries. The discussions on SOEs in OECD countries can be found in Toninelli (2000).

[2] In addition to the two schools of thought, it is often argued that enhancing product market competition is an important measure to reform SOEs. We focus on the ownership school and the management school, since we believe that they are concerned with internal and fundamental changes in SOEs. Improved product market competition or, in general, better market environment is important for improving SOE performance but they are external to SOE organizations and cannot be fundamental means to resolve the SOE problem. This is why we treat the extent of product market competition as a control variable in our empirical tests.

government to retreat from controlling SOEs, is essential to achieve this goal. Many economists have long articulated the views of this school. For example, in his analysis of the former socialist systems, Kornai (Kornai, 1992) has maintained that the root problem of the inefficiencies of socialism and of state enterprises is bureaucratic control. Similarly, Shleifer and Vishny (1994) blame politicians' influence of enterprise decisions for the inefficiency of state enterprises.

The other school believes that nothing is intrinsically inefficient with SOEs. SOEs are no difference from those listed companies in market economies, such as IBM, with widely spread public ownership. The reason that SOEs are inefficient, according to this school, is because the government as the largest shareholder has not been effective in managing its investment. Therefore, the solution to the SOE problem is to improve government's management of SOEs. Possible measures include granting SOE managerial autonomy and linking the bonus of SOE managers and employees to the SOE performance. We call this the management school. It should be noted that in this school of thinking, by management, it refers to the government-enterprise relations, rather than managerial efficiency within the enterprise. The SOE is traded as a unit and how the government manages the SOE is the key issue.

There are many lines of theories that may support the management school. Two stand out most prominently: theories of decentralization and the principal-agent theories. Theories of decentralization argue for the benefit of decentralization or delegation by granting a degree of autonomy to lower level agencies. One of such benefits is better utilization of local information. In the context of SOEs, the implication is that government agencies have had too tight control of SOE employees. To improve efficiency, granting more autonomy to SOE employees including managers is useful. According to the principal-agency theories, government agencies are principals while

SOE employees are agents. In order to motivate the agent to pay effort to improve the performance of the SOE, the principal needs to provide incentives. One way is for government agencies to share SOE profit with SOE employees.

The theoretical underpinning of the ownership school can be found in many political economy analyses of the government and the policy making process. A common scenario of such analyses is that government officials care about their own personal benefits, pecuniary or non-pecuniary, and are subject to influences of various pressure groups in the economy. Grossman and Helpman (1994 and 1995) provide a rigorous analysis of such a set-up. Given that the lobbying process tends to favor those pressure groups who have better access to the government officials, one cannot expect that final amount of contributions to government officials are of the same proportion to the pressure groups' economic interests. Meanwhile, government officials make decisions based on the total size of contribution. The equilibrium of the political influence game is that government officials make policy decisions as if they are after a distorted social welfare function. Alternatively, government officials could be perceived as maximizing social welfare plus a non-social-welfare related objective.

Despite the long-standing and sharp division between the two schools of thoughts on SOE reform in their theoretical underpinning and policy recommendation, there has been little empirical research aiming to directly test the validity of the two theories. Instead, most of existing empirical research has been embedded in one of the two schools. For example, Barberis, et al (1996) test the mechanism through which privatization of Russian shops improves efficiency. Frydman, et al. (1999) are also concerned with the impact of privatization on firm's performance. On the other hand, Groves, et al. (1994 and 1995) examine how granting autonomy and profit incentives to SOE managers improves SOE's performance and how improving managerial incentives helps improving

SOE's efficiency. Li (1997) measures how managerial reform and increased market competition enhance enterprise efficiency. While testing the importance of managerial reform, Groves, et al. (1994 and 1995) and Li (1997) do not consider that of ownership changes.

The purpose of this chapter is to empirically test the two schools of thoughts of SOE reform. We are able to do so by utilizing a unique data set on China's SOE reform where both ownership reform (although marginal) and managerial reform have been implemented. The data set tracks 680 Chinese state-owned enterprises in a period of 15 years from 1980 to 1994. Departing from the large amount of empirical research on China's SOE reform, we observe and document the fact that during this 15-year period, both managerial reforms and ownership reform were implemented in China. Ownership reform in China was not in the form of a large-scale and thorough privatization. Instead, ownership changes in Chinese state enterprises came about by introducing non-government sources of investment funds. State enterprises were allowed to raise investment funds from their employees, foreign investors, non-state enterprises, and outside individual investors. As a result, state enterprises in China have undergone steady changes in ownerships over time. The state ownership has been gradually diluted while the non-state owners penetrated into the enterprises. Meanwhile, managerial reforms were also implemented concurrently. Through observations of enterprises undergoing both kinds of reforms, we are able to evaluate the relative importance of each kind of reforms.

In the next section, we discuss the institutional changes in China's enterprise reforms. Section 3 will discuss the dataset and the research methodology. The results are reported in Section 4, which is followed by concluding remarks.

2. The Evolution of China's State Enterprise Reform

In comparison with other transition economies, China not only has had one of the longest histories of state enterprise reform but also has experimented a variety of measures of reform in the process. The entire period of state enterprise reform can be roughly divided into three stages. The first stage of the reform, which lasted the whole 1980's, espoused the thinking of managerial school of reform and implemented many interesting reform measures. The most common form is the so-called contract responsibility system, in which SOE managers or the entire employees of an enterprise were asked to sign performance contracts with the supervising government agencies. By the early 1990's, such reforms ran into serious trouble and stalled gradually due to wide spread renegotiation of government-enterprise contracts.

The second stage of China's state enterprise reform was implemented in the first half of the 1990s, aiming at separating SOEs' daily management from direct government control. The objective is that government agencies should not issue administrative commands to SOEs. To implement that measure, many SOEs were incorporated as independent legal entities. As a result, the government agencies that had been the supervisors of SOEs became SOEs' equity holders.

While the intellectual thinking behind this stage of reform is still the managerial school, corporatization opens up avenues to diversify the ownership structure of SOEs. Although privatization of entire enterprise was not allowed, it is possible for other types of investors to hold equity shares of the SOEs. As a result, the equity structure of an enterprise changed gradually with government agencies owning less than 100% shares. It only diversifies ownership structure in the incremental part of an SOE assets rather than selling existing stock of assets to non-government investors. Thus, incidentally, the second stage of the reform actually started the process of ownership diversification of

China's SOEs. This is a point that is often neglected by observers of China's SOE reform and other transition economies.

The third stage of China's state enterprise reform involves extensive ownership changes. By the mid 1990s, many SOEs ran into serious financial difficulties and the urgency of the enterprise reform has become increasingly acute. Building upon lessons from previous two stages of reform, the Chinese government began to formulate policies that amounted to privatization or liquidation of some of the state enterprises.

China's long history of state enterprise reform provides the best opportunity to tests the two competing schools of thought of state enterprise reform. Not only that different enterprises have undergone different reforms it is also true that by often times in one state enterprise, different reform measures have been imposed at the same time.

3. Data and Methodology

3.1. The Data

The data set we use is unique in the sense that it covers all three stages of the reform. It is based on two surveys of 680 state enterprises covering the period of 1980-1994. The first survey was conducted in 1990 by a research team consisting of economists from the Chinese Academy of Social Sciences (CASS), Oxford University, and the University of Michigan. The survey gathered enterprise information from 1980 to 1989. The second survey was implemented in 1995 by researchers from the CASS and the University of Michigan and collected information on the same group of enterprises from 1990 to 1994. The data covers four provinces, including Jilin, Jiangsu, Shanxi, and Sichuan, representing four geographical of regions of economic development in China. (Northeast, East, North, and West). The sample SOEs come from 39 industries, which we grouped into five major industrial categories: mining and utility, heavy manufacturing,

chemical, light manufacturing, and others. Unlike surveys of the state enterprises conducted by government agencies, the two surveys were carefully designed and pilot tested by economics researchers. The data set contains detailed information on the operations and financial information of the SOEs in the sample. It also contains qualitative information from the senior managements of the SOEs. The first part of the dataset was widely used in studies such as Groves, et al. (1994 and 1995) and Li (1997).

The criterion of selecting the sample was to represent the population distribution of SOEs in each of the surveyed provinces in 1990. However, given that it was much easier for the surveyors to obtain valid response from large and medium SOEs --- such firms were under tighter government control and were more responsive to requests of cooperation from the local government, the actual sample of valid data is biased towards these two types of SOEs. The same can be said about the second survey, since the overall structure of Chinese SOEs did not change radically between 1990 and 1994.

3.2. The Design of the Econometric Test

We adopt the program evaluation approach to test the propositions based on the two schools of the enterprise reform. That is, we include in our empirical model two sets of proxies that represent the measures for managerial reform and ownership reforms respectively to see how these proxies can explain variances in the performance of state enterprises. Specifically, the econometric model we use is as follows:

$$y_{it} = f_i + \alpha_m\, m_{it} + \alpha_o\, o_{it} + \alpha_z\, z_{it} + \varepsilon_{it} \qquad (1)$$

where:

y_{it} : a measure of the performance of the enterprise i at time t;

f_i : the firm specific fixed effect variable which is not observed;

m_{it} : a vector of measures of the managerial reform applied to firm i at time t;

o_{it} : a measure of ownership changes at firm i at time t;

z_{it} : a vector of control variables at firm i at time t;

ε_{it} : the error term.

Measuring Enterprise Performance y_{it}

For the performance measure y_{it}, we use two alternative approaches. The first is to measure the total factor productivity (TFP) of the enterprise.[3] The TFP is an accurate measure of a firm's production efficiency, since it measures the relationship between a firm's input and output after taking out any effects of price changes. Indeed, it has been the most popular measure of SOE performance. However, a drawback of the TFP as a performance measure is that it does not take into account changes in the behavior of the firm. It is because the TFP is based on production function of a firm. Under the assumption of profit maximising managers, other things being equal, a higher TFP means higher efficiency. This assumption is acceptable for modern enterprises in mature market economies. For state owned enterprises, which have non-profit objectives, it is possible that a higher TFP may induce a lower efficiency and more waste of resources. Bai, Li, Wang (1998) have a simple model to illustrate this possibility. Here for the purpose of comparison with previous work, we use the TFP as a measure of SOE performance.

The TFP can be obtained by regressing the real output on real inputs such as capital, labor, and raw materials. After obtaining the TFP of a firm of each year, we use model (1) to evaluate the impact of each reform measures. Equivalently, we can combine the two steps by doing the following regression:

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[3] The TFP is defined as the portion of a firm's real output (i.e., the value of output divided by accumulated inflation from a base year) that is not explained by real inputs, including labor, capital, and raw materials.

$$\text{Log}(Y_{it}) = f_i + \alpha_m m_{it} + \alpha_o o_{it} + \alpha_z z_{it} + \beta_l \log(L_{it}) + \beta_2 \log(K_{it}) + \beta_3 \log(M_{it}) + \eta_{it} \quad (2)$$

where:

Y_{it} : real output;

L_{it} : size of labor force the enterprise;

K_{it} : capital of the firm;

M_{it} : raw material;

η_{it} : the error term;

the TFP refers to the whole term $f_i + \alpha_m m_{it} + \alpha_o o_{it} + \alpha_z z_{it} + \eta_{it}$.

Given that the TFP may not be an appropriate measure of SOE performance, we also use an alternative measure of enterprise performance. It is called the gross rate of return on assets (GROR). The GROR is constructed as before-tax profit based on market prices divided by the total net asset value of the firm. The before tax profit is calculated by adjusting all raw material and output prices to market prices and then dividing all by economy-wide inflation rate. In addition, wage rates are adjusted by weeding out extra bonuses, which were returns to employees' de facto control rights of the state enterprise and should be excluded from normal wage costs. The net asset value is adjusted by perpetual inventory method and by deflating the nominal value of investment of each year.

The GROR based on market prices captures the total return to one unit of investment available for division among the stakeholders. The stakeholders of an SOE include employees, banks, government agencies, and other investors. Thus, the GROR is a composite index of the economic efficiency of an enterprise incorporating many factors. An improvement in the behavior of SOE managers should be reflected in the GROR. A higher TFP coupled with profit maximizing decisions of an SOE also increases the GROR. Thus, it should be more accurate than the TFP. It is also more accurate than

accounting profitability of the enterprise, since the latter is subject to changes in bonuses paid to SOE employees.

As will be shown later, indeed, in the sample, TFP and GROR are very different measures of SOE performance since the statistically correlation between these two is very small.

Measuring Managerial Autonomy and Incentive m_{it}

We follow Groves, et al. (1994) in measuring managerial autonomy and incentive m_{it}. For managerial autonomy, they used a dummy variable $auto1_{it}$ that is equal to 1 if for firm i by year t, according to the interview with the director of the SOE, the director had obtained production autonomy. That it, if $auto1_{it}=1$, then by year t, the director of SOE i was already able to decide on what to produce and how much to produce. Alternatively, we also use $auto2_{it}$ equalling to the percentage of the enterprise's output sold to market in total output. The rest of the output was turned to the government at planned price.

As the measure of incentive, we use the sum of the two contractual rates of profit retention. The first is the pre-agreed rate of profit retention for the SOE and other is the rate of profit retention if the total profit is beyond a pre-determined level. We used the sum of these two since when the total profit is high, it is the expected rate of profit retention. This is consistent with Groves, et al. (1994).

Measuring Ownership Diversity o_{it}

The index of ownership diversity o_{it} is meant to capture the percentage of non-government shares in the enterprise's total capital stock. For this purpose, we construct two series of capital stock for each enterprise. One is the total capital stock constructed

by the perpetual inventory method as in the case of K_{it} in the production function. The other is the capital stock constructed similarly by only using each year's investment from non-government sources. The ratio of the second capital stock to that of the first one constitutes the ownership diversity index o_{it} which falls between 0 and 1.

By non-government sources of investment, we include investments from collective enterprises, foreign enterprises, employees of the enterprises, etc. The common feature among the diverse forms of the non-government investments is that the investors are much less likely to pursue non-economic objectives as the supervising government agencies of the SOEs. This way, having accumulated non-government sources of investments, in essence changes the ownership composition of the SOE. This is why we use the index o_{it} to capture the extent of ownership reform.

According to the ownership school, when the SOE ownership is diversified, there are many behavioural consequences for the SOE, some of which improves efficiency, while others do not help. Theoretical works of the ownership school do not seem to have consensus on the detailed behavioural changes but they all agree that the net impact should be positive. Here we do not focus on the behavioural consequences and directly test the net and final impact of ownership diversification on the SOE performance, on which the ownership school has a clear prediction.

Control Variables z_{it}

The main control variable we include in the regression is a measure of market competition since previous works have shown that this is an important factor inducing better performance of China's state enterprises in the reform era. Following Li (1997), we calculate the difference between the growth of input price and output price for each

year and each enterprise.[4]   We use this as a reverse index of the mark-up ratio.   That is, when this index is high, the terms of trade of the firm worsens and the mark-up ratio is low.   The mark-up ratio, a standard measure of product market competition, is defined as the ratio between the product price and the marginal cost of the firm.   In general, a high mark-up ratio means that the firm enjoys a high market power, and faces low levels of competition. Note that our reverse index of mark-up ratio varies with both enterprise and year and takes into account both regional and industrial differences.

It is interesting to note that in principle, the reverse index of mark-up ratio has two opposite impact on the enterprises' gross rate of return on assets.   The direct impact is negative, since a higher reverse index means more competition which lowers the rate of return.   The indirect impact is positive, i.e., more competition leads higher efficiency of the SOE which in turns improves the financial performance of the SOEs.   The net effect depends on which effect is more prominent.   As will be shown later, indeed, the net effect is positive.

For the TFP based regressions, we include the logrithum of labor, capital, material as well as these multiplied by industry dummies.   These variables are needed to form production function regressions and the industry dummies are important in order to take into account of different types of technology of SOEs in different industries.

In the GROR regressions, we include for control variables, 1984 dummy, 1989 dummy, 1993 dummy, and time trend (time variable).   The year dummies are meant to capture the nation-wide high inflation effects, which tend to bias the measure of GROR. The time trend is added in order to control for the possible effect that over the years, all

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[4] The data report the price changes of the firm's the main output and main input. This also the basis for us to deflation price changes in order to obtain real input and output. Unlike a modern conglomerate, an SOE were mostly established as a plant making a main product. Thus, such an approach to measuring mark-up ratio is not too distortionary.

SOEs experience lower GROR due to less favourable policies of the government with the SOEs.

4. Results of the Empirical Tests

4.1. Descriptive Statistics

Before discussing the regression results, let us first take a look at the summary statistics of the key variables used in our study. Table 1 categorizes those variables in the test period. It shows that managers of the SOEs in our sample had gained more production autonomy over time in the reform period. In 1980, on average, 44 percent of the output was sold by SOEs to the marketplace, while that figure increased to 75 percent in 1994. With more autonomy of production and sales, SOEs in the sample could also keep more of the profit generated. In 1980, SOEs in the sample was able to retain 22 percent of profit for their own use on average. The ratio steadily increased to 70 percent by 1994. Meanwhile, the proportion of non-government shares in total capital stock increased at a much slower pace from 6 percent in 1980 to about 22 percent of 1994. At the same time, mark-up ratios were also decreasing as evidenced by Table 1's accumulated input inflation rates minus accumulated output inflation rate. The different in inflation rate peaked around the end of 1980's and persisted at a high level by 1994.

One important implication of the summary statistic in Table 1 is that we are dealing with cases of marginal rather than large-scale ownership diversification. In the sample, by 1994, on average only 22 percent of ownership share was in the hands of non-government owners. That means our test results are relevant to cases of moderate and slow ownership changes rather than radical ones. We need to bear this in mind when interpreting the results.

One may be concerned that there might not be enough cross-sectional variations for each of the reform variables so that the panel data regressions implemented, are only driven by time series variations. In other words, within each year, all SOEs in our sample shared similar levels of production autonomy, profit retention, etc. It turns out that the worry is not warranted. Table 1 shows that in each given year, the cross-sectional variation is significant as captured by the large standard deviation relative to the mean of the corresponding variable. Thus, whatever results the regressions will be likely to be driven by both cross-sectional and time-series variations.

Table 2 provides information on the GROR of those SOEs in the sample. The first column from left is the rate of return on asset calculated by directly using accounting data. It shows a dramatic decrease in the gross rate of return on asset in nominal or accounting terms. The rate was as high as 54 percent in 1980 and dropped to 17 percent in 1990. The second column makes an adjustment to the first column by using the 1994 prices of input and output to reconstruct the gross profit. The gross profit is measured at the constant price level of 1994. Note that the calculated rate of return was very high at the early years of the reform period. This is due to the fact that the denominator, the total asset value, was calculated at the price level of 1980. Thus, the final adjustment we made was to deflate the rate of return of the second column by economy wide inflation rate. The outcome of the adjustment still shows the same picture, i.e., the gross rate of return on asset decreased from well above 20 percent in the 1980's to under 20 percent after 1990.

Based on the summary statistics, we made some adjustments in the regressions of GROR. We include a time trend variable, i.e., year, to capture the effect that GROR of all firms tended to decrease over time. The idea is to filter out common time trend between GROR and some of the reform measures. Second, for three special years in

recent history of the Chinese economy, 1984 (price surge due to price reform), 1989 (Political turmoil), and 1993 (high inflation after Deng's south China tour), we create a dummy variable for each of them in order to control for their unusual impact.

It is interesting to study the correlation among the reform variables in Table 3. Not surprisingly, all the reform variables are positively correlated with each other. However, the correlation is not very strong, in general. The coefficients of correlation varying between 0.13 to 0.34. The highest correlation is between non-state ownership and production autonomy, which is 0.34. This means that it was often the case that some SOEs with higher non-government ownership shares enjoyed less production autonomy than those with less non-government shares. Although this sounds very strange, considering the heterogeneity of the sample with SOEs of different size, different locations, and different industries, this is not surprising. For example, one province might have implemented significant reforms in increasing SOE production autonomy with little reforms diversifying SOE ownership, while other provinces have done the opposite. The heterogeneity of the sample in this regard makes it possible for us to test the impact of alternative reforms of the SOE.

The correlation between GROR and TFP is also interesting. We have argued above that TFP may not be a good measure of SOE performance and GROR should be a better measure. If these two are highly correlated, then the discussion is only of theoretical interest. It turns out that in our sample, correlation between them is weak. As Table 4 indicates, the coefficient of correlation is only 0.0061. The economic significance of this finding is that TFP and GROR in the sample are two rather different indices of SOE performance. Therefore, if there are any common patterns in the two groups of regressions using them as dependent variables individually, then the common economic message should be rather robust.

4.2. Regression Results

We are now ready to describe the regression results. The two sets of regressions based on production function and GROR rely on a panel data pooling cross-sectional data (up to 680 firms) and time series data (up to 15 years) but give each firm a distinct constant term. Thus, they are standard fixed effect regressions. First let us examine the regressions based on production function or the TFP regressions. Tables 5-A and 5-B, report the regressions of the logarithm of deflated output on that of labour, capital, and deflated raw material, and time trend (the time variable). In the first column of Table 5-A, which shows a simple production function regression without distinguishing different industries, the coefficients on logarithm of labour, capital, and raw material are all statistically significant and are of appropriate values. They add up to a level close to 1.01, suggesting a proximity to a constant return to scale in production technology in the sample SOEs. The coefficient of the time trend (the time variable) captures the annual growth rate of TFP, which turns out to be statistically significant at more than 1 percent level. The estimated TFP growth rate of the SOEs in our sample is 3.2 percent, which is very close to those reported in may studies on Chinese SOEs' TFP growth in the literature.

Tables 5-A and 5-B also have regressions that further decompose the TFP into contributions of various reform variables. In other words, the TFP is captured by the sum the error term and all the terms other than the production factors (labor, material, and capital).[5] Production autonomy, whether it is measured by a dummy variable or a ratio of market output to total output, is never positive and statistically insignificant in any regressions. Only in the last column of Table 5-B, is the autonomy dummy negative and

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[5] Note that an alternative way is to first do simple regressions of output on production factors and then use the residuals as dependent variable to run regressions on various reform variables. Our one-strike regression is more efficient than the two-step procedure. Thus, the production function regressions are not similar to the GROR regressions.

statistically significant. This shows that granting production autonomy as a measure of managerial reform was not effective in increasing an SOE's TFP. Profit incentive, as measured by the coefficient of profit retention rates, is positive and statistically significant in all regressions. The value of the coefficient ranges from 0.07 to 0.109, indicating that a increase of every 10 in profit share to an SOE would have raised the TFP of the SOE by 0.7% to 1.1%. Finally, the term of the multiplication of profit incentive and the autonomy dummy has a positive and statistically significant coefficient, indicating that granting autonomy and profit incentive at the same time was effective than implementing each of them. In sum, we can say that we have some evidence for profit incentives increasing TFP but not for production autonomy and the two reform measures implemented together are more effective than each of them alone.

It is clear from Tables 5-A and 5-B that the index of ownership diversification as well as mark-up ratio are all statistically significant for increasing the TFP. Moreover, in comparison with profit shares, ownership shares and mark-up ratios are of much higher order in economic importance than profit shares. For example, in each of the regressions, the effect of 10% increase in non-state ownership is roughly twice as much as that of the same amount of increase in profit share. The same can be said about mark-up ratios. Interestingly, the cross-effect of autonomy and ownership is statistically insignificant while that between profit share and ownership is negative and statistically significant. One possible explanation is that for an SOE with high proportion of non-state ownership, it is not necessary to give the SOE employees a lot of profit share to improve efficiency. Proper monitoring and careful selection of SOE managers might be more effective than loading the employees with high profit incentives, which are subject to accounting abuses.

As for the regressions of gross rate of return on assets, basically, the same pattern as that in the TFP regressions remains.[6] Production autonomy does not have a stable, positive, and statistically significant effect across alternative regression models. Profit share retention is mostly statistically insignificant except for one specification of the regression (the third column). The multiplication term of autonomy and profit incentives has a positive and significant coefficient, while that of the production autonomy dummy and profit incentive term has negative and significant sign. Thus, based on these regressions, we cannot reach any conclusions on the existence of the cross effects of autonomy and profit incentives on SOEs.

The ownership share and mark-up ratio are consistently and positively significant across regressions in Table 6. In addition, they are economically significant. For example, an increase of 10 percent in non-government ownership share and mark-up ratio, the gross rate of return would jump by 5.5% and 2.7%, respectively. Note that the direct effect of a higher mark-up ratio as measured in the regressions should be to repress the gross rate of return, since a higher mark-up ratio in the model indicates more intense product market competition and therefore lower rate of return to assets. Thus, the finding shows that the indirect effect of a more competition in increase SOE efficiency must be high enough to off set the direct effect. Finally, estimates on cross effect between autonomy and ownership share are not stable, while the same between profit share and ownership share tend to be negative. Again, we cannot reach any conclusions in this regard.

Overall, the two sets of empirical tests yield the following conclusions. First, ownership diversification has economically large and positive impact on the performance of state enterprises. This effect is robust in both the TFP and GROR regressions. Note

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[6] Unlike the production function based TFP regressions, there is no need to include production factors in the

that the range of the changes of ownership diversification was rather limited in the sample. Thus, the findings show that a moderate ownership reform can be very important and effective in improving SOE efficiency. Second, the evidence on the impact of managerial autonomy and profit incentives is rather mixed. Across different regressions, there do not seem to be any consistent patterns of the sign of the coefficients. The same can be said about the cross effect between autonomy and profit incentives. Third, we have robust evidence for the positive impact of product market competition on the performance of state enterprises. However, we cannot find strong evidence to support the same claim about the cross effect between autonomy and ownership and profit incentive and ownership reform.

5. Concluding Remarks

In this chapter, we test two schools of thoughts on strategies of state enterprise reform, the ownership school and the management school. We are able to do so by utilizing a large panel dataset of state enterprises in China, which has experimented with a wide range of strategies in reforming the state enterprises. We find that moderate ownership diversification in the Chinese case has consistent and economically significant impact on improving the performance of state enterprises while strategies of management reform including granting production autonomy and profit incentives do not have persistent and economically significant effect on enterprise performance. In summary, the findings yield strong support for the ownership school and leaves mixed evidence for the management school.

Our empirical findings carry important policy implications. First of all, a moderate diversification of the ownership structure of state enterprises can be a key to

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GROR regressions, since the index GROR already takes such factors into account.

improve the economic performance of enterprises.   It is not the case with managerial reforms.   Our evidence show rather mixed effects of managerial reforms. Granted, ownership reforms might face much higher political and economic obstacles and this is why they are not widely practiced in many economies.   In this regard, China's state enterprise reform, which is currently concerned with reducing government ownership, is moving in the right direction.   In fact, many of the profit losing small and medium SOEs have being privatized or liquidated by Chinese governments (mostly at sub-provincial level). Currently, a topical issue in China is on reducing government shares in companies listed in the stock markets. Our findings provide strong support for such policy measures.

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Table 1 Summary Statistics of Reform Variables by Year

Year	Autonomy: percentage of out of plan output value in the total output value	Profit share: percentage of retained profit in the total profit	Ownership fraction : percentage of non-traditional-state investment in the accumulative total investment	Markup ratio: the difference between accumulative input price change and accumulative output price change
1980	44	22	6	0
	(49)	(26)	(22)	(0)
1981	46	24	7	5
	(49)	(29)	(22)	(21)
1982	48	27	7	6
	(49)	(29)	(20)	(39)
1983	49	31	7	16
	(49)	(28)	(18)	(37)
1984	51	36	8	19
	(49)	(30)	(18)	(30)
1985	57	38	9	27
	(47)	(30)	(18)	(38)
1986	59	41	10	43
	(47)	(30)	(18)	(48)
1987	61	39	11	58
	(46)	(28)	(20)	(60)
1988	62	40	13	95
	(46)	(30)	(22)	(80)
1989	63	39	14	101
	(45)	(30)	(23)	(90)
1990	72	61	18	97
	(37)	(25)	(19)	(93)
1991	73	60	21	92
	(36)	(24)	(19)	(102)
1992	74	63	24	87
	(36)	(23)	(18)	(103)
1993	74	68	25	91
	(36)	(23)	(18)	(115)
1994	75	70	27	73
	(36)	(23)	(18)	(118)

Note: Standard deviations are in parentheses.

Table 2 Summary Statistics of Gross Rate of Return (GROR) by Year (%)

Year	Nominal market return on total assets (without depreciation)	Nominal market return on total assets (with depreciation)	Return on total assets (without depreciation), at 1994 market prices	Return on total assets (with depreciation), at 1994 market prices	GDP deflated return on total assets (without depreciation), at 1994 market prices	GDP deflated return on total assets (with depreciation), at 1994 market prices
1980	54	54	88	88	34	34
	(98)	(98)	(256)	(256)	(115)	(115)
1981	45	46	76	78	31	32
	(107)	(111)	(255)	(262)	(127)	(131)
1982	42	43	71	73	27	28
	(97)	(100)	(225)	(230)	(110)	(113)
1983	39	40	77	79	30	30
	(82)	(86)	(211)	(217)	(107)	(110)
1984	42	43	82	84	35	36
	(89)	(92)	(191)	(196)	(106)	(109)
1985	19	19	39	40	18	18
	(52)	(54)	(138)	(142)	(77)	(79)
1986	19	19	46	47	22	22
	(48)	(49)	(116)	(119)	(67)	(69)
1987	20	21	51	52	25	26
	(55)	(56)	(121)	(123)	(78)	(80)
1988	22	23	58	60	34	35
	(56)	(57)	(100)	(102)	(65)	(66)
1989	16	16	34	36	23	24
	(59)	(60)	(69)	(73)	(50)	(52)
1990	14	14	28	29	18	19
	(16)	(16)	(27)	(28)	(20)	(21)
1991	14	14	24	25	16	17
	(16)	(17)	(24)	(25)	(19)	(20)
1992	14	15	20	22	15	16
	(12)	(13)	(20)	(21)	(15)	(17)
1993	17	19	22	24	19	21
	(13)	(14)	(19)	(21)	(21)	(22)
1994	17	18	17	18	17	18
	(12)	(14)	(12)	(14)	(12)	(14)

Note: Standard deviations are in parentheses.

Table 3 Correlation among Reform Variables

Correlation	Autonomy	Autonomy Rummy	Profit Rentention	Non-State Shares	Markup Ratio
Autonomy	1.0000				
Autonomy Dummy	0.2279	1.0000			
Profit Retention	0.1808	0.2655	1.0000		
Non-State Shares	0.1438	0.3360	0.2546	1.0000	
Markup Ratio	0.1544	0.2439	0.1286	0.1705	1.0000

Table 4 Correlation Between Total Factor Productivity (TFP) and GDP Deflated Return on Total Assets (DGROR)

Correlation	DGROR	TFP
DGROR	1.0000	
TFP	0.0061	1.0000

Table 5-A Fixed-Effect Productivity Regressions

Variables	Dependent variable: Log(output) at 1980 prices							
Log(raw mat.), at 1980 prices	0.40***	(43.58)	0.48***	(19.2)	0.43***	(51.4)	0.43***	(51.6)
Log(raw mat.) *Min. & util. Ind.dum.			-0.25***	(-6.8)				
Log(raw mat.)*Light manu. Ind. dum.			-0.06	(-1.8)				
Log(raw mat.)*Chem. Ind. dum.			-0.13***	(-4.1)				
Log(raw mat.)*Heavy manu. Ind. dum.			-0.07**	(-2.5)				
Log(capital) at 1980 prices	0.18***	(10.2)	0.37***	(8.8)	0.14***	(8.7)	0.14***	(8.7)
Log(cap.) *Min. and util. Ind. dum.			-0.2***	(-2.7)				
Log(cap.)*Light manu. Ind. dum.			-0.3***	(-6.3)				
Log(cap.)*Chem. Ind. dum.			-0.19***	(-3.6)				
Log(cap.)*Heavy manu. Ind. dum.			-0.17***	(-3.5)				
Log(labor)	0.43***	(13.4)	0.47***	(3.4)	0.39***	(13.5)	0.39***	(13.5)
Log(labor) *Min. and util. Ind. dum.			-0.33**	(-2.0)				
Log(labor)*Light manu. Ind. dum.			-0.11	(-0.7)				
Log(labor)*Chem. Ind. dum.			-0.01	(-0.05)				
Log(labor)*Heavy manu. Ind. dum.			0.12	(0.4)				
Autonomy					-0.012	(-0.772)		
Output autonomy year dum.							0.008	(0.54)
Profit share					0.059***	(2.61)	0.058***	(2.58)
Ownership fraction					0.11**	(1.96)	0.10*	(1.87)
Markup ratio					0.22***	(28.1)	0.22***	(28.1)
Auto.*Owner. fraction								
Auto. Dum.*Owner. fraction								
Prof. Share*Owner. fraction								
Auto.*Prof. Share								
Auto. Dum.*Prof. Share								
1984 year dum.					0.07***	(3.37)	0.07***	(3.43)
1989 year dum.					0.024	(1.20)	0.025	(1.26)
1993 year dum.					-0.013	(-0.83)	-0.014	(-0.85)
Time trend	0.032***	(19.6)	0.033***	(19.98)	0.017***	(7.95)	0.016***	(6.81)
Constant	0.23	(1.12)	-0.013	(-0.065)	0.45*	(2.57)	0.44**	(2.47)
Number of observations	4414		4414		4414		4414	
R-square	0.6295		0.6485		0.6933		0.6932	

Table 5-B Fixed-Effect Productivity Regressions (Cont.)

Variables	Dependent variable: Log(output) at 1980 prices							
Log(raw mat.), at 1980 prices	0.52***	(22.8)	0.52***	(22.8)	0.52***	(22.8)	0.51***	(22.6)
Log(raw mat.) *Min. & util. Ind.dum.	-0.27***	(-8.19)	-0.27***	(-8.21)	-0.28***	(-8.34)	-0.28***	(-8.30)
Log(raw mat.)*Light manu. Ind. dum.	-0.06**	(-2.0)	-0.06**	(-2.0)	-0.06**	(-2.06)	-0.06**	(-2.01)
Log(raw mat.)*Chem. Ind. dum.	-0.11***	(-3.74)	-0.11***	(-3.7)	-0.11***	(-3.72)	-0.11***	(-3.64)
Log(raw mat.)*Heavy manu. Ind. dum.	-0.08***	(-3.05)	-0.08***	(-3.05)	-0.08***	(-3.11)	-0.08***	(-3.02)
Log(capital) at 1980 prices	0.27***	(6.96)	0.27***	(6.98)	0.27***	(7.01)	0.27***	(7.13)
Log(cap.) *Min. and util. Ind. dum.	-0.11	(-1.61)	-0.11	(-1.62)	-0.11	(-1.60)	-0.12	(-1.71)
Log(cap.)*Light manu. Ind. dum.	-0.24***	(-5.64)	-0.25***	(-5.68)	-0.25***	(-5.66)	-0.25***	(-5.74)
Log(cap.)*Chem. Ind. dum.	-0.13***	(-2.66)	-0.13***	(-2.69)	-0.13***	(-2.69)	-0.13***	(-2.73)
Log(cap.)*Heavy manu. Ind. dum.	-0.09*	(-1.93)	-0.09*	(-1.95)	-0.09**	(-1.98)	-0.09**	(-2.08)
Log(labor)	0.33***	(2.62)	0.33***	(2.58)	0.32**	(2.50)	0.34***	(2.72)
Log(labor) *Min. and util. Ind. dum.	-0.26*	(-1.72)	-0.26*	(-1.7)	-0.24	(-1.60)	-0.26*	(-1.72)
Log(labor)*Light manu. Ind. dum.	0.02	(-0.15)	-0.02	(-0.17)	0.03	(0.24)	0.01	(0.05)
Log(labor)*Chem. Ind. dum.	0.10	(0.71)	0.10	(0.73)	0.11	(0.80)	0.08	(0.59)
Log(labor)*Heavy manu. Ind. dum.	0.19	(1.4)	0.20	(1.43)	0.21	(1.52)	0.18	(1.34)
Autonomy	-0.0006	(-0.044)			-0.003	(-0.11)		
Output autonomy year dum.			-0.005	(-0.38)			-0.10***	(-3.07)
Profit share	0.07***	(3.22)	0.07***	(3.24)	0.109***	(3.36)	0.08***	(3.08)
Ownership fraction	0.15***	(2.72)	0.15***	(2.74)	0.21**	(2.25)	0.31***	(3.76)
Markup ratio	0.22***	(28.2)	0.22***	(28.2)	0.22***	(28.1)	0.22***	(28.31)
Auto.*Owner. fraction					0.107	(1.18)		
Auto. Dum.*Owner. fraction							0.063	(0.93)
Prof. Share*Owner. fraction					-0.24**	(-2.16)	-0.38***	(-3.16)
Auto.*Prof. Share					-0.02	(-0.50)		
Auto. Dum.*Prof. Share							0.14***	(3.30)
1984 year dum.	0.066***	(3.47)	0.066***	(3.45)	0.06***	(3.38)	0.064***	(3.36)
1989 year dum.	0.026	(1.35)	0.025	(1.32)	0.02	(1.22)	0.024	(1.24)
1993 year dum.	-0.014	(-0.908)	-0.014	(-0.87)	-0.012	(-0.76)	-0.014	(-0.89)
Time trend	0.017***	(8.11)	0.017***	(7.52)	0.017***	(8.16)	0.018***	(7.58)
Constant	0.32**	(1.69)	0.32**	(1.72)	0.31*	(1.65)	0.29	(1.54)
Number of observations	4414		4414		4414		4414	
R-square	0.7099		0.7099		0.7103		0.7111	

Table 6 Fixed-Effect Regressions of GDP Deflated Return on Total Assets
(GROR) (with depreciation) at 1994 market prices

	Dependent variable: DGROR							
Autonomy	-0.04*	(-1.65)	0.18***	(4.87)				
Output autonomy year dummy					-0.019	(-0.77)	-0.15***	(-3.06)
Profit share	0.018	(0.53)	0.098*	(1.95)	0.019	(0.56)	0.055	(1.33)
Ownership fraction	0.56***	(6.46)	1.36***	(9.56)	0.55***	(6.41)	0.74***	(5.63)
Markup ratio	0.27***	(22.5)	0.27***	(23.0)	0.27***	(22.5)	0.27***	(22.5)
Auto.*Owner. fraction			-1.36***	(-9.60)				
Auto dum.*Owner, fraction							0.26**	(2.45)
Prof. Share*Owner. fraction			0.17	(0.97)			-0.64***	(-3.32)
Auto.*Prof. Share			-0.15*	(-2.29)				
Auto dum.*Prof. Share							0.15**	(2.27)
1984 year dummy	0.049	(1.61)	0.047	(1.55)	0.05	(1.64)	0.05	(1.49)
1989 year dummy	-0.05	(-1.62)	-0.06**	(-2.04)	-0.05	(-1.64)	-0.05*	(-1.69)
1993 year dummy	0.002	(0.085)	0.009	(0.36)	0.006	(0.22)	0.005	(0.18)
Time trend	-0.014***	(-4.9)	-0.02***	(-5.89)	-0.014***	(-4.4)	-0.012***	(-3.75)
Constant	0.04*	(1.82)	-0.07***	(-2.77)	0.018	(0.97)	0.005	(0.24)
Number of Observations	4414		4414		4414		4414	
R-square	0.1313		0.1559		0.1309		0.1342	

Note: t-ratios are in parentheses.
* (**, ***) Significant at the 10 (5, 1) percent level.

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