PROFITING FROM GAIZHI:

MANAGEMENT BUYOUT DURING CHINA'S PRIVATIZATION *

Susan Feng Lu†

Northwestern University

David Dranove

Northwestern University

December 22, 2007

Abstract

During the late 1990s, China introduced the *gaizhi* process for privatizing state-owned firms. Under *gaizhi*, managers could acquire their firms at a price that was based on recent profitability. Systematic analysis of longitudinal data reveals the following: (1) There is a statistically significant 4 percent decrease in net margin relative to trend in the one year period immediately prior to privatization; (2) There is no statistically meaningful difference in net margin in the period after privatization relative to the period one year or more before privatization. These findings suggest that managers intentionally suppressed the performance of their firms so as to acquire them at less than fair value. We test and reject other, more innocuous explanations for this profit pattern.

*We are grateful to Thomas Hubbard, Ben Jones and Scott Stern for comments and helpful conversations. We are indebted to Yang Yao for the China SOE Survey Data. We also thank the participants of the 5th International Industrial Organization Conference at Savannah. All errors that remain are ours.

† Correspondence can be addressed to Susan Feng Lu, Kellogg School of Management, Northwestern University by email: f-lu@kellogg.northwestern.edu.

I. INTRODUCTION

There is considerable debate as to whether firms can perform better after they are acquired by their managers and workers[1]. This ambiguity occurs for management buyouts in the private sector but also seems to occur when formerly communist countries sold state-owned assets to the private sector[2]. For example, Frydman et al. [1999, 2000] find that privatization of companies previously owned by three central European countries led to improved performance, but only if state-owned firms are acquired by outsiders. This stands in contrast with Song and Yao [2005], who study privatization of government-owned assets in the context of privatization in China, also known as *gaizhi*. [3] Song and Yao find that the performance of these firms usually increases.

In this study, we reconcile the differences between Frydman et al. and Song and Yao while offering a new, subtle explanation for the performance of *gaizhi* firms. We find strong evidence that *gaizhi* firms experienced a U-shape pattern of performance relative to their peers that did not privatize. Prior to the 1995 launch of the privatization program, firms that would eventually go through gaizhi had after-tax profit margins (net margins) that were similar to their counterparts. In the year just before privatization, however, *gaizhi* firms saw their profits decline by 4 percent relative to their peers, only to increase (in relative terms) back to pre-*gaizhi* levels after privatization was complete. We thus conclude that:

---

[1] The existing literature provides mixed evidence on the impact of firm restructuring on firm performance. See Jensen [1988], Kaplan [1989, 1991], Lichtenberg and Siegel [1990], Degeorge and Zrckhauser [1993], Bruton et al [2002] and so on.

[2] There is a large body of literature about privatization. See Earle et al [1994], Boycko et al [1996], Li et al [2000], Anderson et al [2000], Coricelli et al [2001], Megginson and Netter [2001], Djankov and Murrell [2002], Su and Jefferson [2003] and so on.

[3] *Gaizhi* refers to the transition from public to private ownership, but may also refer to restructuring of government owned firms. We restrict attention to the former.

a) Consistent with Frydman et al., *gaizhi* firms show no improvement in performance over a period of time that extends more than one year before privatization to more than one year after.

b) Consistent with Song and Yao, *gaizhi* firms improve performance immediately after privatization

c) The pattern of performance reflects a substantial welfare loss due to reduced operating performance in the year prior to privatization. Such a possibility was suggested by Shleifer and Vishny (1993). We confirm this by further analysis of the possible reasons for the profit pattern.

These findings may be understood in the context of the rules used to set the selling prices of *gaizhi* firms. Specifically, the price was a function of the firm's most recent profits. Thus, *gaizhi* gave managers of state-owned firms an incentive to deliberately reduce the short-run value of their firms so as obtain a lower purchase price. As a result, privatization resulted in a net social welfare loss equal to the decline in pre-*gaizhi* value. We document the changes in cost structure to further support this explanation. Besides, we are able to rule out two welfare-neutral alternative explanations for this observed pattern of performance: "revenue shifting" and exploitation of private information.

Other researchers have discussed how the absence of mature financial institutions may promote problematic behavior in developing markets. Coffee [1999] found that managers of newly privatized Czech firms took advantage of lax oversight to siphon off assets, and Glaeser et al. [2001] assert that majority shareholders are more likely "freeze out" minority shareholders in markets that have just experienced mass privatization, such as the Czech Republic and Russia. The attempt to exploit limited financial oversight is

not limited to developing nations, of course, witness the high profile cases of Enron, Global Crossing, and so forth. Even so, the apparent widespread incentive problems that we document in the case of *gaizhi* demonstrate the paramount need for basic valuation institutions in developing economies.

The remaining of this paper is organized as follows: In Section II, we describe *gaizhi* in more detail, explain why it presents opportunities for moral hazard and selection and offers my hypotheses and the related empirical implications. Section III discusses the data and presents evidence of the U-shape profit patterns. Section IV considers the potential for selection bias and presents regression estimates confirming the pattern. Section V presents results. Section VI discusses on the U-shape profit pattern and distinguishes the difference between moral hazard, time shifting, private information and multitasking. Section VII concludes.

II. *GAIZHI*

A. The Privatization Movement in China

Once communism took hold in the 1950s, nearly all non-household production in China occurred in state-owned enterprises (SOEs). The poor performance of SOEs caused both the national and local governments to seek ways to increase incentives within these organizations.[4] This led ultimately to the *gaizhi* privatization process of selling SOEs to their managers. Unlike the massive privatization programs that occurred in Eastern Europe and the former Soviet Union, however, the Chinese government's

[4] In theory the central government owns every SOE, but in reality SOEs are effectively owned and controlled by local governments. The official document of the 16th Communist Party Congress signaled a formal transfer of ownership to local governments.

ownership transformation process has been gradual and low profile. Moreover, ownership transformation has largely been driven by local governments and businesses, unlike the top down process experienced elsewhere.

The move towards privatization can be traced back to the 1980s, when state governments began requiring managers of state-owned enterprises (SOEs) to meet targets for profitability and capital accumulation in return for a share of the earnings. When local managers proved to be risk averse [and failed to undertake risky investments], local governments often turned to outsiders to take over the reins of their SOEs. Some of the new recruits proved wildly successful, to the point where after several years their personal share of the firm exceeded that of the local government.

The modern privatization movement started in earnest after Deng Xiaoping's visit to southern China in 1992, during which he gave a speech encouraging the development of private enterprises and a market economy. Most local governments decided it would be possible to privatize their small SOEs, but some cities went further by privatizing almost all their state and collective firms [Gao and Yao, 1999]. In 1995, the central government decided on the policy of "keep the large and let the small go". The central Chinese government decided to keep 500 to 1,000 large state firms and allow smaller firms to be leased or sold, mainly through management buyouts.[5] This process came to be known as *gaizhi*, or "restructuring." By the end of 1998, about 25 percent of China's 87,000 industrial SOEs had been through *gaizhi* and another 25 percent planed to do so.[6]

[5] In 1994 the ministry in charge of government economic affairs, the State Economic and Trade Commission, sent a report, "Suggestions on Revitalizing Small State-owned Enterprises", to Vice-Premier Wu Bangguo, who was in charge of enterprise reforms. In September 1995 the policy was formerly announced by the central committee of the Chinese Communist Party in one of its plenaries and went forward as a suggestion for the ninth five-year plan.

[6] See China Economy and Business Program [2003] for more details on the valuation process.

Managers steering their companies through the *gaizhi* process had considerable opportunities to influence firm performance. Prior to *gaizhi*, managers could not lay off workers under all but the most extreme conditions. During the process of *gaizhi*, managers could negotiate with the local government to lay off workers.[7] Once the process was complete, however, layoffs could again be blocked by the government. While managers had limited control over employment, they had greater control over how they would deploy their labor and were free to hire new workers. Managers also obtained greater control over investments and research and development.

B. Valuing Assets for Gaizhi

The valuation of assets is a key element of the *gaizhi* process. An evaluation of the *gaizhi* process in a report to the International Finance Corporation (IFC) suggested that the asset valuation process has left much to be desired.[8] Local governments are required to value the assets of the businesses they sell through the *gaizhi* process. The valuation is performed by independent accounting firms that must value assets according to the earnings they can bring in or their current market value. China has poorly developed capital markets, however, so the latter option is usually not available.

The IFC report found additional problems with *gaizhi* valuation. There is no formal supervision of the valuation process. The firms performing the valuations are usually selected by the *gaizhi* firms themselves, and may be influenced by both the *gaizhi* firms and local government to give favorable evaluations (Local governments may desire

[7] This is a legacy of the fact that prior to restructuring, the workers owned their companies. Thus, managers could not lay off workers without worker consent. The *gaizhi* process protected worker rights by limiting the ability of managers to lay off workers without obtaining prior government consent.
[8] China Economy and Business Program [2003]

low valuations so as to meet *gaizhi* quotas). Most critically for our analysis, the accounting firms often had little to no experience with standard methods for valuing business assets such as discounted cash flows and economic income, and rarely attempted to value intangible assets such as goodwill. They instead relied on simple valuation metrics such as current and projected earnings, where projections were themselves based on past performance. This implies that *the price that managers of* gaizhi *firms must pay to acquire their companies depends heavily on their most recent accounting profits*.

C. The Intended and Unintended Consequences of Gaizhi

Proponents of *gaizhi* and similar privatization efforts observe that the managers of state-owned firms do not see a direct link between compensation and firm performance. Privatization is likely to increase this link, thereby enhancing effort incentives and increasing the value of the firm post-privatization. We combine this simple incentives story with the incentives implied by the nature of *gaizhi* valuation to generate hypotheses concerning the time trend in performance. It is important for us to define the different times in the privatization process in order to make the hypotheses explicit. Figure I presents the timeline on privatization. Stage 0 refers to the period before the announcement of privatization policy; Stage 1 refers to the period after the announcement but before the completion of privatization; Stage 2 indicates the post-privatization period.

Our first hypothesis is the standard one applied to restructuring:

H1: Restructuring increases management incentives after the takeover. Profits are constant in stages 0 and 1 and increase in stage 2.

The rules of *gaizhi* lead us to consider another moral hazard problem. Because the price at which managers may purchase a firm depends on the firm's profitability in the previous period, they have an incentive to reduce the firm's profits prior to acquisition. Thus, the second hypothesis:

H2: Profits decline from stage 0 to stage 1 but increase in stage 2 to pre-*gaizhi* levels thereafter.

Combining the two forms of moral hazard [shirking prior to restructuring and increased effort afterwards] leads to the third hypothesis:

H3: Profits decline from stage 0 to stage 1 but increase in stage 2 to levels exceeding that in stage 0.

Song and Yao [2005] also examine performance of *gaizhi* firms. They find a significant positive impact of *gaizhi* on firm profitability. However, their methods do not allow for the kind of U-shaped pattern of profits that is implied by our hypotheses.

III. DATA DESCRIPTION

A. Basic Information of the 11-city Survey

Our data come from the 2002 11-City China SOE Comprehensive Survey, which was sponsored by the International Finance Corporation, an affiliated institution in World Bank and the State Economic and Trade Commission, China. This survey covers a wide range of information about each firm, including basic financial information, corporate governance (e.g., board structure) and the details of *gaizhi*, such as timing, form (e.g., lease versus own), and the post-*gaizhi* situation (e.g., management and worker satisfaction.)

The survey covers 683 firms, of which 309 firms had reported completing *gaizhi* by the end of 2002; of these more than 90 percent reported the form of *gaizhi.* Among those reporting the form of *gaizhi*, 30 percent adopted either a public offering or an internal restructuring without changing ownership, 27 percent distributed shares to employees, 28 percent were sold or leased out, 11 percent declared bankruptcy, and the remaining 4 percent entered joint ventures [see Figure II]. Data on performance, employment and share structure extend from 1995 to 2001. The details of survey implementation and city information can be found in Garnaut, et al. [2003].

Because we are interested in studying the incentives of inside managers, the *gaizhi* that we study in this paper are those that meet the following criteria: (1) they were established before 1995; (2) they were sold to or ultimately controlled by their insiders. We regard the remaining restructuring firms (e.g., those sold or leased) as non-*gaizhi* firms for purposes of testing our hypotheses. Some firms went through *gaizhi* more than once. Usually the early round(s) of *gaizhi* merely restructured internal governance while the final round resulted in the change of ownership into private hands. We use the final round as the reference year of *gaizhi*. There are 482 firms in our final sample, of which 95 firms experienced privatization and were finally controlled by insiders.

As the Study on Restructured SOEs in China (SRSC) reports, the 11-City survey sample may suffer from response bias. However, compared with two other national surveys of industrial firms undergoing *gaizhi*, SRSC shows that the firms covered in the 11-City survey reveal similar timing, form, and pace of privatization though the scope and size of firms in 11-City survey is slightly larger than that in the national surveys. We

can partially solve this shortcoming by using econometric techniques to control for unobservable firm differences.

We also obtained financial data since 1990 from the China Stock Market Financial Database Annual Report. We use this data to compute the year-to-year volatility in firm profit performance.

B. Variables

Our dependent variable is *Net Margin* which equals net profit after tax divided by operating expense to measure firm performance. Financial data can be extremely noisy, so we replace *net margin* below the first percentile with values at the first percentile and those above the ninety-nine percentile with values at that percentile. We also estimate some of our models using median regressions so as to further limit the influence of outliers. Our results are invariant to the way we treat outliers.

GZ is the key variable to identify whether a firm is privatized. It equals 1 across all years of data if the firm went through restructuring and 0 if it had not done so by the end of our sample period. We will interact *GZ* with various time variables to assess the impact of *gaizhi* on profits.

We include in some regressions a control variable *Redundancy*, which measure the extent to which a firm has employed non-productive workers. Recall that *gaizhi* protected the employment status of workers. This was true even if many of the firm's employers did no work. The 11-City Survey asks the firm to report the total number of employees and the number of working employees. We calculate the productive workers share by dividing working employees over total employees. Thus, *Redundancy,* the

percentage of non-productive workers equals to one minus the percentage of productive workers. Since the decision of employment may be correlated with privatization, we use *Redundancy* in the "base year" of 1995 to capture its policy burden from those non-productive workers. A firm with more non-productive workers is less likely to have high net margin.

Size and *Workers* are used to control for economies of scale. We obtain these data directly from the 11-city survey. We use assets in 1995 to control for the initial size of a firm and the number of workers in 1995 to control the initial employment status.

C. Preliminary Analysis

We begin by examining the raw data on firm performance. Figure III depicts the median and mean net margin for all *gaizhi* firms over the period 1996-2001. To provide an apples-to-apples comparison, we define Year 0 to be the year just before restructuring, Year = 1 is the year of restructuring, etc. We can immediately see a U-shaped pattern with median performance 2 years after restructuring almost the same as the median performance 2 years prior, with a dip of 8 percent in the year of restructuring.[9]

We next compare *gaizhi* and non-*gaizhi* firms. To facilitate this comparison, we pick those firms that restructured in 1999 as the *gaizhi* group and compare them with all firms that did not restructure [see Figure IV].[10] This gives three-year pre-*gaizhi* and three-year post *gaizhi* windows to observe the change in performance. The net margin in 1995 was used as a reference point.

[9] Due to the limited time series, there are few firms for which we can directly compare performance 3 years pre- and 3 years post-restructuring.

[10] We also tried the other years. The patterns are similar. The figure picking firms reformed in 1999 provides the best pattern as we expected.

We note that the non-*gaizhi* firms experienced a steady decline in performance throughout this time period. By comparison, the overall performance of *gaizhi* firms *relative* to the control group displays the U-shape – a sharper decline pre-restructuring and then a shallower decline afterwards. Put another way, when compared with the control group, the performance of *gaizhi* firms declines precipitously in the year prior to privatization and immediately rebounds afterwards.

IV. IDENTIFICATION STRATEGY AND ESTIMATION METHODES

We exploit variation in the timing of *gaizhi* to test our hypotheses. Our major concern comes from the possibility that the decision to restructure might be correlated with unobservable factors that also affect the pattern of performance over time. We use the following procedure to reduce any possible bias.

We use propensity score matching to obtain a subsample of one-to-one matches to the *gaizhi* firms. We then estimate fixed firm effect regressions that focus on differences in profits between the *gaizhi* and matched firms in the periods immediately before and after restructuring. We continue exploring the differences in performance of the *gaizhi* firms and their matches by "lining them up" in time and performing an average treatment analysis. In effect, we ask how each *gaizhi* firm's performance compared with that of its matched firm during the exact same window of time before and after restructuring. Finally, we use the Rosenbaum bound test [Rosenbaum, 2002] to examine whether there is any "hidden bias" stemming from unobservable firm characteristics.

A. Modified Differences-in-Differences Model

When considering how privatization affects firm performance, scholars usually use a differences-in-differences (DID) estimator to analyze the impact of privatization.

$$NETMARGIN_{it} = \alpha_0 + \beta * GZ_i * Stage_{it} + \alpha_t + \alpha_i + \varepsilon_{it} \quad (1)$$

Here $NETMARGIN_{it}$ is the outcome of interest, firm performance, for firm *i* at time *t*. *GZi* is a binary variable which equals to 1 if firm *i* was privatized and 0 otherwise. $Stage_{it}$ classifies the timing of privatization into pre- and post-privatization periods. The indicating variables α_i and α_t index firms and time respectively and ε_{it} is the error term.

Recall that we divided the *gaizhi* process into three stages in our study. We recode the variable $Stage_{it}$ that describes the timing of privatization and define two new variables $Stage1_{it}$ and $Stage2_{it}$. Table I provides examples of how this division enters into our empirical work by showing how we code the stages for firms that entered *gaizhi* at different stages. We wish to determine if the performance of *gaizhi* firms differs from that of control firms during stages one and two (just after announcement of policy but prior to and immediately after restructuring). To determine this, we modify the differences-in-differences specification (1) into the following one:

$$NETMARGIN_{it} = \alpha_0 + \beta * GZ_i * Stage1_{it} + \gamma * GZ_i * Stage2_{it} + \alpha_t + \alpha_i + \varepsilon_{it} \quad (2)$$

$Stage1_{it}$ refers to the stage that is after the announcement of privatization and before privatization. $Stage2_{it}$ stands for the post-privatization stage. With this specification, the coefficients β and γ indicate the performance of *gaizhi* firms before and after restructuring relative to time trend of non-*gaizhi* firms, while controlling for overall firm and time effects. We correct the standard errors by using an arbitrary variance-

covariance[11] and also employ Hausman's test to test the validity of a random effects specification.

We also control for bias by replacing firm-specific effects with the place and industry group effects α_s, α_c, and α_t and controlling the initial status of firms:

$$NETMARGIN_{it} = \alpha_0 + \beta GZ_i * Stage1_{it} + \gamma GZ_i * Stage2_{it} + \theta X_{it} + \alpha_s + \alpha_c + \alpha_t + \varepsilon_{it} \qquad (3)$$

Here, X_{it} is a vector of invariant variables controlling the initial status of firms. The indicator variables α_s, α_c, and α_t indexing industries grouped by the first digit of their SIC codes, cities, and time respectively, and ε_{it} is the error term. This model with group-specific fixed effects is similar to that in Frydman et al. [1999]. This specification assumes that firms grouped by industries and cities have similar distribution of unobservable characteristics that influence performance over time, and is intended to reduce the potential for selection bias. We estimate specification (3) by using both mean and median regression.

B. Endogeneity of *Gaizhi*

The identifying assumption of the modified DID method is that performance of both privatized and non-privatized firms will continue their pre-existing trends in the absence of the introduction of the privatization policy. The announcement of *gaizhi* policy is assumed to be exogenous in the sense that managers neither can anticipate the policy nor have the guts to prepare for privatization prior to the policy. Figure IV shows that both privatized firms and their peers that did not privatize have the same trends before 1996.

[11] Bertrand, Duflo and Mullainathan (2004) concern the potential severe serial correlation problem and propose an arbitrary variance-covariance matrix to correct the standard errors in a differences-in-differences model.

However, the decision of privatization is not randomly assigned. In our model, managers' decision of privatization may be influenced by some unobserved factors that also affect the firm performance we are interested in. In another word, the mean independence assumption does not hold.

$$E(\xi \mid GZ) \neq 0 \tag{4}$$

Failure to account for the endogeneity of *gaizhi* can lead to biased difference-in-difference estimators.

A standard approach to solve the selection issue is instrumental variable (IV). In the context of privatization, we need to find an IV which helps to predict the decision of *gaizhi* but have no significant correlations with firm performance. However, it is difficult to find powerful instruments for the decision of privatization. Weak instruments may bring unexpected consequences to the treatment effects. Therefore, instead of using 2SLS, we employ the fixed effects model with a propensity score matching method [Heckman, 1997]. Moreover, we propose an IV which is imperfect though, and include it in the equation for matching so as to improve the efficiency of matching.

C. Propensity Score Matching with Weak Instrumental Variables

The goal of matching methods is to balance treated (*gaizhi* firms) and control (non-gaizhi firms) groups based on observed variables. The idea is based on the strong ignorability assumption:

$$NETMARGIN \perp GZ \mid (X, Z) \tag{5}$$

However, if we match the firms on the basis of the observed covariates, we encounter the curse of dimensionality. Rosenbaum and Rubin [1983, 1985] suggest that if

$$P(x,z) = \Pr(GZ_i = 1 \mid x_i, z_i) = E(GZ \mid X = x, Z = z) \quad \text{and } 0 < P(x,z) < 1$$

then adjustment for the propensity score suffices to remove all bias associated with differences in covariates, i.e. $NETMARGIN \perp GZ \mid P(X,Z)$. The underlying insight was that if the decision of privatization and firm performance are independent conditional on all observed covariates, they are also independent conditional on the conditional probability of taking privatization given covariates. Therefore, we can conduct a probit analysis including all observed covariates to obtain the propensity scores and match firms based on these scores.

Our empirical approach will be to compare the profits of *gaizhi* firms with those of a sample of firms matched by propensity scores.[12] We use 1995 as the base year to predict the probability of privatization from a probit regression of observable variables (X) including firm age, size, working workers, the percentage of retired and laid-off workers, city, industry and a set of weak instrumental variables (Z) that affect the decision of *gaizhi* but have no significant correlation with the treatment outcomes. Of the 95 firms in the initial *gaizhi* sample, only 72 report full information on these observed variables used for matching. These 72 firms represent the "experimental" group in my empirical analysis and are matched against 72 firms with comparable probabilities of privatization.[13]

The instrumental variables Z include the log of *local bank deposits* in 1995 (*deposit)* and the interaction of bank deposits with industry dummies. Here *local bank deposits* refer to the total amount of money deposited by local firms and residents, which

[12] For full details of matching algorithm, see Heckman[1997].
[13] 12 of the 95 *gaizhi* firms do not indicate their industries and *Age* is missing for 8 of the 95 *gaizhi* firms. When I match on the remaining X and Z variables, my sample increases to 87 but my main findings remain qualitatively unchanged.

are not correlated with a specific firm's unobserved characteristics and profitability. Financial institutions in China are underdeveloped. There are very few financial means that residents and firms can choose to invest their money, which partially explains the high saving rates in China. Moreover, due to the credit rationing system [Lu & Yao, 2003] it is difficult for private individuals to directly borrow money from state-owned banks. These are appropriate instruments for *GZ* because managers who wish to acquire their firms must therefore rely on their local banks to obtain financing. The relative importance of local financing depends on the amount required to acquire the firm, which varies by industry, hence the *deposit*/industry interaction.

D. Timing of *Gaizhi*

The primary interest of this paper is how managers game with the timing of *Gaizhi*. If firms in the control group also had the "false" timing of *Gaizhi* relative to their corresponding counterpart, the DID estimators would be more convincing.

The modified DID model does not take full advantage of the propensity score matching. In particular, we do not pair up the matches; instead, we treat all the matches as a single control group. For the sake of robustness check, we pair up the *gaizhi* firms with their matches and estimate treatment effects. We establish the same time line for the *gaizhi* and matched firms; for example, if the restructuring of the *gaizhi* firm occurs in, say, 1999, then we treat stage 1 as occurring between 1996 and 1999 for both the *gaizhi* firm and its match.

We let W=1 for the privatized ("treated") firms and W=0 for their matches. The outcome of interest Y_w in each stage is the change in net margin for the firm during that

stage. Hence, the average treatment effects on the treated (ATT) can be evaluated as follows [Wooldrige, 2004]:

$$Y = W * Y_1 + (1-W) * Y_0 = Y_0 + (Y_1 - Y_0) * W$$
$$where\ ATT \equiv E[Y_1 - Y_0 \mid W = 1] \tag{6}$$

E. Assess Hidden Bias in Propensity Score Models

We have used propensity score matching to mitigate the potential bias from self selection. The effectiveness of this approach may depend on the methods used to create the matches. Moreover, this matching may not fully rule out the potential for "hidden bias" arising from unobservable factors that simultaneously affect assignment of treatment and the outcome.

Rosenbaum [2002] proposes a method to assess the potential importance of selection bias in propensity score models estimated using one-to-one pairs. Assume that U is the confounding variable measuring hidden bias. Then the log-odds ratio for privatization can be written as:

$$\log\left(\frac{\pi_i}{1-\pi_i}\right) = \kappa(X_i) + \gamma * U_i$$
$$where \quad 0 \le U_i \le 1 \tag{7}$$

Equation (7) leads to the following equation that bounds the extent of selection:

$$\frac{1}{\Gamma} \le \frac{\pi_{s,1}(1-\pi_{s,2})}{\pi_{s,2}(1-\pi_{s,1})} \le \Gamma \tag{8}$$

Where s indexes the matched pair s= 1, 2…..S and Γ=exp (γ). Γ=1 would be consistent with the null hypothesis of no selection.

V. RESULTS ON FIRM PERFORMANCE

A. The Matching Sample

Table II reports results of the privatization regression used to compute propensity scores. Both *deposit* and many of the *deposit*/industry interactions are significant and the joint significance of all the instruments is at $p< .01$. This indicates that our matching is based in part on exogenous characteristics. For each of the *gaizhi* firms, we obtain one propensity-score matched firm for a total of 72 pairs of firms.

B. Performance Pattern

Table III presents results from specification (2) and (3) focusing on differences in performance in Stages 1 and 2. The first two columns present the results of two-way fixed and random effects.[14] The next two columns present mean and median regression results from specification (3). The key results are similar in all model specifications, though the magnitude of the period 1 effect is smaller in the median regressions. We focus our discussion on the fixed and random effects models in columns (1) and (2).

The coefficient for *GZ* Stage 1* suggests that *gaizhi* firms underperformed their peers by 4 percentage points in the pre-restructuring period. The coefficient for *GZ* Stage 2* suggests that *gaizhi* firms still underperformed their matched counterparts after restructuring, by an average of about 1.6 percent. However, this difference is no longer statistically significant. Moreover, the mean and median regressions in column (3) and (4) respectively show that the coefficients of *GZ* Stage 2* converge to 0. Thus, we cannot reject the null hypothesis that *gaizhi* firm performance is equal to that of other firms after restructuring is complete.

[14] Results with one-way effects are comparable. The results of Hausman tests are not significant, suggesting that the random effect model is preferred. I present both for completeness and to demonstrate robustness.

C. Robustness Check

Table VI gives the estimates of unconditional ATT on the change of performance *ΔNet Margin* based on the stratified propensity score matching and compares these to standard OLS estimates. The first row (Stage 1) uses the before-privatization sample and estimates the ATT of the performance change between Stage 0 and Stage 1. The second row (Stage 2) uses the after-privatization sample and estimates the privatization effects on performance between Stage 0 and Stage 2. The first column gives the mean outcome among the treatment cases with privatization and the second column gives the mean outcome of the control cases without privatization. The difference between column 1 and 2 is the average treatment effects on the treated (ATT) which is given in the third column. The standard error of this ATT estimate is corrected by using a bootstrap with 100 replication samples. The last column shows the OLS estimate for the effect of privatization on the performance change in different stages. The result is the same as the ATT estimate.

Table VI shows that the average treatment effect of the treated on the change of performance in Stage 1 is -0.05 ($p<.05$), while the ATT in Stage 2 is essentially 0 and is not significant. This pattern is consistent with the performance pattern shown in Table III.

D. The Rosenbaum Test and Sensitivity Analysis on Matching Methods

We performed the Rosenbaum test and obtained p-values are 0.15 in *Stage 1* and 0.61 in *Stage 2* respectively on the null hypothesis that $\Gamma=1$[see Table VI]. Thus, there is no strong evidence of hidden selection bias.

Propensity score matching can be sensitive to the covariates used in the probit regression. Different methods may generate different matches which in turn could generate different results. Table V shows the results of random effects models from four matching methods: one-to-one matching with V (the method we used above), one-to-one matching without IV, K-nearest neighbors matching, and kernel matching. So as to make the analyses comparable, we use maximum likelihood to estimate all four models. The patterns for Stage 1 and 2 are similar for all matching algorithms.

VII. DISCUSSION ON THE U-SHAPE PATTERN

The U-shape pattern of performance may be understood in the context of the rules used to set the selling prices of *gaizhi* firms. Specifically, the price was a function of the firm's most recent profits. Thus, *gaizhi* gave managers of state-owned firms an incentive to deliberately reduce the short-run value of their firms so as obtain a lower purchase price. As a result, privatization resulted in a net social welfare loss equal to the decline in pre-*gaizhi* value. In this section, we document the evidence from the changes in cost structure to further support this explanation and consider three alternative explanations for the observed profit pattern.

A. Changes in Cost Structure

We employ the same specifications to explore the changes in cost structure. In particular, we focus on the changes of total cost, personnel cost, R&D cost and cost for the investment on fixed assets. We aim to detect by what means managers decrease their profit in the period immediately prior to restructuring.

Table VI shows that total cost in the pre-restructuring period significantly increases in the privatized firms relative to their peers that did not privatize. There is no evidence that the privatized firms significantly increase their personnel cost, R&D cost and cost for fixed asset investment of the privatized firms in the pre-structuring period. These findings suggest that the decrease of performance prior to privatization may be a result of a significant increase in total cost. However, the increase in expenditure contributes to neither the improvement of employees' welfare nor the sustainable development that helps to increase the value of firms, such as intensifying R&D or increasing investment for fixed assets. These changes in overall cost and cost structure imply that managers may suppress firm performance in the pre-restructuring period by spending money in some "hard-to-detect" dimensions.

B. Alternative Explanations

We also consider three alternative explanations for the observed U-shape profit pattern. First, managers may have lowered the value of their firms by shifting the timing of the recording of profits. This idea was first suggested by Paul Oyer [1998] as a way for managers to meet annual profit objectives, so we call it the Oyer hypothesis. Second, managers may take advantage of temporary bad news about their companies to purchase them at a discount relative to their true value. We call this the "bad private information" hypothesis. Third, managers have to divert some of their effort from operating firms toward dealing with privatization in the pre-restructuring period. Naturally firm performance goes down before privatization. We call it the multitasking hypothesis.

Oyer [1998] presents a list of industries in which firms can more easily time-shift the recording of sales revenue. We define a binary variable *Oyer* that equals 1 for those industries in which it is easier to time-shift profits and 0 otherwise. When we added *Oyer* to the probit regressions of *Gaizhi*, the coefficient was negative and statistically insignificant. Thus, there is no evidence that firms in industries susceptible to time-shifting of profits were more like to undergo *gaizhi*.

If the bad private information hypothesis is correct, then we should see a higher rate of privatization among firms that have more volatile profit performance. To test for this, we calculated the standard deviation of net income for all firms in the China Stock Market Financial Data Base for the years 1990-1995. *Profit Volatility* is the average value of this standard deviation computed at the 4-digit SIC code level. We added *Profit Volatility* to the probit regressions of *gaizhi*. The coefficient turned out to be small, negative, and statistically insignificant, implying that firms in industries with highly volatile profits are not more likely to undergo *gaizhi*. Thus, we reject both alternative explanations for the observed profit pattern, suggesting that the pattern is most consistent with moral hazard.

We agree with the multitasking hypothesis in the sense that managers do indeed spend many time in dealing with privatization, such as designing privatization schemes, negotiating with both local governments and employees and so on. However, the effect of multitasking on firm performance can not rule out the explanation that managers may have intentionally destroyed the value of their companies in the period immediately prior to restructuring.

To verify for this, we replace the non-gaizhi firms with firms that went bankrupt during privatization as the control group. If multitasking can fully explain the U-shape pattern, then we should see better performance in the privatized firms in the pre-restructuring period relative to those bankrupt ones. However, the coefficients are negative and statistically insignificant, implying that managers in the privatized firms may deliberately suppress firm performance.

VII. CONCLUSION

We have presented two salient facts about *gaizhi* privatization and firm profits: (1) pre-privatization profit performance of *gaizhi* firms is significantly below that of peer firms that do not privatize; (2) in the short period after privatization, performance of *gaizhi* firms nearly recovers initial levels, and we cannot rule out the hypothesis of full recovery. We conclude that managers were depressing the performance of their companies so as to acquire them on the cheap. This behavior may be tied to the special rules used by the Chinese to value assets for the *gaizhi* process. Due to underdeveloped markets for asset valuation, the Chinese used the expedient rule of basing the acquisition price on current performance. The results were all too predictable.

The finding that restructuring failed to improve performance *above* pre-*gaizhi* levels contrasts with that in Song and Yao [2005] who find that performance improves after *gaizhi.* The reason we obtain different results is that we compare performance after *gaizhi* with performance prior to the announcement of the policy change. Because performance of *gaizhi* firms declines in the wake of this announcement, the fact that performance then increases post-restructuring should not be taken as an indication that

gaizhi had favorable incentive effects. Our results, therefore, are more in line with those in Frydman et al. [1999] who find that insider acquisitions did not significantly improve performance in the Czech Republic, Hungary, and Poland. We do note that the institutions governing privatization in these nations may be quite different than the institutions governing privatization in China, so that the underlying reasons for our findings may not be identical.

Our findings are somewhat less disturbing when we consider that it took more than one decade for Eastern European countries to see economic progress after privatization[15]. In Central Europe, the Czech Republic, Hungary and Poland endured a "shock therapy program" during the early 1990s transformation to free markets. They merely returned to their pre-1989 GDP levels by the late 1990s but have continually grown since then[16]. Even so, our results highlight the dangers inherent in moving quickly to privatize state-owned assets when a market to do so does not exist.

15 See Perevalov et al. [2000] and Lutz and Grygorenko [2004] for studies of privatization in Russia and the Ukraine respectively.
16 Sources: Transition reports, Czech Republic Statistical Office and Jennifer Hunt [2006]

REFERENCES

Anderson James, Young Lee and Peter Murrell, 2000. "Competition and Privatization amidst Weak Institutions: Evidence from Mongolia." *Economic Inquiry*, Vol. 38(4): 527-546.

Boycko Maxim, Andrei Shleifer, and Robert Vishny, 1996. "A Theory of Privatization" , *The Economic Journal,* Vol. 106, No. 435 (Mar., 1996), pp. 309-319

Bruton Garry, J. Keels and Elton Scifres, 2002, "Corporate Restructuring and Performance: An Agency Perspective on Complete Buyout Cycle." *J. of Business Research*, 55 (2002) 709-724

Coffee, John. 1999, "Privatization and Corporate Governance: the Lessons from Securities Market Failure", working paper

Coricelli Fabrizio and Simeon Djankov, 2001. "Hardened Budgets and Enterprise Restructuring: Theory and an Application to Romania." *Journal of Comparative Economics*, Vol. 29 (4): 749-763

Degeorge Francois and Richard Zeckhauser, 1993 "The Reverse LBO Decision and Firm Performance: Theory and Evidence", *The Journal of Finance*, Vol, 48, No. 4, 1323-1348

Djankov Simeon and Peter Murrell, 2002. "Enterprise Restructuring in Transition: A Quantitative Survey." *Journal of Economic Literature*, Vol. XL (3): 739-792.

Earle John S, Roman Frydman, Andrzej Rapaczynski, and Joel Turkewitz, 1994, *Small privatization: The transformation of Retail Trade and Consumer Services in the Czech Republic, Hungary, and Poland* (Budapest: Central European university Press)

Frydman Roman, Cheryl Gray, Marek Hessel, and Andrzej Rapaczynski, 1999. "When Does Privatization Work? The Impact of Private Ownership on Corporate Performance in the Transition Economies." *Quarterly Journal of Economics*, Vol. 114 (4): 1153-1191.

Frydman Roman, Cheryl Gray, Marek Hessel, and Andrzej Rapaczynski, 2000. "The Limits of Discipline: Ownership and Hard Budget Constraints in the Transition Economies." *Economics of Transition*, Vol. 8 (3): 577-601.

Gao Shanwen and Yang Yao, 1999. "Implementation of Socially Optimal Outcomes in the Process of Dissolving Public Enterprises in China." *China Economic Review*, Vol. 10 (2): 41-58.

Garnaut Ross, Ligang Song, Stoyan Tenev and Yang Yao, 2003. *A Study of Firm Restructuring in China*. Washington, D.C.: The World Bank.

Glaeser E, Johnson S, and A Shleifer."Coase Versus the Coasians", *Quarterly Journal of Economics*, 2001

Hunt Jennifer, 2006, "*Is the Transition in East Germany a Success?*", working paper

Jensen Michael, 1988, " Takeovers: Their Causes and Consequences", J. of Economic Perspectives, Vol.2, No. 1, 21-48

Kaplan Steven 1989 "The Effects of Management Buyouts on Operating Performance and Value" *Journal of Financial Economics*, 24, 217-254

Kaplan Steven, 1991, " The Staying Power of Leveraged Buyouts" *J. of Financial Economics*, 29, 287-313

Heckman James, 1997. "Instrumental Variables: A Study of Implicit Behavioral Assumptions Used in Making Program Evaluations" Journal of Human Resources,32: 441-462

Li Shaomin, Shuhe Li, and Weiying Zhang, 2000. "The Road to Capitalism: Competition and Institutional Change in China." *Journal of Comparative Economics*, Vol. 28 (2): 269-292.

Lichtenberg Frank and Donald Siegel, 1990, " The Effects of leveraged Buyouts on Productivity and Related aspects of Firm Behavior", *J. of Financial economics* 27 (1990) 165-194

Lu Susan Feng and Yang Yao, 2003. "The Effectiveness of the Law, Financial Development, and Economic Growth in an Economy of Financial Repression: Evidence from China." Working paper, Center for International Development, Stanford University.

Lutz Stefan and Galyna Grygorenko, 2004, working paper, ISSN 1436-6053

Megginson William and Jeffrey Netter, 2001. "From State to Markets: A Survey of Empirical Studies on Privatization." *Journal of Economic Literature*, Vol. XXXIX (June): 321-389.

Oyer Paul, 1998. "Fiscal year ends and nonlinear incentive contracts: the effect on business seasonality". *Quarterly Journal of Economics*, Vol.113, No 1

PerevalovYurzz, Ilya Gimadii and Vladimir Dobrodei, 2000 "Does privatization improve performace of industrial enterprises? Empirical Evedence from Russia", Post-communist Economics

Rosenbaum Paul and Donald Rubin, 1983, "The Central Role of the Propensity score in

Observational Studies for Causal Effects", *Biometrika*, Vol. 70, No.1, 41-55

Rosenbaum Paul and Donald Rubin, 1985, "Constructing a Control Group Using Multivariate Matched Sampling Methods That Incorporate the Propensity Score", The American Statistician, Vol. 39, No.1., pp. 33-38

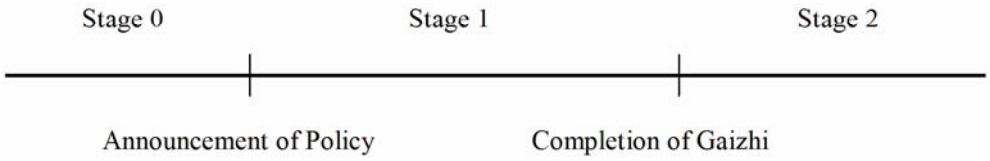
Rosenbaum Paul 2002. Observational Studies, second version, New York: Springer.

Song Ligang and Yang, Yao, 2005 "Impacts of Privatization on Firm Performance in China", forthcoming, *Journal of China Social Science*

Su Jian and Garry Jefferson, 2003. "A Theory of Decentralized Privatization: Evidence from China." *Working paper*, Department of Economics, Brandeis University.

Wooldridge, Jeffery 2004 "Estimating Average Partial Effects Under Conditional Moment Independence Assumptions", working paper.

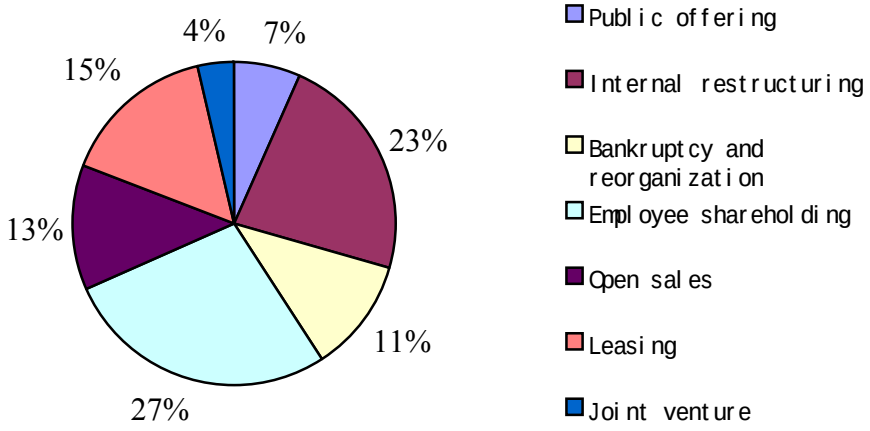
Figure I: Defining the Stages of the *Gaizhi* Process



Notes:

In this paper, we divide the process of privatization into three stages. Stage 0 refers to the period before the announcement of the privatization policy. Stage 1 refers to the period after the announcement but before the completion of privatization; this corresponds to the moment in time at which the price of the firm is set. Stage 2indicates the post-privatization priod.

Figure II: Breakdown of Forms of Gaizhi

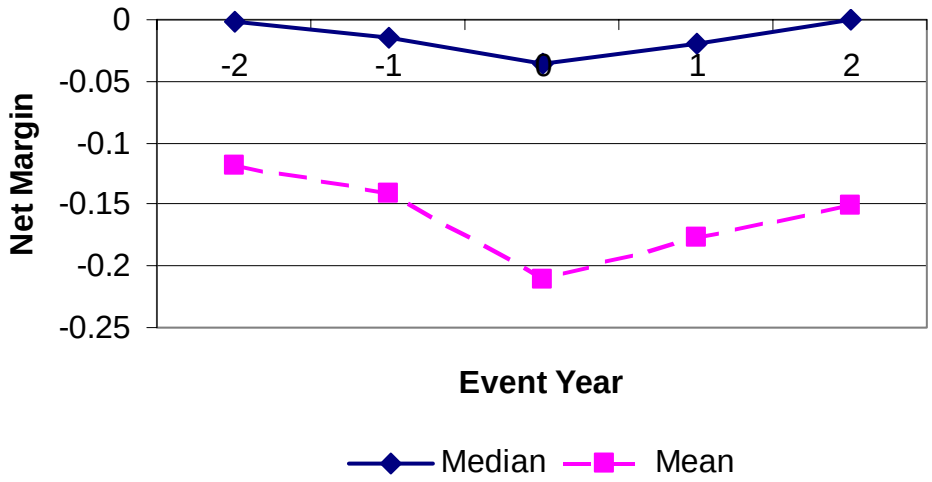


Source: IFC Report: Study on Restructured SOEs in China

Notes:

This figure describes the composition of forms of *Gaizhi*. Only 13% of firms in the sample were privatized through open sales. The remaining firms were privatized by insiders through different forms.

Figure III: Net Margin Over Time for *Gaizhi* Firms

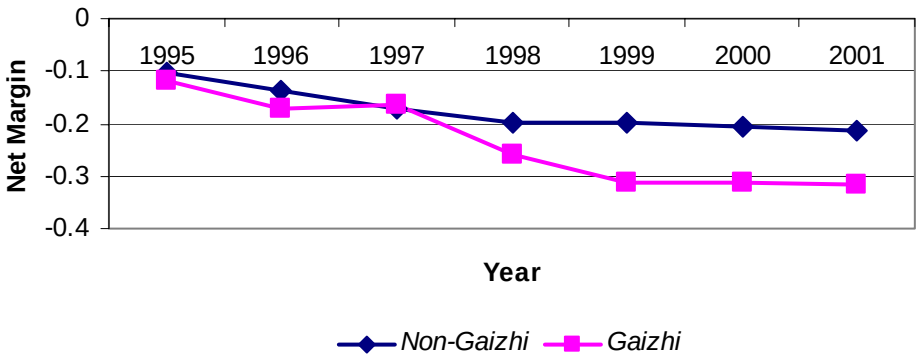


Source: Authors' analysis of 11-City Survey data

Notes:

Figure III depicts the median and mean *Net Margin* of *gaizhi* firms over the period 1996-2001. To provide an apples-to-apples comparison, we define Year 0 to be the year just before restructuring, Year=1 is the year of restructuring. We can immediately see a U-shape pattern of firm performance.

Figure IV: Time Trends of Profits for *Gaizhi* and non-*Gaizhi* firms; *Gaizhi* Occurs in 1999



Source: Authors' analysis of 11-City Survey data

Notes:

Figure IV depicts the mean *Net Margin* of firms undergoing *gaizhi* in 1999 and firms that did not restructure. The non-*gaizhi* firms experienced a steady decline in performance throughout this time period. By comparison, the overall performance of *gaizhi* firms *relative* to the control group displays the U-shape – a sharper decline pre-restructuring and then a shallower decline afterwards.

Table I: Example for Coding Stages and Periods

Year	*Gaizhi* Firm		Matched Firm	
	Stage 1	Stage 2	Stage1	Stage2
1995	0	0	0	0
1996	1	0	1	0
1997	1	0	1	0
1998	0	1	0	1
1999	0	1	0	1
2000	0	1	0	1
2001	0	1	0	1

Notes:

(1) In this example, the *Gaizhi* firm went through restructuring in 1998.

(2) We define *Stage 1* for both the *Gaizhi* firm and its match to equal 1 in years after 1995 and prior to restructuring and 0 otherwise. We define *Stage 2* to equal 1 in the years after restructuring and 0 otherwise.

Table II: Probit Model: Dependent Variable = *GZ*

	Coeffient	Standard Error
Workers	-0.184	(0.26)
Workers Square	0.005	(0.02)
Size	-0.740*	(0.44)
Size Square	0.138	(0.12)
Redundancy	-2.534*	(1.31)
Redundancy Square	1.363	(1.52)
Age	-0.135	(1.89)
Age Square	0.453	(2.80)
Deposit	0.108*	(0.06)
Constant	-1.714	(1.15)
Interaction (Industry*Deposit)	Included*	
City	Included***	
Industry	Included	
Joint Significance for IVs:	Chi2 =24.56	Prob > chi2 = 0.0009
Peudo R-Square	0.258	
Log likelihood	-135.78	
N	367	

* p<0.10, ** p<0.05, *** p<0.01

Notes:

The probit analysis is used to obtain the propensity scores so that firms can be matched based on the scores.

Table III: Matching Sample: Baseline and Fixed Effects Specifications

Dependent Variable: Net Margin

	FE (1)	RE (2)	OLS (3)	Median (4)
Period1	-0.041*	-0.041**	-0.045**	-0.012**
	(0.03)	(0.02)	(0.02)	(0.01)
Period 2	-0.016	-0.018	-0.019	0.003
	(0.03)	(0.03)	(0.02)	(0.01)
Workers			-0.074***	-0.042***
			(0.02)	-0.004
Size			0.077***	0.047***
			(0.02)	-0.004
Redundancy			-0.260***	-0.107***
			(0.04)	-0.012
1996	-0.008	-0.008	-0.006	-0.001
	(0.02)	(0.02)	(0.03)	(0.01)
1997	-0.032**	-0.032**	(0.03)	-0.009
	(0.02)	(0.02)	(0.03)	(0.01)
1998	-0.055***	-0.055***	-0.053**	-0.020***
	(0.02)	(0.02)	(0.03)	(0.01)
1999	-0.067***	-0.067***	-0.066**	-0.020***
	(0.02)	(0.02)	(0.03)	(0.01)
2000	-0.081***	-0.080***	-0.079***	-0.024***
	(0.02)	(0.02)	(0.03)	(0.01)
2001	-0.089***	-0.088***	-0.088***	-0.022***
	(0.02)	(0.02)	(0.03)	(0.01)
City			Included***	Included***
Year	Included***	Included***	Included***	Included***
Industry			Included***	Included***
R-Squared	0.407		0.249	
N	1008	1008	1008	1008

Notes:

The results suggest that gaizhi firms underperformed their peers by 4 percentage points in the pre-restructuring period and recovered to its original level after the restructuring.

Table IV: Treatment Effects of Privatization, Matching Estimates

Dependent variable = *ΔNet Margin*

	Y_Treated	Y_Control	$\delta^{(2)}$	$\beta^{(3)}$	p-value for $U^{(5)}$
Stage 1	-0.082	-0.032	-0.050**	-0.050**	0.148
	(0.17)	(0.09)	(0.02)	(0.02)	
Stage 2	-0.096	-0.09	-0.006	-0.006	0.606
	(0.22)	(0.20)	(0.04)	(0.03)	

Notes:

(1) ***Significant at p<.01, **Significant at p<.05, *Significant at p<.10

(2) δ=Y_Treated-Y_Control. We bootstrap to correct the standard errors, N=100 replication samples.

(3) The column labeled β represents the results from OLS regression.

(4) Heterskesdasticity-consistent standard errors in parentheses.

(5) For Stage 1, we include all the years before privatization. For Stage 2, we use 1995 and the years after privatization.

(6) The results reconfirm the U-shape pattern of firm performance.

(7) Results from Rosenbaum "hidden bias" tests imply that the null hypothesis holds that there is no hidden bias in the matching method.

Table V: Sensitivity Analysis for Different Matching Methods

Dependent Variable: Net Margin

	One-to-One with IV (1)	One-to-One (2)	N-Neighbors (3)	Kernel (4)
GZ Stage 1*	-0.041*	-0.040*	-0.040*	-0.029
	(0.02)	(0.02)	(0.02)	(0.02)
GZ Stage 2*	-0.018	-0.015	-0.026	-0.015
	(0.02)	(0.02)	(0.02)	(0.02)
1996	-0.008	-0.008	-0.014	-0.021
	(0.02)	(0.02)	(0.02)	(0.02)
1997	(0.03)	-0.032*	-0.038**	-0.045**
	(0.02)	(0.02)	(0.02)	(0.02)
1998	-0.055***	-0.069***	-0.062***	-0.068***
	(0.02)	(0.02)	(0.02)	(0.02)
1999	-0.067***	-0.076***	-0.073***	-0.081***
	(0.02)	(0.02)	(0.02)	(0.02)
2000	-0.080***	-0.093***	-0.085***	-0.089***
	(0.02)	(0.02)	(0.02)	(0.02)
2001	-0.088***	-0.084***	-0.074***	-0.082***
	(0.02)	(0.02)	(0.02)	(0.02)
LR Test	383.96	399.33	431.54	371.36
N	1008	1022	1218	2548

* p<0.10, ** p<0.05, *** p<0.01

Notes:

The pattern for Stage1 and Stage2 are similar for different matching algorithms.

Table VI: Changes in Cost Structure: Total Cost and Cost Breakdown

Dependent Variable	Total Cost		Personnel Cost		R&D Cost		Investment in Fixed Assets	
	OLS	FE	OLS	FE	OLS	FE	OLS	FE
*GZ*Stage1*	0.427***	0.565*	-127.018	-51.842	-6.84	-1.693	-0.552**	-0.272
	(0.163)	(0.305)	(248.021)	(484.608)	(8.490)	(17.577)	(0.228)	(0.413)
*GZ*Stage2*	0.096	0.320	-206.054	-331.468	-21.985**	-22.88	-0.829***	-0.307
	(0.180)	(0.315)	(275.906)	(501.920)	(9.383)	(18.162)	(0.269)	(0.439)
Firm Characteristics	Y	N	Y	N	Y	N	Y	N
Year Dummy	Y	Y	Y	Y	Y	Y	Y	Y
Firm Dummy	N	Y	N	Y	N	Y	N	Y
R-Squared	0.163	0.034	0.098	0.039	0.06	0.017	0.349	0.044
N	1008	1008	910	910	1008	1008	396	396

Notes:

Table VI shows that total cost in the pre-restructuring period significantly increases in the privatized firms relative to their peers that did not privatize. There is no evidence that the privatized firms significantly increase their personnel cost, R&D cost and cost for fixed asset investment of the privatized firms in the pre-structuring period.