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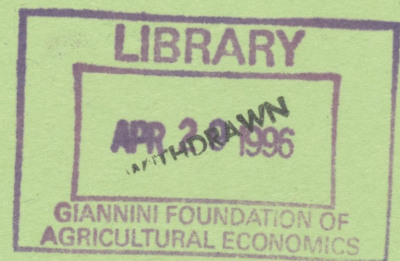
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Decision Rights, Residual Claim and Performance:
A Theory of How the Chinese State Enterprise Reform Works

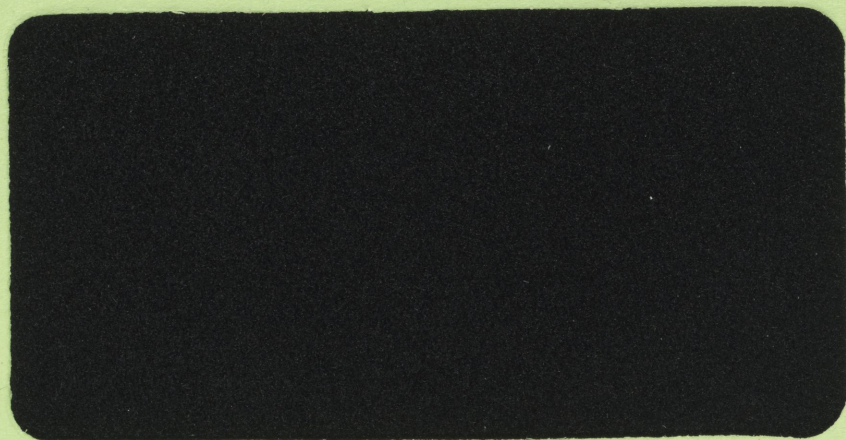Weiying Zhang[*]
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Decision Rights, Residual Claim and Performance:
A Theory of How the Chinese State Enterprise Reform Works

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Abstract

This paper is intended to model the process of shifting decision rights and residual claim from the central agent (government) to the inside members of the firm in China, and to analyze how the reform has improved performance of the state-owned enterprises. We show that the bargaining solution between the central agent and the firm is preferred to an one-sided solution, and that managerial discretion of the state enterprises can greatly improve efficiency through both its direct incentive effect and indirectly hardening the budget constraint. Further improvement of efficiency requires that authority of selecting management is transferred from bureaucrats to real capital-owners who bear business risks. China is already well on this way.

INTRODUCTION

State-owned enterprise reform in China so far can be characterized by a continuously evolutionary process of reassignment of decision rights and residual claim from the central agent to inside members of the firm.[1] The reform started with no intention to abolish public ownership. But it has been directed by a new doctrine which is potentially conflicting with the conventional doctrine of public ownership. We call this new doctrine "the reform doctrine", according to which, both decision rights and residual claim should be shifted to the inside members of the firm (i.e., the manager and workers).[2] The argument for shifting the decision rights to the manager of the firm is based on the assumption that decisions made at the firm level are more efficient than at the central planner level because of information/communication problems. The theoretical legitimacy of this assumption dates back to Hayek (1945), while Chinese economists mainly based their argument on the observed poor performance of the traditional planning system.[3] The argument for shifting the residual claim to the inside members of the firm is based on incentive considerations. Although modern theory of incentives was just recently introduced into China, the pre-reform Chinese experience seems sufficient for both Chinese economists and reform-minded leaders to understand how essential the incentive system is for economic performance.

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[1] Here the central agent refers to the central planner of the old system or loosely the government, or "state". In this paper, the central agent and the government are interchangeably used. Theoretically in a public economy, ordinary citizens are original principals who delegate ownership-authority to the government through a hierarchical structure. For a theoretical describtion of the structure of a public economy, see Zhang (1993).

[2] In Chinese literature, they are termed as "the firm".

[3] For a recent study on colocation of knowledge and decision authority, see Jensen and Meckling (1992).

The reform doctrine can be summarized by a popular official slogan that "the goal of reform is to make the firm independent, autonomous, and responsible for profits and losses". If this doctrine were fully implemented, public ownership would no longer exist in any economic sense; the government would be nothing more than a bond-holder on behalf of the "owners" of capital assets.[4] No doubt such a reformed system would Pareto dominate the traditional one. However, for reasons we will specify later, the reform doctrine has never been fully implemented. Nevertheless, what is important is that, just as the constitutional status of public ownership has made it possible for ordinary citizens (original principals) to acquire some residual via the central planner who were in the position of the acting principal, the reform doctrine has provided a legitimacy for the inside members of the firm to strive for their status of (self-)principalship. As a result, there are two legitimized principals competing with each other. The conflict has been solved in practice by a compromise principalship sharing arrangement determined by a bargaining process, in which the inside members of the firm have appeared more and more offensive, while the government has appeared more and more defensive.

The bargaining between the central agent and the inside members of the firm is mediated by industrial bureaus. Under the old system, the status of the industrial bureau was clearly defined: the agent of the central planner and the principal of the inside members of the firm. However, once the latter acquired their theoretically legitimized status of the principal, the industrial bureau becomes a double-faced agent: to the firm, it represents the government, and to the government, it represents the firm. The functioning of the industrial bureau is important for both the central agent and the firm to get their best deals. The central agent relies on the industrial bureau to provide information and monitor the firm, while the inside members of the firm

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[4]It has been argued by some economists that even ownership of the capital assets should be shifted to the inside members of the firm.

rely on the industrial bureau to use "collective" power to bargain with the central agent. As a result, the industrial bureau is in an advantage to "eat" both the central planner and the inside members of the firm. This has caused much concern among Chinese economists.

This paper is intended to model the process of shifting decision rights and residual claim from the central agent to the inside members of the firm, and to analyze how the reform has improved performance of the state-owned enterprises. The paper is partly motivated by some empirical studies. Since the early 1980s the reform of state-owned enterprises (specially large- and middle-size enterprises) has been put on the top agenda by the reform policy makers as the core of the whole economic reform program. Although the dominant argument among Chinese economists is that the state enterprise reform has not been successful, Jefferson and Xu (1991) and Hay et al (1994), based on the structure-conduct-performance paradigm, find that the reformed Chinese state enterprises behave almost like the classical firm both in product markets and factor markets. This finding surprises most Chinese economists because it seems quite inconsistent with their intuition of the behaviour of the state enterprises.[5] Although one can raise questions about their econometrics methodology and data collection bias, it seems not reason to reject the finding simply because it is counter-intuitive. I myself am an advocate of private property right and have never believed a public ownership-based market economy.[6] However I do believe that their empirical finding is true. Because of this, I bear a responsibility to provide an theoretical interpretation for this finding based on property rights and incentive theory.

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[5]Indeed, I remember that when Hay presented their paper at a seminar in Oxford in October 1991, organized by the Chinese Economic Association in the United Kingdom, he was heavily atttacked by his Chinese audience.

[6]See Zhang (1986, 1988).

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In contrast with most economists' criticism of bargaining, we find that the bargaining solution of allocations of decision rights and residual claim between the government and the enterprise might be socially preferred to an one-sided solution. Perhaps the most remarkable result of the paper is that managerial discretion of the state-owned enterprises has provided great incentives for managers to pursue profit and to improve efficiency. The managerial discretion might not be a good thing in a private economy, as usually argued, but it might be good in a public economy. Given that the state is a legal residual claimant of the enterprises, managerial discretion might be an effective way for managers to become actual residual claimants. Autonomy of the firm and marketization of the economy have generated more opportunities and freedom for managers to enjoy profit, legally or illegally. To a great extent how much perks or more generally how much personal benefit a manager can enjoy depends on how much profit he can make. As a result, managerial incentives have been greatly improved. This is the case partly because the managerial discretion has a positive effect on hardening the budget constraint. The soft budget constraint has been argued as a major reason for inefficiency of the state-owned enterprises. But the budget can be soft only if the government can make arbitrary transfer of profit between profit-makers and loss-makers. Since the reform, the government's ability to make such a transfer has been greatly reduced by the profit-makers' ability to manipulate accounting. Although the loss-makers may still not need go bankrupt, they find it more and more difficult to get subsidies from the government since the government itself is close to bankruptcy. This puts pressure on all firms to improve efficiency. The unhappiness of Chinese economists with the behaviour of the reformed state-owned enterprises is mainly from observation of the managerial discretion. Those who still believe a public ownership-based market economy should be greatly relieved by our finding.

Although shifting of decision rights and residual claim from the government to man-

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agers and its associated managerial discretion have greatly improved the managerial incentive mechanism, there is a fundamental problem which has not be solved for the Chinese state-owned enterprises. That is, selection of high ability managers. An incumbent manager has incentive to make profit, but at present there is no mechanism to ensure that only qualified people can be selected for management. The reason is that managers of the state enterprises are selected by bureaucrats rather than capitalists. As Zhang (1994) demonstrated, given that entrepreneurial ability is not easy to observe, the existence of capitalists is crucial for only high ability people to occupy management positions. To further improve efficiency of the Chinese economy, privatization of the state enterprises is not only necessary but also inevitable. Given the *status quo* of China's institutional structure, which must be respected during the reform process, capitalistization of incumbent bureaucrats and managers may be the only feasible way for China to privatize the state-owned enterprises.[7] In fact, we have every reason to believe that the reform process is already well on this way.

DESCRIPTION OF THE MODEL

For simplicity, we normalize the inside members (the manager and workers) of a state enterprise to a single agent who has a well-defined utility function. Define the gross profit function as follows:

$$\pi = \pi\left(\theta, I_A, \lambda, k, s\right) \tag{1}$$

where π is the *actual realized* gross profit, θ the managerial ability of the firm, I_A work effort of the inside members of the firm, λ a parameter of decision rights held by the firm (the total decision rights are normalized to one such that $\lambda = 0$ implies the firm has no autonomy at all, and $\lambda = 1$ implies the firm enjoys the full autonomy),

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[7]By capitalistization, we mean transforming incumbent bureaucrats and managers into capitalists.

k the capital stock used by the firm but owned by the government (on behalf of the original principals), and $s \in [\underline{s}, \overline{s}]$ is the state of nature. Note here decision rights refer to autonomy of deciding what to do and how to do it within given human and capital resources.

We shall assume that π is a monotonically increasing, concave function of all θ, I_A, λ, k, and increasing with s. That is, $\frac{\partial \pi}{\partial x} > 0, \frac{\partial^2 \pi}{\partial x^2} \leq 0, x = \theta, I_A, \lambda, k; \frac{\partial \pi}{\partial s} > 0$. In particular, we assume that $\frac{\partial \pi}{\partial \lambda} \to 0$ as $\lambda \to 1$, which means that if the manager of the firm holds full autonomy of decision making, reducing autonomy by an ϵ will have little effect on efficiency.[8] Because the importance of the managerial ability depends on autonomy of the firm, we assume that $\frac{\partial^2 \pi}{\partial \theta \partial \lambda} > 0$, and $\frac{\partial \pi}{\partial \theta} = 0$ for $\lambda = 0$.

Assume that the distribution of profit between the central agent and the inside members of the firm takes a linear form:[9]

$$y_F = f + \beta (\pi - f - g) = (1 - \beta)f + \beta(\pi - g) \tag{2}$$

$$y_G = g + (1 - \beta)(\pi - f - g) = \beta g + (1 - \beta)(\pi - f) \tag{3}$$

where y_F is the profit retained by the inside members of the firm, and y_G the profit delivered to the central agent; f and g are their respective fixed terms, and β and $(1-\beta)$ are their respective residual shares after deduction of the fixed terms.

From the standard principal-agent theory[10], given that the government is less informed of the state of nature, and monitoring is costly, if the inside members of the

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[8]Note that by directly introducing autonomy into the profit function, we suppress the role of the central agent's effort. That is, the relative importance of the central agent's effort over the inside members' effort decreases as the firm's autonomy increases. The effect of λ on π can be understood as the net benefit of switch of decision rights from the central agent to the manager of the firm.

[9]The practical contract between the government and the firm is typically piece-wise linear. The linearity assumption should not affect the main arguements. In addition, in this paper, we do not consider taxation problem which equivalently exists in a private economy.

[10]For an excellent survey of principal-agent theory, see Hart and Holmstrom (1987).

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firm are risk-neutral, the optimal contract is to set $\lambda = 1$, $\beta = 1$, $f = 0$ and $g > 0$; that is, the manager has the full autonomy to make decisions, the inside members are the full residual claimant, and the government is guaranteed a fixed term in return for capital services. This is the policy implication of the reform doctrine.

The first constraint which may make such a "first best" contract infeasible (unenforceable) is that, on the one hand, because of the lower-bound constraint of the profit the guaranteeable fixed term might be too low to compensate the government for capital services (even negative if the bad state occurs); on the other hand, because of the lower-bound constraint of consumption, it is impossible to set $f = 0$.[11]

Because of this, it is inevitable to set $\beta < 1$; that is, the residual has to be shared between the government and the inside members of the firm. This leads to the second constraint. If the inside members of the firm are able to manipulate accounting of profits, what actually shared by the central agent is not $(1 - \beta)$ times the real profit but the manipulated one. In the extreme case, the reported profit might be nothing more than $(f + g)$ or even less, although the actual residual is very large. By doing so, the inside members of the firm enjoy all the residual and leave the central agent very little.[12] The observation is that ability for the inside members to manipulate accounting is increasing with the degree of autonomy of the firm. The intuition is

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[11]It is worthwhile to make a comparison with a capitalist firm. In the capitalist firm, bond-holders are protected by share-holders: the fixed return to the bond-holders is guaranteed by assets of the share-holders when the firm makes loss. This protection relieves the bond-holders from regular monitoring; monitoring by the bond-holders comes only when the share-holders' assets value becomes zero, i.e., bankruptcy occurs, which is very infrequent. In contrast, for a firm in which the only capital-supplier is the bond-holder, bankruptcy would become frequent and the bond-holder must monitor the firm regularly. This implies that the bond-holder is actually a "bad-holder": he plays the role of monitoring like a share-holder when the performance is bad, but has no status to claim the residual when the performance is good.

[12]Accounting manipulation should be understood as a reduced expression of the inside members' comsumption of all perks and other forms of managerial discretion.

that when the manager has various decision choices, he can transfer funds from one use to another, can overstate input prices and understate output prices, and even open a private account. It is very difficult for the central agent to judge whether a particular use of funds is reasonable.[13] This implies that it is impossible for the central agent to agree to set $\lambda = 1$. The manager cannot hold all the decision rights.

A special case of accounting manipulation is where the manager reports a profit when the firm actually makes loss. This is possible because the manager has the right to make investments. Funds borrowed from bank on the pretext of investment may be simply "eaten" as bonuses. In some cases, the "profit" is just depreciation of the capital stock. Because there is no market value of the assets, eating up the principal is very unnoticeable for outsiders. In fact, some capital asset might be delivered to the central agent as profit.

The third constraint comes from impossibility of separation of exercising decision rights from personal enjoyment of rents by the central agent. In a public economy, although the government bureaucrats are motivated by their personal enjoyment of rents, they have no legal rights to pocket the residual; the personal enjoyment of the rents must be embodied into exercising decision rights (Zhang, 1993). Fully transferring the decision rights to the firm implies depriving them of the residual claim, which is not only impossible but also might not be good for the society. Because the bureaucrats are multi-task agents, the loss of their incentives would lead to a collapse of the whole society.

These three constraints are complementary. They help each other in supplying the rationales for the central agent to refuse to transfer fully both decision rights and residual claim to the inside members of the firm. As a result, the only feasible contract is to set $\beta < 1$ and $\lambda < 1$. However, the feasible set defined by these restrictions is

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[13]For a theoretical analysis of the effect of richness of the action space on the form of the contract, see Holmstrom and Milgrom (1987).

still large. There is a room for negotiation.

For simplicity, assume that the fixed terms f and g are set such that $(f + g)$ is just equal to $\underline{\pi}$, the lower-bound of the profit (in the worst case), which is common knowledge. Assume $f > 0$, that is, the central agent guarantees the inside members a "subsistence level income" (If $\underline{\pi}=0, f = -g$, which implies that $g < 0$). Because capital abuse by the inside members of the firm is the most serious when the worst state occurs, we miss an important insight by making this assumption. To remedy this, we explicitly introduce a term $\alpha(\lambda)k$ to represent capital abuse, where $0 < \alpha < 1$, $\frac{\partial \alpha}{\partial \lambda} > 0$.

We now use π to denote the net profit (i.e., the gross profit minus $(f + g)$). Denote by π^0 the reported profit and assume that π and π^0 satisfy the following relation:

$$\pi^0 = \delta(\lambda)\pi, \text{ where } 1 \geq \delta > 0 \ , \ \frac{\partial \delta}{\partial \lambda} < 0 \text{ and } \delta(0) \equiv 1$$

That is, ability to manipulate accounting is increasing with the degree of autonomy; it is impossible to manipulate accounting when the manager has no decision right. Note that we assume that the manager only under-reports profit (over-report of profit is captured by the term of capital abuse.) We assume that this relation is known to the central agent but is unverifiable (otherwise there would be no accounting manipulation).

Because the central agent gets its residual according the reported profit rather than the real profit, the real residual is shared as follows:[14]

$$y_F = \beta\pi^0 + \left(\pi - \pi^0\right) = (1 - \delta(1 - \beta))\,\pi \tag{4}$$

$$y_G = (1 - \beta)\,\pi^0 = \delta(1 - \beta)\,\pi \tag{5}$$

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[14]We drop f and g because they are irrelevant for the optimum.

We call $(1 - \delta(1 - \beta))$ "the real residual share" of the inside members of the firm and $\delta(1 - \beta)$ "the real residual share" of the central agent (accordingly, β is called "nominal residual share"). From (4) and (5), we see that for any given nominal residual share, the real residual share held (and profit retained) by the inside members is increasing with the degree of autonomy, while the real residual share held by (and profit delivered to) the central agent is decreasing with the degree of autonomy. For a given λ, the deviation of the real from the nominal depends on manipulation technology, which we do not explore here.

Assume that both the central agent and the inside members of the firm are risk-neutral and their respective utility functions are defined as follows (note: now π denotes the expected profit):

The inside members of the firm:

$$U_F = (1 - \delta(\lambda)(1 - \beta))\,\pi(\theta, I_A, \lambda, k) + \alpha(\lambda)k - C(I_A) \tag{6}$$

where $C(I_A)$ is the cost function of work effort, $\frac{\partial C}{\partial I_A}, \frac{\partial^2 C}{\partial I_A^2} > 0$

The central agent:

$$U_G = \gamma\left(\delta(\lambda)(1 - \beta)\,\pi(\theta, I_A, \lambda, k) - \alpha(\lambda)k\right) + (1 - \gamma)\,G(\lambda) \tag{7}$$

where $\frac{\partial G}{\partial \lambda} < 0, \frac{\partial^2 G}{\partial \lambda^2} < 1$.

The first utility function is self-explanatory. The second can be interpreted as follows. The central agent's utility is a weighted sum of two parts: the first part is monetary residual and the second is non-monetary term which captures the idea that he has to exercise some decision rights directly in order to enjoy rents. We use γ to capture both the ownership constraint from the original principals and the possibility of pocketing the rent. The central agent cares for the residual both because of his personal enjoyment and because of his responsibility for delivering some minimum benefit to the original principals. This implies $\gamma > 0$. However, how important the

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residual is depends on to what degree he can pocket the residual after delivering the minimum requirement to the original principals. The easier pocketing is, the more important y_G is, which in turn implies the less necessary to use the decision rights as a tool of enjoying the rent. We assume that $\gamma = 1$ if he can directly pocket the rent, in which case, the decision rights are useless for him. Note we implicitly assume that the central agent has no direct preference for the decision rights *per se* , and that indirectly consuming the rent by exercising the decision rights is less efficient than directly (if possible).[15]

The contract between the central agent and the insider members of the firm is characterized by a set of λ (share of decision rights) and β (residual share). Bargaining between the central agent and the inside members is to set (β, λ). We shall discuss the bargaining solution in next section.

THE BARGAINING SOLUTION OF ALLOCATION OF DECISION RIGHTS AND RESIDUAL CLAIM

Before discuss how β and λ are to be set, let us first solve the optimal work effort chosen by the inside members for given β and λ. The first-order condition implies that

$$\frac{\partial C}{\partial I_A^*} = (1 - \delta(\lambda)(1 - \beta)) \frac{\partial \pi}{\partial I_A^*} \tag{8}$$

It is easy to see that the optimal choice of work effort is increasing with both the residual share and the decision rights. It is worth noting that the decision rights affect the optimal work effort through two channels: the first is its direct effect on the profit function and the second is its effect on the real residual share through accounting manipulation. For any given β and λ, an improvement in accounting manipulation ability will surely increase work effort. This implies that from the incentive point of

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[15]More ideall form of the central agent's utility function is $(\delta(\lambda)(1 - \beta) \pi(\theta, I_A, \lambda, k) - \alpha(\lambda)k)^\gamma (G(\lambda))^{1-\gamma}$.

view, managerial discretion is not a bad thing.[16]

We now turn to determination of β and λ.

As a starting point, let us first consider the case in which the central agent has exclusive authority to set both β and λ. Then the central agent's problem is

$$
\begin{array}{ll}
\underset{\{\beta, \lambda\}}{Max} & U_G = \gamma \left(\delta(\lambda)(1-\beta) \pi(\theta, I_A, \lambda, k) - \alpha(\lambda)k \right) + (1-\gamma)G(\lambda) \\
s.t. & \frac{\partial C}{\partial I_A^*} = (1 - \delta(\lambda)(1-\beta)) \frac{\partial \pi}{\partial I_A^*}
\end{array}
\tag{9}
$$

By rearranging the first order conditions, we obtain (we assume that the interior solutions exist and qualify this assumption later):

$$
\beta^*: \quad (1-\beta) \frac{\partial \pi}{\partial I_A^*} \frac{\partial I_A^*}{\partial \beta} = \pi
\tag{10}
$$

$$
\lambda^*: \quad \delta(\lambda)(1-\beta) \left(\frac{\partial \pi}{\partial \lambda} + \frac{\partial \pi}{\partial I_A^*} \frac{\partial I_A^*}{\partial \lambda} \right) = \frac{\partial \alpha}{\partial \lambda} k - (1-\beta) \frac{\partial \delta}{\partial \lambda} \pi - \frac{(1-\gamma)}{\gamma} \frac{\partial G}{\partial \lambda}
\tag{11}
$$

where $\frac{\partial I_A^*}{\partial \beta}$ and $\frac{\partial I_A^*}{\partial \lambda}$ are defined by the first-order condition (8).

The LHSs of the equations are the marginal benefits and the RHSs are the marginal costs of increasing β and λ, respectively. The optimal β and λ for the central agent, denoted by β_G^* and λ_G^*, are determined by equalization of the marginal benefits and the marginal costs. The marginal benefit of β comes from the effect on work effort through the incentive compatibility constraint, and the marginal cost of β is the direct reduction of the residual share. The marginal benefit of λ contains two parts: the first is the direct efficiency improvement $\left(\frac{\partial \pi}{\partial \lambda} \right)$ based on information advantages by the

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[16]To be concrete, assume $C(I_A) = 0.5 I_A^2$, $\pi = \theta I_A (1+\lambda)k$ and $\delta = (1 - \tau\lambda)$, where $0 \le \tau \le 1$ is a parameter of easiness of accounting manipulation. Then,

$$
I_A^* = (1 - (1 - \tau\lambda)(1-\beta)) \theta (1+\lambda) k
$$

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manager, and the second is the indirect effect on work effort through the incentive compatibility $\left(\frac{\partial \pi}{\partial I_A^*} \frac{\partial I_A^*}{\partial \lambda} \right)$; the marginal cost of λ contains three parts: the first is the effect on capital abuse $\left(\frac{\partial \alpha}{\partial \lambda} k \right)$, the second the effect on accounting manipulation $\left((1 - \beta) \frac{\partial \delta}{\partial \lambda} \pi \right)$, and the third the effect on the use of decision rights to carry out the rent enjoyment $\left(\frac{(1-\gamma)}{\gamma} \frac{\partial G}{\partial \lambda} \right)$.

The condition for the existence of the interior solution of β seems fairly satisfied. Clearly $\beta = 1$ is not optimal because that implies the central agent gets nothing. $\beta = 0$ can be optimal only if either the direct monitoring by the central agent is sufficiently effective, which has been excluded, or the inside members of the firm has very great ability to manipulate accounting such that the central agent is the full nominal residual claimant while the inside members of the firm actually claim a considerable part of the residual.[17] However, if the later is the case, the central agent may simply reject assigning any decision rights to the manager, which implies that the whole situation would go back to the *status quo*. So it seems reasonable to assume that $0 < \beta_G^* < 1$.

The condition for the existence of the interior solution of λ is to be qualified. $\lambda_G^* = 0$ can be excluded on basis of information advantage of the manager in making decisions, which has been the major rationale for reform. $\lambda = 1$ cannot be optimal if the internal members of the firm can fully manipulate accounting when they have the full autonomy, i.e., $\delta(1) = 0$. But $\delta(1) = 0$ seems not realistic and we shall exclude it. Then the existence of the interior solution requires that the marginal cost of λ grow faster than the marginal benefit. How fast the marginal cost of λ grows depends on how λ affects the marginal ability of abusing capital, the marginal ability of manipulating accounting, and the marginal effect on the central agent's ability to use the decision rights to enjoying the rent. If all these three marginals are increasing

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[17]In the dsitorted public economy, the original principals are the full nominal residual claimant, while the government officials actually claim a considerable part of the residual.

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with λ (that is, $\frac{\partial^2 \alpha}{\partial \lambda^2} > 0$, $\frac{\partial^2 \delta}{\partial \lambda^2} < 0$ and $\frac{\partial^2 G}{\partial \lambda^2} < 0$), the condition seems satisfied, because given that $\frac{\partial^2 \pi}{\partial \lambda^2} < 0$ and $\frac{\partial^2 \pi}{\partial I_A^2} < 0$, the marginal benefit of λ cannot grow very fast even if $\frac{\partial^2 I_A^*}{\partial \lambda^2} > 0$ (this is normal case because λ has two positive effects on I_A^*); intuition is that λ drives the marginal cost through three channels while it drives the marginal benefit through only one channels. A sufficient condition for the existence of the interior solution is that $\left| \frac{\partial G}{\partial \lambda} \right| \to \infty$ as $\lambda \to 1$, which means that holding no decision rights at all would be a disaster for the central agent. This is extreme but can be justified given that the government bureaucrats have no legal right to pocket the rent.

Based on the foregoing arguments, we shall assume that $0 < \beta_G^* < 1$ and $0 < \lambda_G^* < 1$. We now do some comparative statics of how β_G^* and λ_G^* are dependent on the managerial ability (θ), capital stock (k) and the parameter of possibility of pocketing rents (γ). In other words, from the point of view of the central agent's interest, should the optimal residual share and the optimal autonomy of the firm be increasing, constant or decreasing with the managerial ability, capital stock and the probability of pocketing rents respectively?

Rewriting the first-order conditions (12) and (13) as follows:

$$L = (1 - \beta) \frac{\partial \pi}{\partial I_A^*} \frac{\partial I_A^*}{\partial \beta} - \pi \equiv 0 \tag{12}$$

$$\Gamma = \delta(\lambda)(1 - \beta) \left(\frac{\partial \pi}{\partial \lambda} + \frac{\partial \pi}{\partial I_A^*} \frac{\partial I_A^*}{\partial \lambda} \right) - \frac{\partial \alpha}{\partial \lambda} k + (1 - \beta) \frac{\partial \delta}{\partial \lambda} \pi + \frac{(1 - \gamma)}{\gamma} \frac{\partial G}{\partial \lambda} \equiv 0 \tag{13}$$

Differentiating $L(\beta, \theta, k)$ with respect to β, θ, and k, we obtain:

$$\frac{\partial L}{\partial \beta} = -\frac{\partial \pi}{\partial I_A^*} \frac{\partial I_A^*}{\partial \beta} + (1 - \beta) \left(\frac{\partial^2 \pi}{\partial I_A^{*2}} \left(\frac{\partial I_A^*}{\partial \beta} \right)^2 + \frac{\partial \pi}{\partial I_A^*} \frac{\partial^2 I_A^*}{\partial \beta^2} \right) - \frac{\partial \pi}{\partial I_A^*} \frac{\partial I_A^*}{\partial \beta} < 0 \tag{14}$$

$$\frac{\partial L}{\partial \theta} = (1 - \beta) \left(\frac{\partial^2 \pi}{\partial \theta \partial I_A^*} \frac{\partial I_A^*}{\partial \beta} + \frac{\partial^2 \pi}{\partial I_A^{*2}} \frac{\partial I_A^*}{\partial \theta} \frac{\partial I_A^*}{\partial \beta} + \frac{\partial \pi}{\partial I_A^*} \frac{\partial^2 I_A^*}{\partial \theta \partial \beta} \right) - \left(\frac{\partial \pi}{\partial \theta} + \frac{\partial \pi}{\partial I_A^*} \frac{\partial I_A^*}{\partial \theta} \right) = ? \tag{15}$$

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$$\frac{\partial L}{\partial k} = (1-\beta)\left(\frac{\partial^2 \pi}{\partial k \partial I_A^*}\frac{\partial I_A^*}{\partial \beta} + \frac{\partial^2 \pi}{\partial I_A^{*2}}\frac{\partial I_A^*}{\partial k}\frac{\partial I_A^*}{\partial \beta} + \frac{\partial \pi}{\partial I_A^*}\frac{\partial^2 I_A^*}{\partial k \partial \beta}\right) - \left(\frac{\partial \pi}{\partial k} + \frac{\partial \pi}{\partial I_A^*}\frac{\partial I_A^*}{\partial k}\right) \;=\; ? \quad (16)$$

That is, the effects of the managerial ability and the capital stock on the optimal residual share from the central agent's point of view are ambiguous. However, a careful examination of (15) and (16) shows that the greater the cross partial derivative between work effort and managerial ability (capital stock) is, the more likely the effect is positive (i.e., more share should be assigned to the inside members). Intuition is that work effort is more sensitive to the residual share when the cross effect is large.

Differentiating $\Gamma(\lambda, \theta, k, \gamma)$ with respect to $\lambda, \theta, k, \gamma$, we obtain:

$$\frac{\partial \Gamma}{\partial \lambda} = \delta(\lambda)(1-\beta)\left(\frac{\partial^2 \pi}{\partial \lambda^2} + 2\frac{\partial^2 \pi}{\partial I_A^* \partial \lambda}\frac{\partial I_A^*}{\partial \lambda} + \frac{\partial^2 \pi}{\partial I_A^{*2}}\left(\frac{\partial I_A^*}{\partial \lambda}\right)^2 + \frac{\partial \pi}{\partial I_A^*}\frac{\partial^2 I_A^*}{\partial \lambda^2}\right)$$
$$+2(1-\beta)\frac{\partial \delta}{\partial \lambda}\left(\frac{\partial \pi}{\partial \lambda} + \frac{\partial \pi}{\partial I_A^*}\frac{\partial I_A^*}{\partial \lambda}\right) - \frac{\partial^2 \alpha}{\partial \lambda^2}k + (1-\beta)\frac{\partial^2 \delta}{\partial \lambda^2}\pi + \left(\frac{1-\gamma}{\gamma}\right)\frac{\partial^2 G}{\partial \lambda^2} \;<\;(?)\;\; 0$$
$$(17)$$

$$\frac{\partial \Gamma}{\partial \theta} = \delta(\lambda)(1-\beta)\left(\frac{\partial^2 \pi}{\partial \theta \partial \lambda} + \frac{\partial^2 \pi}{\partial \lambda \partial I_A^*}\frac{\partial I_A^*}{\partial \theta} + \frac{\partial^2 \pi}{\partial \theta \partial I_A^*}\frac{\partial I_A^*}{\partial \lambda} + \frac{\partial^2 \pi}{\partial I_A^*}\frac{\partial I_A^*}{\partial \theta}\frac{\partial I_A^*}{\partial \lambda} + \frac{\partial \pi}{\partial I_A^*}\frac{\partial^2 I_A^*}{\partial \theta \partial \lambda}\right)$$
$$+(1-\beta)\frac{\partial \delta}{\partial \lambda}\left(\frac{\partial \pi}{\partial \theta} + \frac{\partial \pi}{\partial I_A^*}\frac{\partial I_A^*}{\partial \theta}\right) \;>\;(?)\;\; 0$$
$$(18)$$

$$\frac{\partial \Gamma}{\partial k} = \delta(\lambda)(1-\beta)\left(\frac{\partial^2 \pi}{\partial k \partial \lambda} + \frac{\partial^2 \pi}{\partial \lambda \partial I_A^*}\frac{\partial I_A^*}{\partial k} + \frac{\partial^2 \pi}{\partial k \partial I_A^*}\frac{\partial I_A^*}{\partial \lambda} + \frac{\partial^2 \pi}{\partial I_A^*}\frac{\partial I_A^*}{\partial k}\frac{\partial I_A^*}{\partial \lambda} + \frac{\partial \pi}{\partial I_A^*}\frac{\partial^2 I_A^*}{\partial k \partial \lambda}\right)$$
$$-\frac{\partial \alpha}{\partial \lambda} + (1-\beta)\frac{\partial \delta}{\partial \lambda}\left(\frac{\partial \pi}{\partial k} + \frac{\partial \pi}{\partial I_A^*}\frac{\partial I_A^*}{\partial k}\right) \;=\;\; ?$$
$$(19)$$

$$\frac{\partial \Gamma}{\partial \gamma} = -\frac{1}{\gamma^2}\frac{\partial G}{\partial \lambda} \;>\; 0 \quad (20)$$

The examination suggests that: (i) If the cross partial derivatives $\left(\frac{\partial^2 \pi}{\partial \theta \partial I_A^*}\right)$, $\left(\frac{\partial^2 \pi}{\partial \theta \partial \lambda}\right)$ and $\left(\frac{\partial^2 \pi}{\partial \lambda \partial I_A^*}\right)$ are large, the central agent may wish to give more autonomy to the firm of high managerial ability ($\frac{\partial^2 \pi}{\partial \lambda \partial I_A^*}$ also enters (17), but it seems not very important given that there are so many negative terms). However, one should be cautious in

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applying this point to the reality before discussing the mechanism of selecting the manager.[18] (ii) If the marginal ability of abusing capital $\left(\frac{\partial \alpha}{\partial \lambda}\right)$ is large, the central agent may wish to give less autonomy to the big firm. Taking into account the fact that the large firm is more easier to manipulate accounting (because of the big action space) which implies that there is one more negative term $\left(\frac{\partial^2 \delta}{\partial k \partial \lambda} \pi\right)$ entering the derivative of $\frac{\partial \Gamma}{\partial k}$ (in differentiating Γ w.r.t. k, we didn't consider this effect), this may explain why the central agent has been so reluctant to vitalize the large firms. (iii) The central agent unambiguously wishes to give more autonomy to the firm as possibility of pocketing the rent increases. I believe this partially explains the observation that in the areas where the government bureaucrats have more opportunities to take bribery as the transactions are more and more monetized, managers have more freedom to make their decisions (the managers simply buy autonomy from the bureaucrats. However, the bureaucrats must hold the essential part of decision rights in order to capture these opportunities, given that directly taking money from the state budget is illegal.)

In the above discussion, we assumed that the central agent has the exclusive authority to set the residual share and the degree of autonomy of the firm. What would happen if the inside members of the firm held the exclusive authority to set β and λ? Absolutely, they would set $\beta = 1$ and $\lambda = 1$! That is, the optimal β and λ for the inside members, denoted by β_F^* and λ_F^*, are strictly greater than β_G^* and λ_G^*. The conflicts occur. Because in reality, neither of the two sides has the exclusive authority to set β and λ (the central agent's authority has been undermined by the reform doctrine, while the inside members' authority cannot be justified by the conventional doctrine of public ownership which is still constitutionally alive), the conflicts can be solved only through a bargaining between the two sides. The resulting solutions of β and λ are between (β_G^*, λ_G^*) and (β_F^*, λ_F^*).

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[18]We shall briefly discuss the managerial selection mechanim in the concluding section.

An important question is: Which is *socially* preferred, (β_G^*, λ_G^*) or (β_F^*, λ_F^*)? Denote by β_S^* and λ_S^* the social optimum. The income distribution aside, if we assume that the social welfare function is equal to the total profit π minus capital abuse term (capital abuse is *socially* bad because it destroys future productivity), that is

$$Max \ \pi - \alpha(\lambda)k$$

β_S^* and λ_S^* satisfy the following conditions:

$$\frac{\partial \pi}{\partial I_A^*} \frac{\partial I_A^*}{\partial \beta} \geq 0$$

$$\frac{\partial \pi}{\partial \lambda} + \frac{\partial \pi}{\partial I_A^*} \frac{\partial I_A^*}{\partial \lambda} \geq \frac{\partial \alpha}{\partial \lambda} k$$

It is easy to show that $\beta_G^* < \beta_S^* = \beta_F^* = 1$ and $\lambda_G^* < \lambda_S^* < \lambda_F^* = 1$. That is, the social optimal residual share is equal to that preferred by the inside members of the firm and greater than that preferred by the central agent, while the social optimal autonomy is strictly less than that preferred by the inside members but greater than that preferred by the central agent. The social optimum is not incentive compatible, since given $\beta = 1$, the central agent would have no interest to implement the remaining decision right allocated to him (equal to $1 - \lambda_S^* > 0$). The only possible way to implement the social optimum is to grant the residual claim to the insiders permanently so that they no longer have any incentive to abuse capital.[19] But this would change the whole game: the central agent would become redundant. Given that the social optimum is unimplementable, the resulting solution from bargaining between the two sides is strictly preferred to that exclusively set by the central agent, because the bargaining solution is more close to the social optimum.

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[19]The policy proposal based on this kind of arguement is to extend the tenure of contract between the government and the firm to 3-5 years. The effect has been positive. In agriculture, the long tenure contract of the land has proved quite successful in preventing land abuse.

In reality, the bargaining over β and λ does not go directly between the central agent and the inside members of the firm, but is mediated by the industrial bureau. There are two questions associated with this mediated bargaining: Does the industrial bureau's intermediation make the pie bigger or simply share the pie which has already existed? Does the involvement of the industrial bureau increase or reduces the residual share and the degree of autonomy? Most Chinese economists give the negative answers. They argue that many decision rights released by the central agent has been hoarded by the industrial bureau rather than passed to the manager as they should be, and the industrial bureau has acquired its rent simply by exploiting the inside members of the firm and even the central agent. This seems not quite correct. My argument is as follows.

From the preceding analysis, we have see that λ_G^* is negatively affected by the inside members' ability to manipulate accounting and to abuse capital; in other words, the central agent would wish to grant greater autonomy to the firm when the inside members' ability of manipulating accounting and abusing capital is low than when it is high. Because autonomy is socially productive, restriction of autonomy has a negative effect on the total social surplus. This implies that a Pareto improvement would come if some not very costly information is available so that the inside members are less easy to manipulate accounting and to abuse capital. One role provided by the industrial bureau is to collect information of the firm and to monitor the inside members' non-productive activities. By doing so, at least theoretically, the industrial bureau can increase λ_G^*. Furthermore, the information provided by the industrial bureau may make it possible for the central agent to get a higher fixed term g (or less negative) so that a greater residual share might be agreed in bargaining. This is of course a Pareto improvement. In summary, the industrial bureau may make contributions to rent generation through the effect on both β and λ of information collection and monitoring work. Of course, like a broker, the industrial bureau officials

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must be motivated for their services by some charge. But we have no reason to assume that the rent accruing to them is necessarily greater than the rent created by them. For the incentive reason, the central agent has to allow the industrial bureau to enjoy some rent; to get a good deal, the inside members may need to bribe the industrial bureaucrats. But this does not necessarily mean that both sides are harmed by the industrial bureau. Like all government officials, they have no legal right to pocket the money. This implies that they must hoard some decision rights in order to acquire their rent share. But one needs further justification before claiming this hoarding necessarily reduces the actual autonomy of the firm.

THE EFFECTS ON THE SOFT-BUDGET CONSTRAINT OF MANAGERIAL DISCRETION

In this section, I relate the preceding discussion to a hot topic in the literature of the socialist economy, that is, the soft-budget constraint, to show how the Chinese economic reform has improved performance of the firm through hardening its budget constraint.

The soft-budget constraint was originally coined by Kornai (1980) to characterize the loose correlation between performance of the firm and pay-off of the insiders in the socialist economy. Theoretically, the conception is not quite correct because the loose correlation is not unique for the socialist firm: even in the capitalist firm, the correlation between payment of workers and performance of the firm is very loose.[20] In any kind of firm, it is the residual claimants who should take responsibility for performance. If the insiders of the firm are not the residual claimant, there is no rationale for them to take responsibility. On the other hand, the residual claimant can never escape from his responsibility, even under the pre-reformed socialist economy.

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[20] In a classical capitalist firm , the correlation is zero.

However, this kind of objection might be misleading, because the conception points to a more fundamental flaw of the public economy, that is, the responsibility for performance of the firm is so diversified that there is little pressure on an individual firm to improve its efficiency. An implication is that to harden the budget constraint, the residual claim must be shifted from the central agent to the inside members of the firm.

Then the problem to be considered is: Has the Chinese economic reform been successful in the sense of hardening the budget constraint? Clearly, if the contract reached *ex ante* is renegotiation-proof *ex post*, as we have assumed so far, the budget constraint can be said "hard". The problem is that in reality, the contract is at most cases renegotiable *ex post*. Demand for renegotiation can come from either the central agent or the insiders of the firm. Typically when the performance has proved good, the central agent asks for renegotiation to decrease β or increase g; when the performance has proved bad, the insiders asks for renegotiation to increase β or reduce g. Because the performance is a joint outcome of effort and unexpected events some of which are controlled (or affected) by the central agent's actions, it is very hard for one party to reject demand for renegotiation by the other. For example, if a bad performance coincides with a tight macro-policy which is not fully taken into account at the contracting time, the central agent cannot require the firm to deliver profit according to the contract; and if a good performance coincides with a policy-induced increase of output prices, the firm has to deliver some extra surplus to the central agent. Renegotiation may benefit both sides through its insurance effect or improving *ex post* efficiency of resource allocation, but it generates a big negative effect on incentives. When the inside members of the firm anticipate that they cannot retain the extra profit according to the *ex ante* contract, they will stop working further once a reasonable target is reached; when they anticipate that they do not need suffer from a big loss, they might give up once the target proves more difficult than expected.

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The prevalence of renegotiation has led most Chinese economists to conclude that the soft-budget constraint problem has been little changed. My argument is much different. I certainly agree that the budget constraint of a state-owned enterprise is much softer than in a capitalist firm. However, it seems to me that it is not only much harder than at the pre-reform stage but also much harder than the statistics data suggest for the following reasons.

First, the fact that the contract is not renegotiation-proof does not mean that renegotiation is costless. The intuition suggests that the *ex post* renegotiation is quite costly. For the inside members, the costs include both pecuniary expense of bribing the central agent or intermediators and non-pecuniary loss (such as fall of the probability of future promotion of the managers). Their intention to reduce g or increase β normally faces resistance from the central agent who would be hurt if the renegotiation succeeds. Although the loss-makers can always find some exogenous factors to blame and may make themselves better off than when the contract is executed, they can hardly be as well-off as the profit-makers. Therefore, they will resort to renegotiation only if the cost of working is greater than the cost of renegotiation. The renegotiation demand from the central agent is normally met with strong resistance from the inside members. In particular, given that the insiders have some freedom to manipulate accounting, at most cases, it is almost impossible for the central agent to do better by renegotiation than by carrying out the *ex ante* contract.[21]

Second, accounting manipulation (as well as other kinds of agency discretion) of an individual firm does not only improve its own incentive system, but also has the

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[21]This leads to a phenomenon of asymmetric renegotiation: renegotiation is more likely to take place when the firm makes loss than when it makes big profit. Chinese economists summarize this phenomenon by *"fu-ying bu fu-kui"* (responsible for profit but not for loss). This may be not fair from the point of view of social justice, but it is certainly preferred to the symmetric irresponsibility (i.e., responsible neither for profit nor for loss) from the point of view of efficiency.

effect on hardening the budget constraint of other firms. The reason is that the central agent's budget constraint cannot be soft! An individual firm's budget constraint can be soft only because the central agent can transfer profits among the different firms. The central agent's ability to transfer profit is constrained by its total revenue which is in turn constrained by agency discretion at the firm level. The larger share the profit-making firms can retain, the less available for the central agent to subsidize the loss-making firms. In the extreme case, if there are no profit-makers delivering any profit to the central agent, the central agent can do nothing in helping the loss-makers but let them go bankrupt. When the firms anticipate that they are less likely to get help from the central agents, they have to work for themselves. The argument can be formulated as follows.

Assume that there are m firms, and firm i's net *expected* revenue depends on both its own profit π_i and a subsidy f_i from the central agent as follows:

$$y_i = f_i + (1 - \delta_i(\lambda_i)(1 - \beta_i))\pi_i \tag{21}$$

Because f_i is normally negatively related to π_i, which implies that f_i is a decreasing function of work effort, we can assume that firm i is endowed with a fixed *ex ante* total effort I_i. The decision facing firm i is to divide I_i into two parts: *ex ante* work effort I_i^a and *ex post* bargaining effort I_i^b, to maximize $y_i - C_i(I_i^a + I_i^b)$, where $I_i^a + I_i^b = I_i$. In other words, firm i needs to decide whether to work *ex ante* for a big π_i or wait to bargain ex post for a big f_i.

The central agent's budget constraint is that [22]

$$\sum_{j=1}^{m} f_j \leq \sum_{j=1}^{m} \delta_j(\lambda_j)(1 - \beta_j)\pi_j \tag{22}$$

[22]The central agent may use deficit budget to subsidize the loss-makers, but this does not affect the argument because the deficit is bounded. In addition, we assume the central agent does not collect a fixed term.

Because $\sum_{j=1}^{m} \delta(\lambda)(1-\beta)\pi_j$ is the total funds available for the central agent to transfer between firms, we may define the average (upper-bound) degree of softness of the budget constraint as follows:

$$S = \frac{\sum_{j=1}^{m} \delta_j(\lambda_j)(1-\beta_j)\pi_j}{\sum_{j=1}^{m} \pi_j} \tag{23}$$

S is decreasing with managerial discretion parameter $\delta_j(\lambda_j)$. Suppose that all firms are identical *ex ante*. Then the *expected* maximal subsidy for a representative firm is constrained as follows:

$$f_i = f \leq \frac{1}{m} \sum_{j=1}^{m} \delta_j(\lambda_j)(1-\beta_j)\pi_j \tag{24}$$

Even without explicitly solving the firm's optimal problem, we can see that an individual firm's incentive to wait for *ex post* bargaining fall as all other firms' ability of accounting manipulation increases. In the extreme, if all profit-makers can fully manipulate accounting such that $\delta_j = 0$ for all j with $\pi_j > 0$, it would be foolish for firm i to wait for bargaining *ex post* instead of working *ex ante*.[23]

CONCLUDING REMARKS: CAPITALISTIZATION OF INCUMBENT BUREAUCRATS AND MANAGERS

Shifting of decision rights and residual claim from the government to inside members of the firm and its associated managerial discretion have greatly improved performance of the state-owned enterprises through both direct incentive effects and hardening budget constraints. However, there are still many problems to be solved by further reforms, one of which is the mechanism of selecting managers. To ensure that only high ability people will be professional managers, authority of selecting management should be transferred from bureaucrats to capitalists (Zhang, 1993). This calls

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[23]This kind of effect has been ignored by most economists who, on the one hand, blame the government for the soft budget constraint, and on the other hand, argue that the central agent's budget revenue is tool small.

for privatization of the state enterprises. China is well on this way. The observation suggest that privatization of the state enterprises will be a process of capitalistization of (some) incumbent bureaucrats and managers (and even some workers).[24] As the reform proceeds, incumbent bureaucrats find it more and more difficult to capture rents in their current positions, because of disappearance of monopolistic profits and managerial discretion. Experience teaches them that they can do much better by directly doing business with their remaining political capital of "connection" (before it fully depreciates). They have to make their minds to "*xia hai*" (go business). By doing so, they lose nothing because the rents they used to enjoy can be embedded into profits which may legally accrue to them in various forms. They have no risk to bear because start-up capital comes from the state (initially the firm is "owned" by the state). Before they leave government office, they will grant full autonomy to the firms with which they will work. They will appoint themselves as chairmen of the board, directors, or executives. Once they pocket some profits, they will buy into the firms. They can do this quietly because once the firms are corporatized, they can be easily sold piecemeal instead of as a whole.[25] In addition, the central government may have to sell its shares because of its budget deficit. The state-owned enterprises

[24]Capitalistization will be companied by "debureaucratization" because of social pressure. In the following, "capitalistization" should understood as a dual process of capitalistization and debureaucratization. Yang (1988) proposes capitalistization of bureaucrats as a policy suggestions for reform.

[25]To my knowledge, Wu and Jin (1985) were the first to propose the state-owned joint-stock reform, according to which, the enterprises are still owned by the government, but ownership is implemented by many competing government institutions who function as shareholders. I was critical of this proposal (see Zhang, 1986, 1988). How can you transform a zebra into a horse simply by brushing stripes on its back? However, I now have realized that the state-owned joint stock system may be a feasible transitional approach to retail the enterpreises. A strong objection of privatization is that "nobody can afford to buy". This objection may apply to wholesale, but not to retail.

gradually evolve into private joint-stock companies. In this stage, it is possible for the government to become a bond-holder who can be protected by private shareholders. Once incumbent bureaucrats become capitalists, they will have incentives to select high ability people for management; they themselves will voluntarily step down if unqualified. Capitalistization of incumbent bureaucrats and managers will also automatically solve the problem of principal-agent relationship between the manager and workers, which has been a real headache of the state-owned enterprises.

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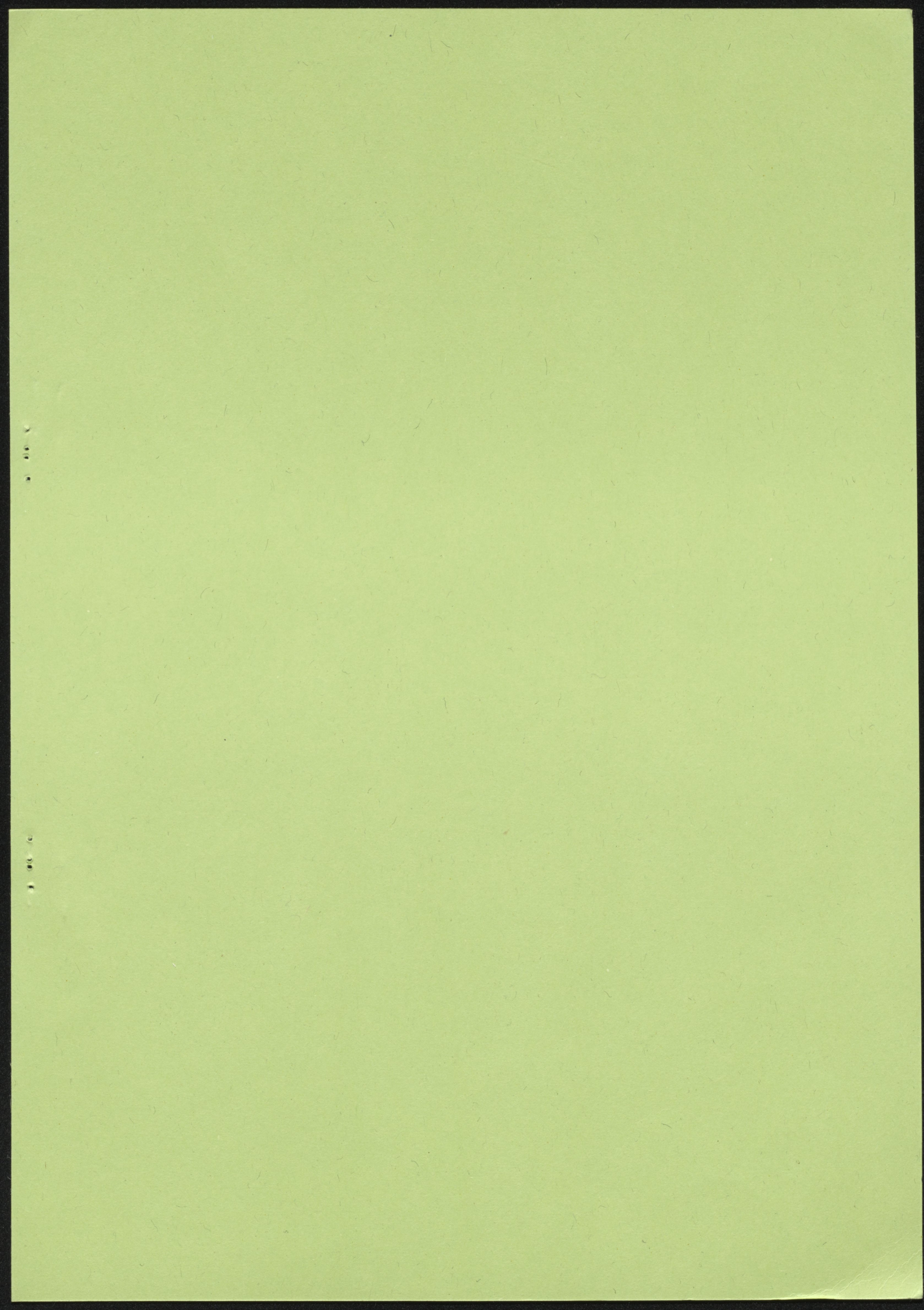
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