

University of Ottawa
Faculty of Social Sciences

Department of Economics

Agency Cost and the Crisis of China's SOE

Major Paper
Prepared for the Completion of
M.A. in Economics

By Mi Zhou

With the supervisor of
Professor Rose Anne Devlin



To My parents for their love

To Bingsheng, Yahong, Xiaoming for their spirits



Mi Zhou
1999/05/25



Agency Cost and the Crisis of China's SOE

Mi Zhou

1. Introduction

1.1 Objective

This paper tries to explain the crisis in China's state owned enterprises (SOEs) from the perspective of agency cost. The conclusion drawn from models in this paper is that collusion between two state agencies (local official and SOE manager) and an ill-functioning managerial incentive scheme have caused an abnormally high agency cost, which is an important contributor to SOEs' inefficiency. My prescription will be a new managerial incentive scheme to provide better incentives to SOE managers, and an information age SOE management system to reduce political intervention, to reduce informational asymmetry and to help effectively monitor SOEs.

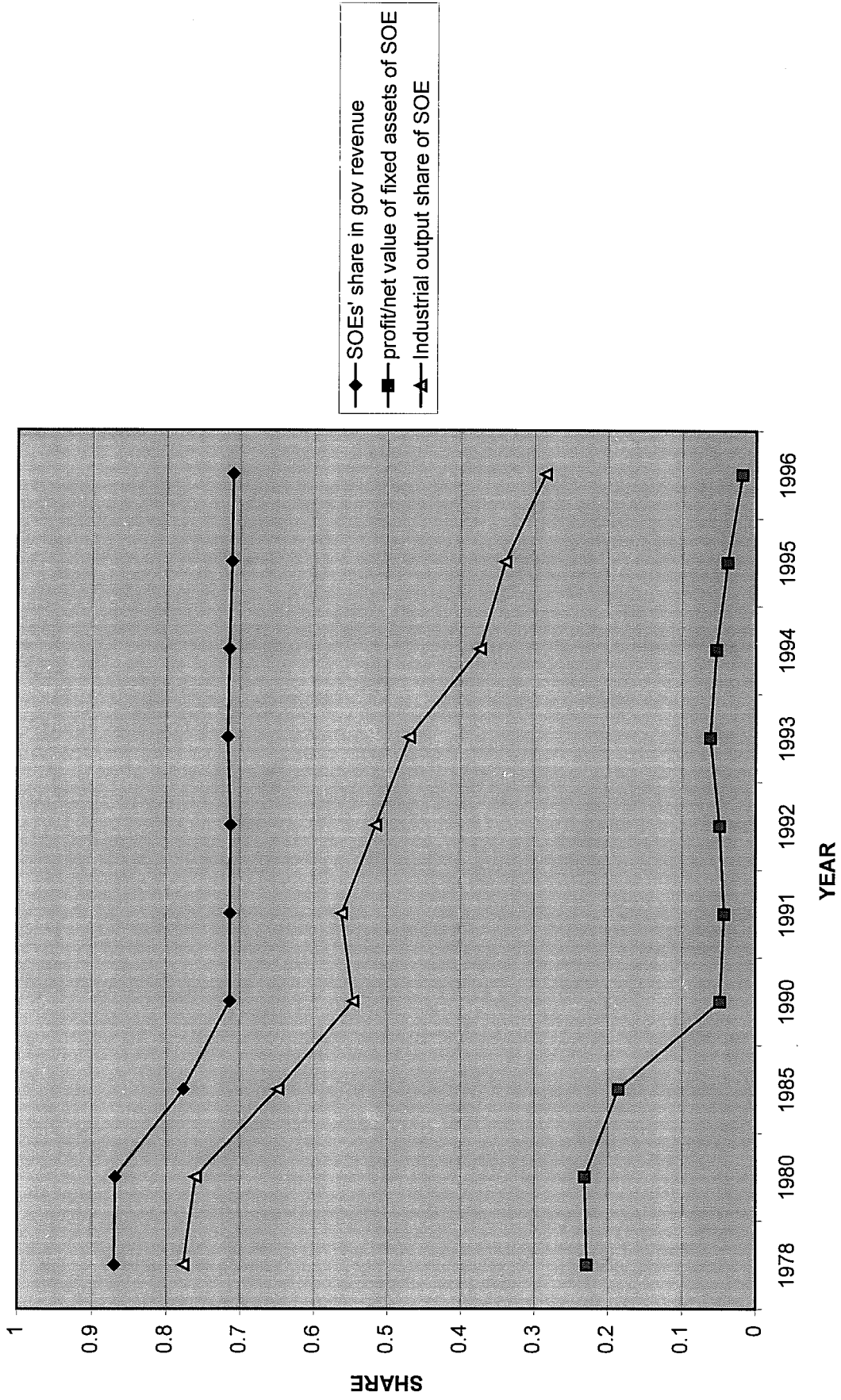
In Table 1 we can see the SOEs' decline in market competition since 1978. The SOEs' share of total industrial output has dropped from 77.6% in 1978 to 8.4% in 1996. Such a loss has happened in just 17 years. The ratio of SOEs' total profit to their total net value of fixed assets has dropped from 22% in 1978 to 1.8% in 1996. Obviously, China's SOEs are in a deep crisis. Such a crisis, if not subject to immediate reform, will inevitably lead to a disaster.

(insert Table 1)

1.2 Agency problem

A few people have noticed that agency theory might be helpful in explaining SOEs' problem. They are Lee (1993); Qian (1996) and Clauley (1992). Agency theory deals with the contractual relationship between the principal (owner, residual risk bearer

Table 1: SOEs' Performance Indicators (Data source: China 1997 Statistics Year Book)



and residual profit claimant) and the agent (manager, engaged by owner) to provide effective discipline and incentive so as to align the objectives of manager and owner to the same one (profit maximisation). In agency theory, ownership is an irrelevant factor. What matter are discipline and incentive, and that both sides are able to maximise their own utilities from the contractual relationship.

Lee (1993) notices that the agency problem of SOEs is characteristic of a two-tier hierarchical collusion. The upper level of collusion refers to that between local officials and SOE managers; the lower level of collusion refers to that between the SOE manager and workers. Cauley (1992) uses a LEN (linear-exponential-normal) model to analyse the agency problem between SOE manager and workers. Qian (1996) suggests that reducing political cost and agency cost should be the main concern in China's further reform. He recommends three approaches: depoliticisation by setting up state asset management system; effective governance through corporation system to reduce agency cost; and shifting social burden away from SOE to reduce social cost.

According to *Econlit*,¹ five papers by Lee (1993); Aram (1991); Qian (1996); Clauley (1992) and Giersch (1997) constitute all of the current literature (since 1969, among 1330 papers on China's reform) on agency problems in China's enterprise. There are possibly four reasons why very few people have done such a research:

1) The legal principal of China's SOEs, is the state, but in reality, it is the local official who acts like a principal. Those party officials have the authority to sack SOE managers, but they do not pursue profit maximisation of SOEs as the sole goal. This is in conflict with the basic assumption of traditional principal-agent relationship.

1. <http://polaris.uottawa.ca/ovidweb/ovidweb.cgi>

2) The traditional incentive scheme model is too simplified to solve the agency problems in a much more complicated real world. A two-wage model (Mas-Colell et al., 1995 pp.477) that adjusts compensation only when rare events happen is not likely to provide correct incentives.

3) In a neoclassical world, the firm is treated simply as a production function with input and output constraints, or as an automatic profit maximising organization (Jensen & Meckling, 1976 pp.306). This may apply in the old mode of owner-manager firm. But the modern corporation, which is characteristic of complete separation between ownership and management, has already dominated the economic activity. In reality, the firm is rather an organization maximising its profit provided that the CEO also maximises his own interests. After we entered the information age which featured an explosion in information, the information constraint is becoming at least as important as other two constraints on inputs and outputs (Holmstrom and Milgrom, 1987 pp.303). The firm is rather a production function with input, output and informational constraints (moral hazard problem of agent). Since the neoclassically trained economists still dominate, there is inevitably some degree of negligence on the crucial role of entrepreneurs in an uncertain transition economy. Informational problems are more central during reform than in a capitalistic economy and reforming economies will be riddled with informational imperfections (Murrell, 1991 pp.62). Economists must look outside the standard models of competition, the focus on Pareto-efficient resource allocation, and the welfare theorems to build a theory of reform (Murrell, 1991 pp.60).

4) Coincidentally, the tradition of China's feudalism and the ruling of the dictating

communist government both do not attach much importance to the value of human capital. The conservative communist leaders believe that some beautiful slogans (instead of real wealth incentive) suffice to provide motivational incentives for the SOE managers. Consequently, mainstream economic thought in China does not give a crucial role to the SOE managers' attitude toward risk and rewards.

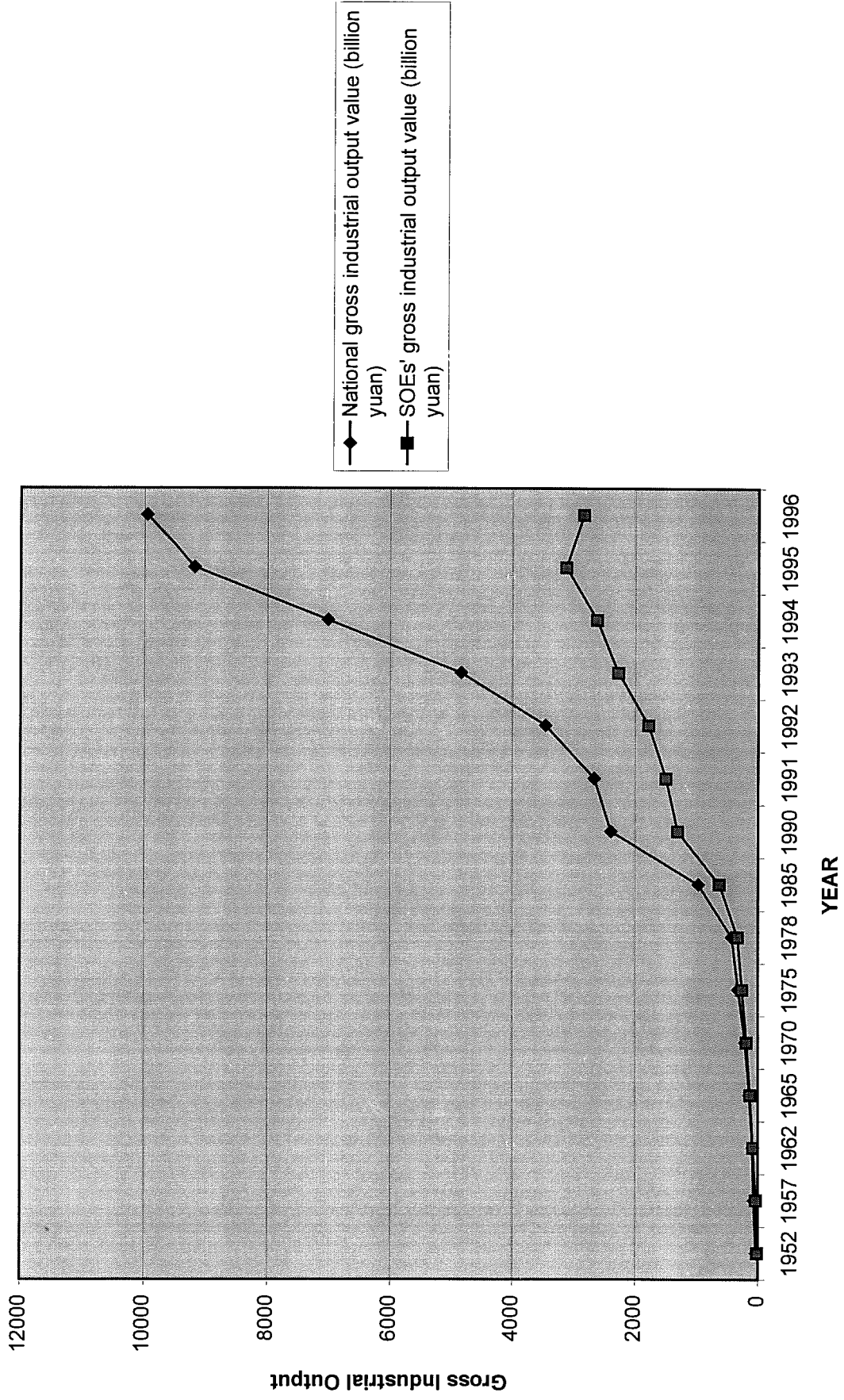
1.3 Why the agency problem in Chinese SOEs should be discussed

First of all, it seems shocking that behind the miracle of China's economic boom (see table 2), the major player in China's economy, the SOEs, have been leading a life of loss since the beginning of the reform. Considering that the SOEs still employ more than half of the urban labor force and contribute more than 70% of government revenue, it seems unlikely that the reform will be successful with dying SOEs.

Somebody has said: If you want something done right, do it yourself. What if we do not have the competency or time to do it? Then we will have to enter a principal-agent relationship. Like marriage, such a relationship is easy to enter but hard to sustain and prosper. A sustained and well-functioning principal-agent relationship depends on two factors: the monitoring mechanism and the incentive scheme. China's industrial reform has created a principal-agent relationship that was previously non-existent. The legacies of the old state owned system are just incompatible with a dynamic and complex economic situation. As a result, both the monitoring system and incentive scheme do not work on SOE managers. Intuitively, high uncertainty on the agent's actions and opportunities, and low incentives will cause high agency cost.

Although some economists have noted that agency problems may explain the SOEs' crisis, none of them have tried to model it. It seems that nobody has examined

Table 2: China's boom (Data Source: China 1997 Stastics Year Book)



SOEs' managerial compensation practice through modelling the principal-agent relationship between the state and SOE managers. In addition, no one has worked out a new state owned system compatible with current situation, although Qian (1996) did perceive the absence and Williams (1990) observed that China's major issues resolve around reforming its management system..

1.4 Structure of the paper

This paper fills the gap in the literature through the following steps. In section two a comparison between the SOE and the modern corporation is made. In section three the LEN model (linear-exponential-normal) is used to model the collusion between the SOE managers and local officials and the poorly functioning managerial incentive scheme of SOEs. These models are based on the original work of Holmstrom and Milgrom (1987). In section four policy recommendations for the next step of SOE reform are made. Section five contains a summary of this paper.

2. Comparison between SOE and modern corporation system

2.1 Modern corporation system

2.1.1 Structure of modern corporation system

The modern corporation system is a proven efficient mode to organize economic activities. It has survived more than a century and continues to be the main organizational form of advanced market economies. The modern corporation system has three main players : shareholder, board of directors and manager.

(1) Shareholder : The principal

The shares of a corporation are usually held widely and diffusely in the society, partly due to the using of portfolio theory to diversify risk. This implies a high degree of

separation between ownership and control. Usually a shareholder has no interest in overseeing the performance of a specific corporation's management. His main official information comes from the company's quarterly (or annual) financial report prepared by CPA firms. When trouble looms, the shareholders' first response is often to exit (dumping the stock).

(2) Board of directors : intermediate instrument

Appointed by share holders, the board of directors serves as a "governance instrument" (Garner, 1996 pp.101) to control managers' decision making and to monitor management performance. It is a bridge between shareholders and managers. The board of directors includes major shareholders as well as outside directors which makes the collusion among top managers difficult. The board of directors decides the compensation plan of CEO. The board of directors is said to be a "lower cost mechanism" to replace top management than outside turnover (Fama, 1980 pp.294) .

(3) Manager : The agent

She acts as the agent of shareholders. Garner (1996 pp.89) has observed some characteristics of manager as below. She is supposed to have one sole goal which is to maximise the value of the stock or the shareholders' wealth. Failing to ingest this objective will make progressing her career to the top position impossible. This identification could be reinforced by a proper rewarding scheme. Profit is the only and automatic measure of a manager's performance.

The modern coporation system is supported by three major market institutions :

CPA firms (certified public accountant in US, certified general accountant , CGA, in Canada and the association of chartered certified accountant , ACCA member in Britain), the capital market, and the managerial market.

(1) CPA :

The CPAs impartially audit the financial reports of an individual corporation and publishes the results. Most importantly, they disclose major information of the company. Advanced capitalistic economies are largely based on the integrity and competence of accountants, especially the certified public accountants (CPA). In an advanced market economy, CPA firms are set up in partnership and they bear unlimited liability to any default behavior. In China, CPA firms bear only limited liability.

(2) Capital market :

In capital markets the ownership of any corporation can be traded, which provides a chance for outside turnover. Whenever the internal disciplinary mechanism fails to promote good performance of top management, the force from outside can bring about the necessary change.

As long as the effects of good management will ultimately be reflected in the stock price, capital markets can effectively evaluate the CEO's performance. Garner (1996 pp.90) has used "shareholder accountability" to refer to the system constituted jointly of the stock market, brokers, and media analysts : "they assemble together all the information about a corporation's affairs that expresses a collective judgement upon each corporation's condition and prospects and efficiency of management". In the US, public corporations publish their revenue reports quarterly, any decline in the rate of return will incur ruthless punishment from Wall Street. In 1994 Intel announced that a kind of chip it

has produced had some technical flaw so that the profit was affected. Suddenly its share price dropped from \$65 to \$56, but after Intel solved the flaw, its share price bounced up and has climbed to \$156 in seven months (Voice of America, Feb.28, 1999). An efficient capital market can significantly reduce the shareholders' monitoring cost.

(3) Managerial market :

An efficient managerial market is capable of re-evaluating the human capital of a manager according to his deviation behaviour in the past so as to provide disciplinary pressure. The ongoing economy is always in the market for competent managers. The wage offered in the market reflects the long run observation of a manager's performance (Groves, 1995 pp.878). Fama (1980, pp.296) has observed the following managerial market mechanism: as long as the manager has a multi-period horizon, future wages will give her a stake in the success of the firm. Before adopting any deviation strategy, she may find that the change in present value of future wage streams is higher than the gain of her deviation from the contract so that she will choose not to deviate. The presence of an efficient managerial labour market serves as a form of full ex post settling up for the manager's deviation behaviour. However, when a manager no longer expects to be in the labour market, or if there is no such a fully functioning managerial labour market, the manager can easily beat the game by shirking or consuming more perquisites than agreed in the compensation contract.

2.1.2 Agency problems in modern corporation

As we can observe, the modern corporation is not perfect in curing agency problems. The modern corporation does not have an owner in some sense because of the diffuse distribution of stocks. Informational asymmetry always exist and this inevitably

engenders moral hazard. CEOs may collude with the board of directors for favorable compensation arrangement. A typical case is that of Mike Eisner and Disney. The compensation to Eisner in 1996 was 8.5 million \$US plus 196 million \$US of stock option. In 1996 when he was 60, after he *agreed* to stay in his position instead of retiring, the board offered him two million shares of tradable stocks for free.² People may ask : “Is there really such a dearth of fine talent at the executive level that share holders must pay out exorbitant amounts for merely decent management?”³ The truth is that : Sitting on the board is Eisner’s personal lawyer, his children’s former elementary school principal, an architect who has done extensive work for Disney and Eisner, and three Disney’s former executives.⁴ Facing the threat of outside turnover, the CEO may choose to “swallow a poison pill” (eg. a big deal significantly reducing the company’s liquidity which was previously desirable to the predator) against it.

Empirical evidence indicates that the compensation of top management is positively correlated with a firm’s size. As we know, greater prestige is always associated with the management of larger firm. In the absence of efficient monitoring, the CEO may pursue maximising the size of the firm instead of its profit. Empirical evidence also indicates that the rates of change in executive compensation are always positively associated with the stock performance (Coughlan et al., 1985 pp.44). The CEO may be induced to buy up the stock price so as to get higher salary. Some of China’s corporation (SOE in nature) frequently did so.

2.2 China’s SOE

2. <http://www.gy.gz.cn/jingm/xinw/xinw1.htm>

3. <http://www.fool.com/Rogue/1997/Rogue970905.htm>

4. <http://www.aflcio.org/paywatch/problem/index.htm>

2.2.1 Intrinsic differences of SOE from private enterprise

(1) Producing more political goods than consumer goods

Many people have complained that the inefficiency of SOEs results from the outside pressure of politicians. According to the “1998 China entrepreneurial growth and development Report”⁵ by 10 Chinese government departments, which covers 2,415 enterprises in 31 provinces, 90.9% of SOE managers are directly appointed by their superior government official. Since the managers are appointed by the government, the politician can manipulate the SOEs' behavior through the managers they appointed. There are several political goods that politicians can pursue. First of all, over-employment. The politician can get votes through over-employment in his constituency (Shleifer et al., 1994 pp.995) although extra labor produces nothing or even worse, it produces negative goods. The politician can also profit from arranging patronage jobs in SOEs for his relatives or friends. Secondly, the local officials can benefit from influencing the process of selecting supplier of major inputs or project contractors, marketing of short supplied goods, etc. It is said that the foreign telecom companies are lining up to bribe China's Telecom ministry officials in order to enter the telecommunication market. One serious problem of China's SOEs is the duplication of investment which causes excess capacity in almost all industries. Imagine that China has hundreds of laundry machine assembly lines and more than one hundred automobile factories. “The SOEs are producing goods desired by politicians rather than by consumers, choosing locations that please politicians rather than minimize cost” (Shleifer, 1994 pp.996). Thirdly, SOEs have heavy ideological and social burdens. In a typical Chinese SOE, the manager is also the party's secretary and is in charge of the party's organizational work. The typical SOE is supposed to be

responsible for a wide range of workers' life : from kindergarden to high school, from medical, housing to funeral service.

(2) Government agency instead of free market player

“Enterprise is a unit of management endowed with sufficient authority to be able to act independently at a given time in a given market” (Mach, 1974 pp.233). According to the “1995 Chinese Entrepreneurial Growth and Development Report”, only 61.2% of SOE managers think of themselves as an entrepreneur.⁶ A SOE is rather a government agency than a free market player. Garner (1996) thinks it understandable for the government to closely overwatch the SOEs. Even when the SOEs borrow in the financial market (either domestic market or foreign market) in their own name, the lenders tend to consider it as a kind of government capital financing, which will affect the state's credit standing in a whole. When trouble looms the state as principal, unlike common share holders, is usually prevented from abandoning the enterprise due to political consideration. While the fields of decision in need of owners' approval are highly restricted in modern corporations, those in SOEs may cover a much broader area.

According to Li (1996, pp.6), local government are heavily involved in most of the investment decisions in SOEs. Investment decisions made by government accounted for 55.6%, those by SOEs but subject to government's approval accounted for 21.2%, the decisions made solely by SOE accounted for only 23.2%. The tax rate imposed on SOEs is also much higher than that on private enterprises. The SOEs, enmeshed in the regulatory web and slowed by heavy policy burden, facing eroding monopoly rents and going severe competition, are dying for a fair play.

5. http://www.ceis.gov.cn/wsdc/98/98_dc11.asp

6. <http://www.ceis.gov.cn/wsdc/cenetex-952.asp>

The above two features have engendered a serious problem, known as Soft Budget Constraint. Since the bureaucrats cannot tell whether poor performance of a SOE is attributable to its inherently low productivity or the heavy policy burden or the manager's incompetence, and the managers will always attribute the loss to the first two reasons, in the end the state will have to subsidize for the loss, either in form of grants or policy bank loans (Groves, 1995 pp.880; Lin, 1998 pp.426). This is often referred to as the "Soft Budget Constraint", and it has accumulated so many unrepayable bank loans that make major banks in China qualified for bankruptcy by any criteria.

(3) Inflexible managerial compensation arrangement

Chow (1997, pp.321) incisively points out that "providing incentives for the management of publicly owned assets is a key to China's success". SOE, by nature a labour-managed firm, usually offer low salaries to its managers. The line between government official and SOE manager is ambiguous and there are specified salaries for different levels of government officials. It often happens that SOE manager is paid according to her rank as government official instead of on her real managerial effort. Besides, the ideological thought that "there is no intrinsic difference between jobs except for their functions" and political concerns about workers' complaint have prevented government officials from providing high (fair) salaries to SOE managers. Empirical evidence shows that managerial wages rose less than the production workers' wages between 1980 and 1989 (Groves, 1994 pp.206). While ordinary Chinese workers rarely change their jobs, SOE managers frequently did so in the 1980's (Groves, 1995 pp.880). It was observed that average SOE managers' tenure was only 5.5 years, compared with 7.1-7.7 years in US and Japan (Groves, 1995). When wage does not compensate for the

effort, the best is the first to leave. The 1980's saw a high turnover rate of SOE managers (Groves, 1994 pp.206). Not just managers, the brain drain out of SOEs includes some of the best engineers, accountants, etc. That is an important reason why the township enterprise has thrived in 1980's. It is said that township enterprises mimic private enterprises and have very flexible compensation plan which attracts talents out of SOEs (Rawski, 1998 pp.271). The inflexible managerial compensation scheme has caused significant loss both in state assets and managerial talents. In January this year, the former CEO of Hongta group, Mr. Zu was charged with life sentence because he expropriated one million \$US. During the past 17 years Zu's legal income totaled as 800,000 Yuan (1\$US=8.3 Yuan) while the SOE assets under his management has increased by 120 billion Yuan. This means for every one billion Yuan increased wealth to the state, the agent gets only 6,490 Yuan.⁷

2.2.2 SOE Reform since 1978

According to Lee (1993), China's industrial reform on SOEs has experienced three stages. The initial stage is from 1978 to 1984. Its main contents are decentralising output autonomy upon fulfillment of state plan, and profit retention; the second stage is characteristic of a CMI model which includes three system: Contract management system, Management responsibility system, Internal contract system. The second stage aims at the delegation of more decision rights to the local. The third stage is the stock stage which aims at setting up modern corporation system and the complete separation between ownership and management. The contract stage and stock stage had some overlapping in late 1980's. The SOE reform has not changed the nature of SOE (like Russia) but has created a principal-agent relationship between the state and SOE

⁷ <http://www.chinayouthdaily.com/zqb/19990128/GB/9393^Q620.htm>

managers, which was previously non-existent, while the state owned system is still basically the legacy of the planned economy before 1978.

2.2.3 Evaluating the impact of SOE reform on agency problem

In a planned economy, the influence of manager's action on the profitability of a SOE is only secondary (Lin, 1998 pp.423). The profit was mainly determined by input and output price. There was no point for the state to offer incentive wage to the manager, the SOEs were managed by a group of party cadres. Both monitoring and bonding cost were low. It is the reform toward decentralization of decision making and separation of ownership and control that has created a agency problem much more serious than the comparable one in advanced market economies. Given an ineffective monitoring mechanism, the separation of ownership and control has transformed agency problem from previous production workers' shirking to managers' aggressively plundering state assets.

(1) The principal-agent relationship has three components.

- 1) State : the principal
- 2) Local official : the intermediate instrument
- 3) Manager : the agent

(2) There are two characteristics of the agency problem.

- 1) Non-existence of principal (ambiguous property right)

The principal of SOEs is the state, or more accurately, the Chinese people. And by order, the central government, the provincial government, the local officials, the manager of SOE, the SOE production workers, all serve as agents of the state. They are all supposed to serve the state's interests. The problem is that the local officials are not

necessarily loyal and knowledgeable stewards of the state. Corruption is a very serious and widely spreading phenomenon in China. 100,000 corruption cases involving government officials were filed in 1998.⁸ According to the 1998 Corruption Perceptions Index (CPI) published by Transparency International, the degree of China's transparency was ranked No. 55 in the world's 85 countries, just a little bit better than Mexico which was No.61.⁹

A very strange phenomenon in China is the widespread plundering on state assets and the collusion among agents, while nobody has incentives to curb it. The principal is the state which represents Chinese people, but the central government is not elected by the people and they do not need to be responsible to Chinese people (they also lack the incentives to do so since their legal wage cannot cover the required efforts), and the local agencies were only answerable to their upper level government officials. The principal is silent or non-existent. The consequence is that, in the end, the Chinese people, the real principal, will have to bear the residual risk of all these agents' deviation behavior in forms of reduced revenue and SOEs' inefficiency, to say the best.

2) Managers with discretionary power

During the reform, while the former vertical control was considerably loosened, no adequate horizontal or internal control mechanism has been timely set up. In a developing country, with a small number of official bodies charged with the supervision of 93700 state owned enterprises (Jefferson, 1994 pp.64), the monitoring task is overtaxing the government's administrative talent. Efficient monitoring of such an enormous number of SOEs is technically impossible and prohibitively costly. In a

⁸ <http://lateline.muzi.net/cgi/lateline/news?p=14682&l=chinese>

⁹ <http://www.transparency.de/documents/cpi/index.html>

transition economy which lacks independent accounting, auditing and property evaluation institutions, there is a high moral hazard that the agents may take advantage of the informational asymmetry. The manager has a high degree of discretion on the way they take the opportunities of autonomy. Byrd (1998, pp.332) has observed that over-investment has been encouraged by the growth of enterprise discretionary funds and increased availability of bank loans.

3. Modeling the principal agent relationship of SOE

3.1 Current literature

Whenever there is a separation between control and risk bearing, there is a principal-agent relationship. Since the principal is risk neutral and the agent is risk averse, there is a need to find a fee function that efficiently divides the risk between the principal and the agent. Agency theory thus developed. Agency theory is in the standard economic tradition. Both the principal and the agent are assumed to be making their decisions optimally in term of their constraints (Arrow, 1984 pp.38). In a neoclassical world, the fee function is constrained by a participation constraint (PC) that depends on the opportunities the agent has in the labor market. If PC is violated, the agent is not willing to take the job. Otherwise, the structure of the salary is free for the principal to choose. In a world of moral hazard and asymmetric information, the structure of the salary is further constrained by an incentive compatibility constraint, in other word, once a salary function is assigned, the agent will act to maximize her own, but not necessarily the principal's utility (Sung et al., 1993 pp.332). It has been recognized that, in the presence of moral hazard, market al.locations under uncertainty will not be unconstrained Pareto optimal (Arrow, 1971).

It is not until 1970's that economists have begun to undertake a systematic analysis of the properties of the second best allocations that arise under these conditions. Much of this analysis has been concerned with what has become known as the principal-agent problem (Grossman et al., 1980). Harris (1979) has observed that in situations involving uncertainty, the existence of a complete set of contingent claims is sufficient to assure a Pareto-efficient allocation of resources.

Several models have been developed to deal with the principal-agent problem. The literature has focused mainly on two cases: (1) the agent's action is not directly observable by the principal; (2) the outcome is affected but not completely determined by the agent's action (Arrow, 1984 pp.37). Arrow (1971) was concerned with the optimal sharing of purely exogenous risk. Wilson (1968) and Ross (1973) considered situations in which risk could be affected by the actions of the agents. Competition was used in agency models. Machlup (1967) argued that there is no scope for slack if a firm operates on a perfectly competitive market. Leibenstein (1966) claimed that there may be a substantial amount of "X-inefficiency" and Schimdt (1997) derived an optimal incentive scheme for a manager as a function of the competitiveness of the environment in which her firm operates. Stiglitz (1975) analyzed incentive contracts between employers and employees. Spence and Zeckhauser (1971) studied insurance contracts.

There is a school of regulatory economics which is worthy of attention, as it provides another way to model the informational asymmetry problem present in the SOEs. Some of the literature in this school treat regulation as an agency relationship, dealing with the optimal incentive scheme within a regulatory framework. The government's (principal) maximization problem is thus subject to three regulatory

constraints: an informational constraint, a transactional constraint, and an administrative (political) constraint (Laffont et al., 1993 pp.1). This school provides insight into the SOEs' agency problem. The lack of commitment and the concomitant bargaining between firms and regulators is shown to have two perverse effects. A short-term career horizon prevents the SOE managers from pursuing long-term gains and exerting adequate managerial effort. Furthermore, a "ratchet effect" prevents the SOE managers from disclosing their real costs and from being efficient in the first period (Laffont et al., 1993 pp.375).

There are both positive side and negative side of those agency models. On the positive side, there is little question that many economic relations inexplicable in previous standard analysis can now be understood. Sharecropping, incentive compensation to executives and other employees, the role of dismissal as an incentive, coinsurance, etc. all find a place in this literature not found in the previous standard economic analysis (Arrow, 1984 pp.48).

There is also negative side. Much of the literature focuses on single period. The main analytical approach is the "first-order" approach, which replaces the incentive compatibility constraint with the weaker requirement that only the first order conditions for optimality be satisfied (Sung and Schattler, 1993 pp.332). In early literature, the first-order solution was usually accepted without question. Mirrlees (1975) was the first to point out that the first-order approach, which involves weakening the constraint that the agent choose a utility-maximizing action to require instead only when his utility is at a stationary point, is not generally correct.

Another limitation of the agency literature before 1987 is that those models tend to lead to very complex fee functions. We do not find such complex relations in reality. There is large, though not easily defined, cost to a contract that specifies payments that depend on many variables. Costs are inherent in the very statement of the contract, in understanding it and its implications, and in verifying which terms apply in a given situation. There is a pressure for simple contract (Arrow, 1984 pp.48).

The third problem with those literatures is the non-existence problem observed by Mirrlees (1974). Classical compensation scheme pays a fixed wage unless output is very low, and pays a very low wage for very low output. This “two-wage” scheme is effective because normal distribution have the property that very low outputs are much more likely when the agent shirks than when he does not. Consequently, the two-wage scheme can be designed to impose virtually no risk on an agent who follows instructions but a large risk on an agent who shirks (Holmstrom and Milgrom, 1987 pp.305). Those two-wage schemes, if in practice, will cause problems. A scheme that adjusts compensation only when rare events occur are not likely to provide correct incentive; besides, it is nearly impossible for the principal to get precise knowledge about the agent’s preferences, actions, and opportunities.

A continuous-time principal-agent model with exponential utility was first developed by Holmstrom and Milgrom (1987). It gives a simple closed form solution: the second best sharing rule is a linear function of aggregate output. In the model of Holmstrom and Milgrom, the agency problem is in a continuous time version, the agent controls the drift rate of a vector of accounts that is subject to frequent, small random fluctuations. The solution is as if the problem were the static one in which the agent

mean of a multivariate normal distribution and the principal can observe only coarser aggregate such as profit, provided that the manager has sufficient discretion in how to account for profit, then the optimal compensation will be a linear function of profit (Holmstrom and Milgrom, 1987 pp.303, pp.306). Sung and Schattler generalized the linear model developed by Holmstrom and Milgrom. They gave sufficient conditions for the validity of the first order approach to the continuous-time principal-agent problems. These conditions are easily verified and therefore represent a solution to the question raised by Mirrlees (Sung and Schattler, 1993 pp.332). They also justified the robustness of Holmstrom and Milgrom's continuous time model over the discrete-time formulation (Sung and Schattler, 1997). Muller (1998) shows that the first best sharing rule of the continuous-time model of Holmstrom and Milgrom is also linear in aggregated output.

The model of Holmstrom and Milgrom has solved all the perceived problems of current available models on agency problem. The linear scheme is easy to enforce and convenient for sensitivity analysis, e.g. agency cost comparison. Based on the model of Holmstrom and Milgrom we build three models in the following part of the paper. In the first model we calculated the normal agency cost with uncertainty and CARA of the agent. As Arrow (1984, p.50) has observed: a limitation of the present models is the restricted reward or penalty system used. Still further extensions are needed to capture the aspects of the reality, for there is a whole world of rewards and penalties that take social rather than monetary forms. We explore further the much richer world on the basis of the first model. In the second model we added bribe and hidden income into the principal's problem to calculate the agency cost of SOEs from the collusion between agents in the hierarchical chain of SOE system. In the third model we added a new constraint on the

hierarchical chain of SOE system. In the third model we added a new constraint on the first model to calculate the agency cost of SOEs from the poor managerial incentive (the presence of an upper limit on the SOE manager's salary).

3.2 Modeling the agency cost of SOE

3.2.1 Model 1 : Agency cost calculated from the model of Holmstrom and Milgrom

This model is based on the sensitivity analysis of Holmstrom and Milgrom (1987, pp.323). It is also available in Varian (1992, pp.453).

(1) Assumptions :

P : The principal who pursues profit maximization as his sole goal.

A : The agent whose main income is from *P*'s compensation.

Here we consider a risk neutral principal's problem of providing the optimal incentive scheme continuously to a strictly risk averse agent who has the constant absolute risk aversion (CARA) utility function. The utility function of the agent is an exponential one :

$$U(w) = -\exp(-rw) \quad (1.1)$$

This kind of utility function has been widely used in economics research, eg. consumption problem of macroeconomics. Its advantage is that the absolute risk aversion is a constant *r*.

r: CARA measures. The Arrow-Pratt measure of absolute risk aversion (Varian, 1992).

$$r = -\frac{U''(w)}{U'(w)} \quad (1.2)$$

W : wealth or wage

The cost function of the agent is a quadratic one :

$$C(e) = \frac{k}{2}e^2, \quad k > 0, \quad (1.3)$$

$C(0) = 0$, $C'(e) = ke > 0$, the more effort the agent exerts, the more negative utility incurs to her.

$C''(e) = k$, this means that marginal cost increases on the level of effort. The agent's effort e is directly unobservable. Profit is the only observable variable.

$X = e + \theta$, X refers to profit.

θ is the disturbance with normal distribution $\theta \sim N(0, \sigma^2)$.

The agent controls the effort e .

Holmstrom and Milgrom proved that, based on the above assumptions, the optimal sharing rule for the principal's problem is a linear function of profit (Holmstrom and Milgrom, 1987 pp.321).

The optimal incentive scheme is :

$$S(X) = \alpha + \beta X \quad (1.4)$$

S represents the salary of the agent. α stands for the fixed part of salary; β stands for the degree that salary links to the firm's performance, or the profit share.

Some empirical evidence exists for the validity of the linear model: for an instance, KPMG has recently published an article named Executive Compensation Practices in the TSE (Toronto Stock Exchange) 300 Companies 1998¹⁰, which shows strong linear relationship between executive compensation and the sale/revenues of a firm (see next page). It coincides with the linear incentive scheme in the above model.

The principal wants to maximise his utility or wealth. Because the principal is risk neutral, his utility function is his wealth function, i.e. profit function

Exhibit 4 shows 1997, 1996 and 1995 CEO compensation for all companies.

EXHIBIT 4

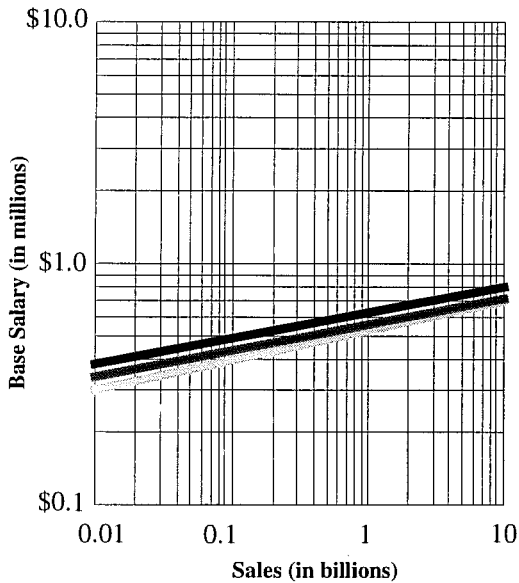
CEO COMPARATIVE DATA, ALL COMPANIES, 1997 COMPARED TO 1996 AND 1995

(IN THOUSANDS)

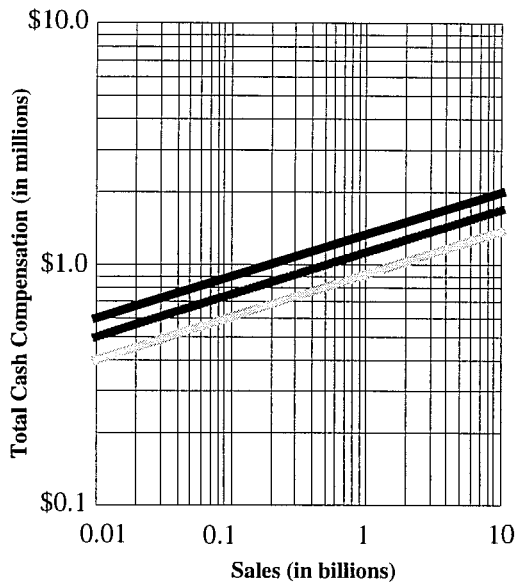
	25th Percentile			Median			75th Percentile			Average		
	1997	1996	1995	1997	1996	1995	1997	1996	1995	1997	1996	1995
Base Salary	\$275	\$250	\$221	\$400	\$346	\$309	\$573	\$500	\$452	\$464	\$415	\$379
Annual Incentive	\$121	\$103	\$76	\$256	\$220	\$163	\$534	\$429	\$350	\$492	\$391	\$286
Total Cash Compensation	\$360	\$333	\$265	\$588	\$519	\$447	\$986	\$837	\$765	\$862	\$731	\$605



Regression Analysis —
All Companies CEO Base Salary



Regression Analysis —
All Companies CEO Total Cash Compensation



1997 1996 1995

$$\begin{aligned}
\underset{\alpha, \beta}{\text{Max}} E\pi &= E[X - \alpha - \beta X] \\
&= E[(1 - \beta)X - \alpha] \\
&= E[(1 - \beta)(e + \theta) - \alpha] \\
&= (1 - \beta)e - \alpha
\end{aligned} \tag{1.5}$$

The principal's profit maximisation is subject to two constraints :

- 1) ICC (incentive compatibility constraint) : Because of the asymmetric information, the agent will maximise her expected utility through the assigned incentive scheme.
- 2) PC (participation constraint) : The agent must be able to achieve a certain minimum expected utility of \bar{U} (opportunity cost).

So the principal's problem can be written as below :

$$\underset{\alpha, \beta}{\text{Max}} E\pi = (1 - \beta)e - \alpha$$

$$\text{s.t (1) ICC : } A \text{ will maximise } U[S(X) - C(e)] \tag{1.6}$$

$$(2) \text{ PC : } U[S(X) - C(e)] \geq \bar{U} \tag{1.7}$$

Compared with the first best solution of the principal's problem (no uncertainty, no risk aversion of the agent), the above model gives us the second best solution.

(2) Simplifying ICC :

Because the agent has CARA utility function, the certainty equivalent utility of $U[S(X) - C(e)]$ is $U(CE)$.

$$\begin{aligned}
U(CE) &= E_{\theta} \left[\alpha + \beta X(e, \theta) - \frac{k}{2} e^2 \right] \\
&= E_{\theta} \left[\alpha + \beta(e + \theta) - \frac{k}{2} e^2 \right]
\end{aligned}$$

¹⁰ <http://www.kpmg.ca/abc/vl/surveys/tse300.htm>

$$= \alpha + \beta e - \frac{k}{2} e^2 + E_{\theta}(\beta \theta) \quad (1.8)$$

$$E_{\theta}(\beta \theta) = 0 - \frac{r}{2} \beta^2 \sigma^2 \quad (\text{Varian, 1992 pp.190}) \quad (1.9)$$

$$U(CE) = \alpha + \beta e - \frac{k}{2} e^2 - \frac{r}{2} \beta^2 \sigma^2 \quad (1.10)$$

The agent chooses the optimal effort level e to maximise her utility, i.e.

$$\text{F.O.C } \frac{\partial U(CE)}{\partial e} = \beta - ke \Rightarrow e = \frac{\beta}{k} \quad (1.11)$$

(3) Now the principal's problem can be simplified as

$$\text{Max}_{\alpha, \beta} E\pi = (1 - \beta)e - \alpha \quad (1.12)$$

$$\text{s.t } e = \frac{\beta}{k} \quad (1.13)$$

$$CE = \alpha + \beta e - \frac{k}{2} e^2 - \frac{r}{2} \beta^2 \sigma^2 \geq \bar{U} \quad (1.14)$$

Because we are concerned with the monopoly solution for the P - A problem where there is only one principal (the state) who acts as a monopolist : the principal sets the payment scheme under which the agent will either accept it if she can get a utility level no less than her opportunity cost \bar{U} , or the agent will quit. The agent has no bargaining power in this game. The PC will settle at the point where CE is equal to \bar{U} .

$$\alpha + \beta e - \frac{k}{2} e^2 - \frac{r}{2} \beta^2 \sigma^2 = \bar{U} \quad (1.15)$$

Let's substitute (1.13) into (1.15), then we get

$$\alpha = \bar{U} - \frac{\beta^2}{2k} + \frac{1}{2} r \sigma^2 \beta^2 \quad (1.16)$$

Solve for the optimal α^*, β^*

We substitute (1.13) and (1.16) into (1.12) and the principal's problem is as below

$$\text{Max}_{\beta} (1 - \beta) \frac{\beta}{k} - [\bar{U} - \frac{\beta^2}{2k} + \frac{1}{2} r \sigma^2 \beta^2] \quad (1.17)$$

F.O.C

$$\frac{1}{k} - \frac{\beta}{k} - r \sigma^2 \beta = 0$$

Then we get the optimal profit share of the agent

$$\beta^* = \frac{1}{1 + rk\sigma^2} \quad (1.18)$$

Substitute β^* into (1.15), we get

$$e^* = \frac{1}{k(1 + rk\sigma^2)} \quad (1.19)$$

Substitute β^* into (1.18), we get

$$\alpha^* = \bar{U} + \frac{kr\sigma^2 - 1}{2k(1 + rk\sigma^2)^2} \quad (1.20)$$

Now we have the optimal effort level choice of the agent

$$e^* = \frac{1}{k(1 + rk\sigma^2)} \quad (1.21)$$

and the optimal incentive scheme

$$S^* = \alpha^* + \beta^* X = \alpha^* + \beta^* (e^* + \theta)$$

$$E(S^*) = \alpha^* + \beta^* e^*$$

$$= \bar{U} + \frac{kr\sigma^2 - 1}{2k(1 + rk\sigma^2)^2} + \frac{1}{1 + rk\sigma^2} \frac{1}{k(1 + rk\sigma^2)}$$

$$= \bar{U} + \frac{1}{2(k + k^2\sigma^2 r)}$$

The maximised profit (or maximised expected profit) of the principal can be derived by substituting e^*, α^*, β^* into (1.12)

$$\begin{aligned}
 E\pi^* &= (1 - \beta^*)e^* - \alpha^* \\
 &= \left(1 - \frac{1}{1 + rk\sigma^2}\right) \left(\frac{1}{k(1 + rk\sigma^2)}\right) - \bar{U} - \frac{kr\sigma^2 - 1}{2k(1 + rk\sigma^2)^2} \\
 &= \frac{kr\sigma^2 + 1}{2k(1 + rk\sigma^2)^2} - \bar{U} \\
 &= \frac{1}{2k(1 + rk\sigma^2)} - \bar{U} \tag{1.22}
 \end{aligned}$$

(4) Agency Cost

Now we consider the first best solution of the principal's problem: $e^{FB}, \beta^{FB}, \alpha^{FB}$
(no risk aversion of the agent : $r = 0$; No white noise : $\sigma = 0$)

$$\begin{aligned}
 \text{We have } e^{FB} &= \frac{1}{k}, \quad \beta^{FB} = 1, \quad \alpha^{FB} = \bar{U} - \frac{1}{2k}, \\
 E(\pi)^{FB} &= \frac{1}{2k} - \bar{U}, \tag{1.23}
 \end{aligned}$$

Agency cost arises from the difference between $E(\pi)^{FB}$ and $E(\pi)^*$

$$\begin{aligned}
 \text{Agency cost } AC &= E(\pi)^{FB} - E(\pi)^* \\
 &= \frac{1}{2k} - \frac{1}{2k(1 + rk\sigma^2)} \\
 &= \frac{rk\sigma^2}{2k(1 + rk\sigma^2)} \tag{1.24}
 \end{aligned}$$

The more risk averse the agent, the higher r , the higher the agency cost AC . The higher uncertainty, the higher the σ^2 , and the higher the agency cost AC .

3.2.2 Model 2: Agency Cost from collusion between local official and SOE manager

From the first model, we have

$$\begin{aligned} \underset{\alpha, \beta}{\text{Max}} E\pi &= (1 - \beta)e - \alpha \\ \text{s.t. ICC: } e &= \frac{\beta}{k} \\ \text{PC: } CE &= \alpha + \beta e - \frac{k}{2}e^2 - \frac{r}{2}\beta^2\sigma^2 \geq \bar{U} \end{aligned}$$

We know that satisfying PC is the pre-condition of solving *P-A* problem. But in China there is an interesting phenomenon. According to the “1995 China Entrepreneurial Growth and Development Report”¹¹ that covers a sample of 2,756 large-and-medium-scale-enterprise managers in 30 provinces, responding to the question: *Does your remuneration cover your talent, responsibility and risk?* Only 2.4% of SOE managers answered as *Yes*; 65.4% answered as *Partly Covers* and 32.2% of them answered as *Not At All*.

From the above information about the SOEs' managerial compensation practices, we can do some analysis. By substituting the SOE manager's effort e_{SOE} and salary $\alpha_{SOE} + \beta_{SOE}e_{SOE}$ into PC we get

$$\alpha_{SOE} + \beta_{SOE}e_{SOE} - \frac{k}{2}(e_{SOE})^2 - \frac{r}{2}\beta_{SOE}^2\sigma^2 < \bar{U}$$

If we apply the above condition in the first model, the PC does not hold at all, why should the principal-agent relation still exist in SOEs. The reason is the intrinsic difference between China's SOE and the modern corporation. The PC of SOE is not the same as that in the first model. Instead, hidden income together with legal income (salary) constitutes the incentive scheme of the SOE manager so that PC can hold.

¹¹ <http://www.ceis.gov.cn/wsd/cenetex-957.asp>

Analysing the agency problem of China's SOEs, we find that the real principal is the state but in reality, the state has to rely on local government officials to monitor SOEs. To a local official, on the one hand, he pursues profit maximisation of the SOEs, because the better performance of his subordinate SOEs, the better his political performance, and the better chance he can get promoted; on the other hand, the low salary available to local official drives him to pursue rent seeking through abusing his political power, e.g., accepting bribes from SOE managers, influencing the ordering or contracting process of SOEs, and arranging patronage jobs in SOEs for his relatives or friends.

To the SOE managers, although the legal salary is very low, from their full control over SOEs and the poor monitoring infrastructures, they can derive considerable hidden income, e.g. bigger free houses, luxury cars, travelling abroad, some SOE managers even open new companies and feed them with profitable deals from the SOEs.

In this model we try to deal with the collusion problem in China's SOE management system. We assume that bribe is the only rent available to a local official. We add a variable B into the principal's problem and change the PC (participation constraint).

In this model, the principal is the local official and the agent is the SOE manager. The official pursues both profits and bribes B . Accepting bribes will incur political cost to the official:

$$C_o(B) = \frac{b_o}{2} B^2, \quad b_o > 0,$$

$$C_o(0) = 0, \quad C'_o(B) = b_o B, \quad C''_o(B) = b_o$$

The SOE manager gets her hidden income $\beta\phi B$ in return. Bribing the official also incurs political cost to the manager, which is a quadratic one:

$$C_a(B) = \frac{b_a}{2} B^2, \quad b_a > 0,$$

$$C_a(0) = 0, \quad C'_a(B) = b_a B, \quad C''_a(B) = b_a$$

We can consider B as a kind of illegal transaction cost which makes PC hold so as to solve the principal's problem in China's SOEs.

Under this new condition, we have new PC (participation constraint) as below:

$$\alpha + \beta e + \beta\phi B - \frac{k}{2} e^2 - B - \frac{b_a}{2} B^2 - \frac{r}{2} \beta^2 \sigma^2 \geq \bar{U}$$

The principal's problem is

$$\text{Max } E[(X + B) - \alpha - \beta(X + \phi B)] - \frac{b_a}{2} B^2 \quad (2.1)$$

$$\text{s.t. (1) ICC: Agent maximises } U(CE) \quad (2.2)$$

$$(2) \text{ PC: } U(CE) \geq \bar{U} \quad (2.3)$$

$$\begin{aligned} U(CE) &= E_0 \left[\alpha + \beta(X + \phi B) - \frac{k}{2} e^2 - B - \frac{b_a}{2} B^2 \right] \\ &= \alpha + \beta e + \beta\phi B - \frac{k}{2} e^2 - B - \frac{b_a}{2} B^2 - \frac{r}{2} \beta^2 \sigma^2 \end{aligned} \quad (2.4)$$

$$\alpha + \beta e + \beta\phi B - \frac{k}{2} e^2 - B - \frac{b_a}{2} B^2 - \frac{r}{2} \beta^2 \sigma^2 \geq \bar{U} \quad (2.3)$$

Comparing (2.3) to the PC in the first model: $\alpha + \beta e - \frac{k}{2} e^2 - \frac{r}{2} \beta^2 \sigma^2 \geq \bar{U}$, we find that the existence of bribes leads to new incentives $\beta\phi B$ for the manager to stay in his position and new costs $(\frac{b_a}{2} B^2 + B)$ associated with the political risk of bribing. We

assume $\phi > 1$, because per unit of effort brings the manager a benefit equal to β , and per unit of bribe bring $\beta\phi B$ and $\beta\phi > \beta$, this is in accordance with the reality: successfully bribing his superior official will bring the SOE manager more pecuniary gains than wholeheartedly fulfilling his duty. We also assume $b_a > k$, which reflects that bribing bears a higher risk than working honestly.

To simplify ICC, we maximise $U(CE)$.

$$U(CE) = \alpha + \beta e + \beta\phi B - \frac{k}{2}e^2 - B - \frac{b_a}{2}B^2 - \frac{r}{2}\beta^2\sigma^2$$

F.O.C for e and B we get:

$$\frac{\partial U(CE)}{\partial e} = 0 \quad e = \frac{\beta}{k} \quad (2.5)$$

$$\frac{\partial U(CE)}{\partial B} = 0 \quad B = \frac{\beta\phi - 1}{b_a} \quad (2.6)$$

Since bribe cannot be negative, from (2.6) we get

$$\phi \geq \frac{1}{\beta} \quad (2.7)$$

Because $\beta \in [0,1]$, as long as bribe exists, there will be $\phi > 1$. This is consistent with our earlier assumption.

From (2.3) we get the monopoly solution of PC:

$$\begin{aligned} \alpha &= \bar{U} - \beta \frac{\beta}{k} - \beta\phi \frac{\beta\phi - 1}{b_a} + \frac{k}{2} \frac{\beta^2}{k^2} + \frac{\beta\phi - 1}{b_a} + \frac{b_a}{2} \frac{(\beta\phi - 1)^2}{b_a^2} + \frac{r}{2}\beta^2\sigma^2 \\ &= \bar{U} - \frac{\beta^2}{k} - \frac{\beta\phi(\beta\phi - 1)}{b_a} + \frac{\beta^2}{2k} + \frac{\beta\phi - 1}{b_a} + \frac{(\beta\phi - 1)^2}{2b_a} + \frac{r}{2}\beta^2\sigma^2 \end{aligned} \quad (2.8)$$

Substitute (2.5), (2.6), (2.8) into (2.1)

The principal's problem can be written as:

$$\begin{aligned}
& \text{Max}_{\beta} \quad e + B - \alpha - \beta(e + \phi B) - \frac{b_o}{2} B^2 \\
& = \text{Max}_{\beta} \left[\frac{\beta}{k} - \frac{\phi^2}{2b_a} \beta^2 + \frac{\phi}{b_a} \beta - \frac{1}{2b_a} - \bar{U} - \frac{1}{2k} \beta^2 - \frac{r}{2} \beta^2 \sigma^2 - \frac{b_o}{2} \frac{(\beta\phi - 1)^2}{b_a^2} \right] \quad (2.9)
\end{aligned}$$

F.O.C of β , then we get:

$$\begin{aligned}
& \frac{1}{k} - \frac{\phi^2}{b_a} \beta + \frac{\phi}{b_a} - \frac{1}{k} \beta - r\sigma^2 \beta - \frac{b_o}{2} \frac{2(\beta\phi - 1)}{b_a^2} \lambda = 0 \\
& \frac{1}{k} + \frac{\phi}{b_a} + \frac{b_o}{b_a^2} \phi = \left[\frac{1}{k} + r\sigma^2 + \frac{\phi^2}{b_a} + \frac{b_o}{b_a^2} \phi^2 \right] \beta \\
& \beta_2^* = \frac{\frac{1}{k} + \frac{\phi}{b_a} + \frac{b_o}{b_a^2} \phi}{\frac{1}{k} + r\sigma^2 + \frac{\phi^2}{b_a} + \frac{b_o}{b_a^2} \phi^2} \quad (2.10)
\end{aligned}$$

$\phi > 1$, so $\beta_2^* < \beta^*$, see (1.18) for β^*

$e_2^* = \frac{\beta_2^*}{k}$, so $e_2^* < e^*$, see (1.19) for e^*

The equilibrium results of this model include a bribe and a lower level of managerial effort. The latter leads directly to the drop in SOEs' profit. When a SOE manager favours non-productive activities so that they can derive some hidden income, the state assets are consumed with no efficiency.

In the first model, the agency cost comes from information asymmetry, while in this model agency costs not only relate to asymmetric information, but also to a lot of non-productive activities of the agent. The agency cost in this model is much higher than that in the first model due to both the lower effort level and the non-productive

consumption of SOEs' assets. Thus we know that the presence of bribe and collusion leads directly to reduction in SOEs' profit.

How to eliminate bribes? From (2.6), we know that $B^* = \frac{\beta\phi}{b_a}$, if we can

increase b_a , e.g. when b_a is close to $+\infty$, B^* is close to 0. The higher the risk of bribing to the SOE manager, the lower the incentive of the SOE manager to bribe her superior official. If the principal (real principal) cannot be bribed and any deviant managerial behaviour will lead to the demotion of the manager, or if the monitoring mechanism works well, then it will be too risky for the manager to bribe and deviate. But these are not the crucial measures. The root of corruption and bribery is the unfair managerial compensation arrangement existing in most SOEs. The legal salaries of most SOE managers are much lower than they should be. If no hidden income are available to the SOE managers, the PC will not hold and no rational people will stay in her position.

If we can enhance the manager's salary to $\bar{S}(\bar{\alpha} + \bar{\beta}\bar{e})$ so that $\bar{\alpha} + \bar{\beta}\bar{e} - \frac{k}{2}\bar{e}^2 - \frac{r}{2}\bar{\beta}^2\sigma^2 = \bar{U}$, then the legal salary satisfies participation constraint, and the manager may not risk bribing to get hidden income, given a compatible monitoring mechanism. Given $S = \bar{S}$ and the absence of collusion, can the agency cost be reduced to the second best solution in the first model? The answer is negative. Because of the characteristics of public ownership in former communist countries, the state, besides pursuing profit maximisation, also pursues equality of salary. The salary gap between workers and managers cannot be too large. An upper limit exists on the managers' salaries. In the next model, we discuss the influence of salary upper limit on the agency

problem of SOEs given the elimination of collusion between SOE managers and local officials.

3.2.3 Model 3: Agency cost of SOEs from upper limit on managers' salaries

(1) Assumption: The principal is the state and the agent is the SOE manager. The state only pursues profit maximisation just like the principal in the first model. What is new in this model is there is usually an upper limit on the salary of the SOE manager, $S = \alpha + \beta e \leq \tilde{S}$, the presence of upper limit \tilde{S} reflects the fact that the state is pursuing both profit maximisation and equality of income.

(2) A principal's problem with the third constraint : upper limit on agents' salaries

$$\underset{\alpha, \beta}{\text{Max}}(1 - \beta)e - \alpha \quad (3.1)$$

$$\text{s.t. ICC: } e = \frac{\beta}{k} \quad (3.2)$$

$$\text{PC: } \alpha + \beta e - \frac{k}{2}e^2 - \frac{r}{2}\beta^2\sigma^2 \geq \bar{U} \quad (3.3)$$

Salary upper limit constraint:

$$\alpha + \beta e \leq \tilde{S} \quad (3.4)$$

The Lagrange function can be written as:

$$\begin{aligned} L(\alpha, \beta, \lambda_1, \lambda_2) = & (1 - \beta)\frac{\beta}{k} - \alpha \\ & - \lambda_1\left(\alpha + \frac{\beta^2}{k} - \tilde{S}\right) - \lambda_2\left[\bar{U} - \alpha - \frac{\beta^2}{k} + \frac{\beta^2}{2k} + \frac{r}{2}\beta^2\sigma^2\right] \end{aligned} \quad (3.5)$$

To solve the above maximisation problem, we use the Kuhn-Tucker theorem, then we get

$$\frac{\partial L}{\partial \alpha} = -1 - \lambda_1 + \lambda_2 = 0 \quad (3.6)$$

$$\begin{aligned} \frac{\partial L}{\partial \beta} &= -\frac{2}{k}\beta - \frac{2\lambda_1}{k}\beta + \frac{2\lambda_2}{k}\beta + \frac{1}{k} - \frac{\lambda_2}{k}\beta + r\beta\sigma^2\lambda_2 \\ &= -\frac{2}{k}\beta - \frac{2\lambda_1}{k}\beta + \frac{\lambda_2}{k}\beta + \frac{1}{k} + r\beta\sigma^2\lambda_2 \\ &= 0 \end{aligned} \quad (3.7)$$

$$\frac{\partial L}{\partial \lambda_1} = -\left[\alpha + \frac{\beta^2}{k} - \bar{S}\right] \geq 0 \quad (3.8)$$

$$\frac{\partial L}{\partial \lambda_2} = -\left[\bar{U} - \alpha - \frac{\beta^2}{2k} + \frac{r}{2}\beta^2\sigma^2\right] \geq 0 \quad (3.9)$$

$$\lambda_1 \frac{\partial L}{\partial \lambda_1} = 0 \quad (3.10)$$

$$\lambda_2 \frac{\partial L}{\partial \lambda_2} = 0 \quad (3.11)$$

$$\lambda_1, \lambda_2 \geq 0 \quad (3.12)$$

(3) Analysis

a) If $\lambda_1 = 0$, $\frac{\partial L}{\partial \lambda_1} > 0$

Then $\lambda_2 = 1$, $\frac{\partial L}{\partial \lambda_2} = 0$

$$\begin{aligned} L &= (1 - \beta)\frac{\beta}{k} - \alpha - \left[\bar{U} - \alpha - \frac{\beta^2}{k} + \frac{\beta^2}{2k} + \frac{r}{2}\beta^2\sigma^2\right] \\ &= (1 - \beta)\frac{\beta}{k} - \left[\bar{U} - \frac{\beta^2}{2k} + \frac{r}{2}\beta^2\sigma^2\right] \end{aligned} \quad (3.13)$$

Under such condition, $S = \alpha + \beta e < \tilde{S}$, this constraint is not binding. This model is the same as the first one, the equilibrium solution (α^*, β^*) has nothing to do with the variable \tilde{S} .

b) If $\lambda_2 = 0$, $\frac{\partial L}{\partial \lambda_2} > 0$

Then $\lambda_1 = -1$ which is in conflict with $\lambda_1 \geq 0$, so we are able to reject it.

c) If $\lambda_1 = 0$ and $\lambda_2 = 0$, it is in conflict with $\lambda_2 - \lambda_1 = 1$,

So it is also rejected.

d) $\lambda_1 > 0$, $\frac{\partial L}{\partial \lambda_1} = 0$; then $\lambda_2 > 0$ $\frac{\partial L}{\partial \lambda_2} = 0$.

Then we can get the following two conditions.

$$\alpha + \frac{\beta^2}{k} - \bar{S} = 0 \quad \text{or} \quad \alpha = \bar{S} - \frac{\beta^2}{k} \quad (3.14)$$

$$\text{and } \bar{U} - \alpha - \frac{\beta^2}{2k} + \frac{r}{2} \beta^2 \sigma^2 = 0 \quad (3.15)$$

\bar{S} stands for the solution to \tilde{S} , \bar{S} satisfies PC so that

$$\bar{\alpha} + \bar{\beta} \bar{e} - \frac{k}{2} \bar{e}^2 - \frac{r}{2} \bar{\beta}^2 \sigma^2 = \bar{U} \quad (3.16)$$

By substituting (3.14) into (3.15) we get

$$\beta^2 = \frac{\bar{S} - \bar{U}}{\frac{1}{2k} + \frac{r}{2} \sigma^2} = 0 \quad (3.17)$$

By substituting (3.17) and (3.14) into the principal's problem, we get the maximised wealth of the state

$$\begin{aligned}\pi &= (1-\beta)\frac{\beta}{k} - \alpha \\ &= \frac{1}{k} \sqrt{\frac{\bar{S}-\bar{U}}{\frac{1}{2k} + \frac{r}{2}\sigma^2}} - \bar{S}\end{aligned}\quad (3.18)$$

We can see that \bar{S} gives the border solution of the principal's problem.

There are infinite solutions \bar{S} . Among them the smallest one \bar{S} can be calculated as below:

$$\begin{aligned}& \underset{\alpha, \beta}{\text{Min}} \alpha + \beta e \\ \text{s.t.} \quad & \alpha + \beta e - \frac{k}{2} e^2 - \frac{r}{2} \beta^2 \sigma^2 = \bar{U}\end{aligned}$$

After substitution and F.O.C, we get:

$$\begin{aligned}r\sigma^2\beta + \frac{\beta}{k} &= 0 \\ \beta &= 0,\end{aligned}\quad (3.19)$$

$$\alpha = \bar{U}, \quad (3.20)$$

$$\bar{S}_{\min} = \bar{U} \quad (3.21)$$

From (3.18) we know if \bar{S} changes, then the profit π also change. Among all those \bar{S} there is an optimal one: \bar{S}^* . Thus we can do comparative analysis to get the optimal \bar{S}^* which gives the maximised profit $\pi^*(\bar{S})$.

F.O.C of (3.18)

$$\frac{\partial \pi}{\partial \bar{S}} = \frac{1}{2k} \frac{1}{\sqrt{\frac{\bar{S}-\bar{U}}{\frac{1}{2k} + \frac{r}{2}\sigma^2}}} \frac{1}{\frac{1}{2k} + \frac{r}{2}\sigma^2} - 1$$

$$= \frac{1}{\sqrt{2(k+k^2\sigma^2r)(\bar{S}-\bar{U})}} - 1 = 0$$

After simplification, we get

$$\bar{S}^* = \frac{1}{2(k+k^2\sigma^2r)} + \bar{U} \quad (3.22)$$

\bar{S}^* is the optimal upper limit on the SOE manager's salary.

We also get the maximised wealth of the state: $\pi^*(\bar{S}^*)$.

$$\pi^*(\bar{S}^*) = \frac{1}{k} \sqrt{\frac{\bar{S}^* - \bar{U}}{\frac{1}{2k} + \frac{r}{2}\sigma^2}} - \bar{S}^* \quad (3.23)$$

Substitute (3.22) into (3.23), we can get

$$\begin{aligned} \pi^*(\bar{S}^*) &= \sqrt{\frac{\frac{1}{2(k+k^2\sigma^2r)}}{k^2\left(\frac{1}{2k} + \frac{r}{2}\sigma^2\right)} - \frac{1}{2(k+k^2\sigma^2r)} - \bar{U}} \\ &= \frac{1}{2k(1+k\sigma^2r)} - \bar{U} \end{aligned} \quad (3.24)$$

We can see that (3.24) is the same as (1.22), which means whenever the state gives the manager the optimal upper limit on salary at \bar{S}^* , we get the same profit as what the second best solution in the first model has given:

$$E\pi^* = \frac{1}{2k(1+k\sigma^2r)} - \bar{U}$$

Substitute (3.22) into (3.16), we can get the β^* corresponding with \bar{S}^*

$$\beta^*(\bar{S}^*) = \sqrt{\frac{\bar{S}^* - \bar{U}}{\frac{1}{2k} + \frac{r}{2}\sigma^2}} = \frac{1}{1+rk\sigma^2} \quad (3.25)$$

From above calculation we can see that, by setting the upper limit on the salary of the SOE manager equal to \bar{S}^* , we can get the same second best solution of β , e , π as those in the first model.

$$\beta^* : \beta^*(\bar{S}^*) = \beta^{*SB}$$

$$e^* : e^*(\bar{S}^*) = e^{*SB}$$

$$\pi^* : \pi^*(\bar{S}^*) = \pi^{*SB}$$

When $\bar{S} > \bar{S}^*$, the upper limit constraint is not binding. When $\bar{S} \in [\bar{U}, \bar{S}^*]$, from the above comparative analysis, we know $\pi(\bar{S}^*) = \pi^{*SB}$. Among all those $\bar{S} \in [\bar{U}, \bar{S}^*]$, $\tilde{S} = \bar{S} = \bar{S}^*$ gives the highest profit $\pi^{*SB} = \frac{1}{2k(1+k\sigma^2r)} - \bar{U}$, $\tilde{S} = \bar{S} = \bar{U}$ gives the lowest profit $\pi = -\bar{U}$, which justifies the failure of SOEs. As long as $\tilde{S} \neq \bar{S}^*$, the profit $\pi(\tilde{S})$ would be less than π^{*SB} and the agency cost will be higher than that of the first model.

From the above model with constraint of upper limit on manager's salary, we can see that even if the PC problem is solved after proper adjustment of managerial salary and there is no collusion, the agency cost would not automatically drop to the agency cost level in the first model. Due to the existence of salary upper limit \tilde{S} , as long as $\tilde{S} = \bar{S} \in [\bar{U}, \bar{S}^*)$, the resulted profit will be lower than optimal profit.

Differing from the last model in which agency cost mainly comes from non-productive activity, in this model, agency cost mainly comes from the artificial upper limit on the economic variable S . By eliminating \tilde{S} or setting $\tilde{S} = \bar{S} = \bar{S}^*$, the agency cost can be reduced to the optimal level of the first model.

4. Next step of China's SOE Reform

4.1 Conventional wisdom on SOE reform: Privatisation and Shareholding systems

SOEs have been equipped with the most talented professionals and the most abundant capital, but they have had the poorest performance. What's wrong with China's SOEs? Is there any solution to this crisis? Is "shock therapy" a solution? Is shareholding system a rescue? In order to answer these questions, we must start from the theory of firm. There are several schools about the theory of firm.

The first one is the school of "Property Right". Alchian and Demsetz (1972) and Jensen and Meckling (1976) are best examples. The "Entrepreneur" (manager- risk bearer) is central in both Jensen-Meckling and Alchian-Demsetz. The "Entrepreneur" defined by Alchian-Demsetz (1972, pp.794) assumes the consistency between control right and cash flow right. Schankerman (1997) states that modern theory of property rights views ownership as a system of control rights and cash flow rights. Efficiency requires that these rights be aligned. He argues that pervasive political control over assets fatally undermines efficient allocation, largely because legal cash flow rights are rare. He suggested various alternatives to align control rights and cash flow rights in TEs (transition economies): corruption, privatization, bureaucratic reform. He points out that corruption might in principle solve the inefficiency problem created by poorly defined property rights, but it can be efficient only when it is centralised or co-ordinated. Decentralising some control rights but not cash flow rights to multiple government agencies and managers will exacerbate the inefficiency of corruption (Schankerman ,1997).

Privatization seems to be the speedy way to solve the property rights problem. It aligns the control right and cash flow right immediately and is supposed to lead to restructuring the firm toward efficient production. There are many economists supporting mass privatisation programs in TEs (transition economies). The most striking case is the "Shock Therapy" prescribed by IMF to Russia. In less than two years (Oct 1992-July 1994), Russia privatized more than 14,000 firms employing more than 40 million workers (Schankerman, 1997). The mass privatization was driven by the government's desire to move as many firms as possible into private hands before politics could reverse this process (Akhmetshina, 1998 pp.26). The strategy was to give cash flow rights where *de facto* control rights already existed (Schankerman, 1997). The mass privatization program was characteristic of insider control, undervaluation, hyperinflation, but not restructuring. The book value of the 14,000 privatised enterprises was calculated once, in January 1992, and have not been changed since then, even though prices have risen by 10,500% in the intervening period. The 14,000 largest SOEs was estimated to be around \$12 billion, only slightly more than the book value of Kellogg, an American cereal company (Akhmetshina, 1998 pp.28). Buck (1996) found that, differing in pace and scope, privatization in Russia and Ukraine has resulted in insiders usually dominating the ownership structure. Barberis (1996) surveyed 452 Russia shops and found no evidence that equity incentive of old managers promote restructuring. After investigating a large random sample of Russian firms, Earle (1996) found no evidence that privatization affects any major area of enterprise behavior or performance. Nishimura (1994) observed the serious problem that the budding new ownership may come to nothing as a result of economic collapse. Buck (1994) found that employee buyout (voucher privatisation), the

main privatization vehicle for large Russian SOEs, provides no new funds for investment and results in faulty corporate governance.

Some Chinese scholars believe that privatization is the obvious solution (Wang, 1996) to SOEs' inefficiency. Privatisation might be the right way toward restructuring, but shock therapy is the last thing Chinese want. If China adopt the mass privatization, the first thing to happen is a huge fiscal deficit. Due to the poor market infrastructures, the non-state sectors' trade cannot be effectively monitored. The SOEs, with a 28% of total industrial output, have been burdened with more than 70% of government revenue contribution. The second thing to happen is the mass layoff from industrial sector by new private owners. In the absence of a social safety net, the social turmoil is in sight. Restructuring SOEs is urgent, but not at the cost of social and macroeconomic stability. What we need is an explicit strategy beyond privatization.

To Fama (1980), however, ownership is an irrelevant factor in the theory of firm, at least in light of modern joint stock corporation which does not have a owner in some sense. He believes that the separation of security ownership and control right can be explained as an efficient form of organization. Within the "set of contracts" perspective (Jensen & Meckling, 1976 pp.310), each factor in a firm is owned by somebody. The firm is just the set of contracts covering the way inputs are joined to create outputs and the way receipts from outputs are shared among inputs. The two functions usually attributed to the entrepreneur: management and risk bearing, are naturally separate factors within the "set of contracts" called a firm. These two factors of production, each faced with a market for its services that provides alternative opportunities and, in the case of management, motivation toward performance (Fama, 1980 pp.288-291).

This school does not think of ownership as a crucial issue in the SOEs' inefficiency. This school has many supporters in China and they believe that stock market system will provide the rescue to China's SOEs. Li, a professor of Beijing University, also known as "Stock Li" is a well known promoter of stock system. Qian (1996) is also a strong promoter of corporation system.

Fama's thesis was written in 1980, USA. His theory of firm was based on the following assumptions: First of all, advanced (if not perfect) market infrastructures which support and monitor the enforcement of all those contracts existing within and outside the firm. This includes a well functioning capital market to signal the performance of a firm, an efficient managerial market to reevaluate the wage of a manager according to his deviation history, a strict auditing and law enforcing system, etc. All these institutions are the cornerstones of the proper functioning of a market economy, but they are non-existent in transition economies like China; and even worse, they take long time to build up. Until then, the emerging market economy will fall short of "responsible capitalism" with the required deep-rooted political legitimacy (Mark, 1997). Secondly, should the contract to apply in a static situation, the very person who set up the contract must have specific and comprehensive understanding of both parties' preferences, capabilities so that execution of the contract can provide an opportunity cost higher than the gains of deviation from the contract; if the contract is to apply in a dynamic situation, the actions and opportunities of both parties should be timely and freely exchangeable. This assumption is becoming too strong to hold as we enter the post-industrial age (or information age) which is characteristic of exponentially growing information.

Both of the two above assumptions are not met in China's case. If those who favour the stock market system base their point of view on Fama's theory, they must have misunderstood Fama's intent and dangerously oversimplified Fama's theory of the firm. What Fama wanted to show in his 1980 thesis is that, the separation of security holders and management is an efficient way of organizing an economy provided that the stock market, managerial market and other institutions have already offered effective managerial incentive and efficient tools for monitoring and disciplining. China cannot simply copy the stock system and expect it to be a panacea. China started the share holding system in 1984, the stock market value was 14,919 billion Yuan (1 US\$= 8.2 Yuan) in September, 1997,¹² but the tradable stock accounted for only 26% of total market value.¹³ In the absence of huge private capital, the state has to hold the majority of stock in hand. Prevented by political thinking, the state cannot dump the stock even if the company's performance is really bad. Or even if it is allowed do dump the state's share, it is hard to answer : who, when and how much shares to dump? Before legitimate answers to those questions could be found, such a stock market is not likely to be able to signal the management's performance. Even worse, state partially divesting itself from SOEs is likely to cause more uncertainty between private and state sector so as to create more opportunity for economic crime. In China's shareholding system, CEO usually hold key positions in the board, such as deputy chairman, which makes the major mechanism of the board (low cost alternative to replace top management than outside turnover) dysfunctional (Lee, 1993 pp.189). One thing is sure, this kind of corporation is not what Fama has envisioned.

¹² <http://www.ceis.gov.cn/wsd/diaocha/shichang/Famt10.asp>

¹³ <http://www.ceis.gov.cn/wsd/diaocha/shichang/Famt12.asp>

4.2 Propositions of this Paper : Reform towards reducing Agency Cost

The analysis in section three has provided direction for solving SOEs' inefficiency. Since the agency cost comes mainly from low incentives and the collusion between SOE managers and local officials, further reform should aim at enhancing managerial incentive and changing the organizational structure of the state owned system so as to effectively monitor SOEs.

4.2.1 Step 1: Solve the incentive problem

If we instead solve the monitoring problem first, then we will encounter two problems. The first is that nobody will stay in the manager's position if the hidden income becomes untenable and legal income does not satisfy the participation constraint. Under the rule of adverse selection, when wages cannot cover opportunity cost, the best worker is the first to leave, then the second best, etc (Mas-Colell, 1995 pp.441). The only manager who is willing to stay with the low salary must be the most incompetent one. An investigation found that only 60.4% of SOE managers are willing to peg their compensation with their companies' performance.¹⁴ This may reflect a decline in managerial competency. If the manager has to stay only because of the poorly developed managerial labour market, given the imperfect monitoring mechanism, his only choice is to deviate, to expropriate state asset. The resulting agency cost is high. Groves (1995, pp.884) has studied the post auction performance of SOEs. He found that firms in which the new manager won the auction experienced no significant improvement in performance, but those in which the incumbent won did. Another reason of solving incentive problem first is that setting up a new system takes time but SOEs are in a crisis, so reforming the incentive scheme can be the first aid.

To solve the incentive problem is easy, just raise \tilde{S} to \bar{S}^* , then eliminate the upper limit of SOE manager's salary. From (1.26) we can see the composition of agency cost: $AC = E(\pi)^{FB} - E(\pi)^* = \frac{rk\sigma^2}{2k(1+rk\sigma^2)}$, considering that China is in a transition economy characteristic of high uncertainty σ^2 , before effective monitoring mechanism can be set up, giving SOE manager a β_{SOE} level higher than β^* will get higher $e = \frac{\beta}{k}$ which can offset the higher σ^2 . Then the agency cost can be reduced to the optimal level in the first model. Hart (1990, pp.1133) has proposed that if an agent is indispensable to an asset, then he should own it. Since China lacks a fully developed managerial market so that the SOE manager have no alternative place to go, it seems to be optimal to give the incumbent SOE manager a higher profit share instead of pushing him to plunder the state assets.

4.2.2 Step 2: Build the information age SOE management system to reduce informational asymmetry

Since China is in a transition economy which has more uncertainty and fewer market institutions (monitoring instrument) than does an advanced market economy, the highly asymmetric information has caused abnormally high agency cost in SOEs. Further reform should aim at enhancing the transparency of the economy and the observability of enterprise management. This requires significant institutional change, both in the state owned system and the basic market institutions. Here we focus on the organizational change of the state owned system.

¹⁴ <http://www.cq.cei.gov.cn/market/cqzb/cqzb30jj.html>

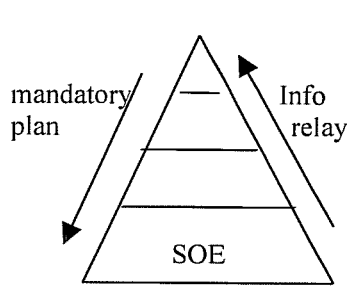
(1) Evolution of SOE management system

The "Cultural Revolution" has destroyed many valuable legacies of Chinese culture, but failed to substitute a new one of its own merits. The same mistake has happened on SOE reform when the hierarchical organization model was destroyed but effective substitute was not set up. Chinese government has spent nearly three decades to build up the hierarchical SOE management system although it seems that it was hurry destroying the hierarchy during the past two decades. From Table 3 we can see that the hierarchical model looks like a pyramid.

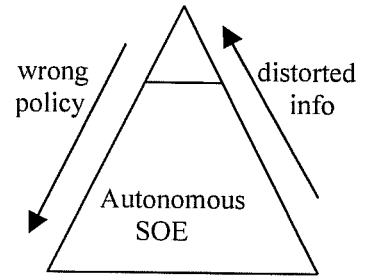
Ericson (1991, pp.19) has observed some features of a classical Soviet-type Economy: a hierarchical structure of authority; rigid, highly centralised planning of production and distribution; a commitment to maximal resource utilisation; formal planning; exhaustive price control; lack of any liquidity or flexible response capability; lack of legal alternatives to assigned economic relationships; absolute and arbitrary control by superiors; incentives that are geared to meeting the plans and desires of evaluating superiors.

This centralised system has been extremely effective shortly after the foundation of PRC when China was insulated from outside and had extreme scarce in resources. Pooled capital, human resource and strong support from the state have made possible the great success of China's early five-year national plans. In a closed and centralised economy, the state assumed the information of price and quantity of inputs and outputs, there is no much "uncertainty" in the economy. Although the planned mode of economy has imposed large negative social, political, ecological and personal externalities

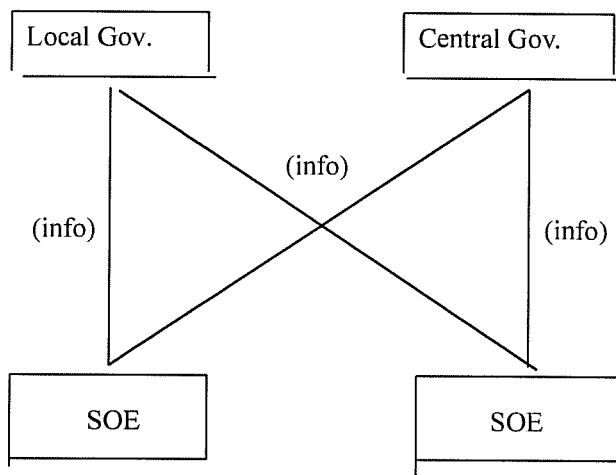
Table 3 Organizational models



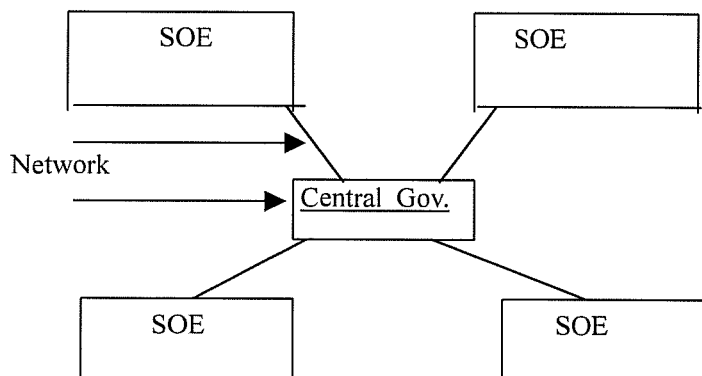
1. Hierarchy



2. Anarchy



3. Matrix



4. Info Age Organization

(Ericson, 1991 pp.11), the hierarchical organisation model has appeared to be efficient to manage SOEs in a rurally dominated, slow growing market.

The emphasis on ideological struggle has disrupted China's economy and pushed China into the border of collapse. After adopting the "open door and reform" policy in 1978, especially after the huge success of decentralisation in primary sector, the Chinese government wanted to simply copy it for the industrial sector. This reform did not work because the industrial sector has a much more complexity than primary sector.

The early industrial reform has aimed at empowering SOEs to adapt to the rapidly changing market condition. Decision right was decentralised from the central government. Local officials and SOE managers have gained great autonomy over investment and output. Economists are calling for further separation between SOEs and the state. However, the SOEs' efficiency and competency have grown inversely with the degree of autonomy. What is wrong with SOEs?

The reason is simple: The strategic thinking of China's industrial reform has out-paced the organisational capabilities of the state owned system. After rejecting the option of mass privatisation, the Chinese leaders were left in a deep dilemma. Speed counts, but not at the expense of accountability. They want the speed of economy growth to meet the booming labour force, but they do not want to lose efficiency. They want the SOEs to be able to address real-time consumer need and to meet the increasing competition from non-state sector as well as global competitors but they do not want to lose control over SOEs (anarchy).

Before the information age, hierarchy is the only form of organisation that can enable employing large numbers of people yet preserve unambiguous accountability for

the work they do (Jaques, 1990, pp.127). China's industrial reform since 1978 has actually transformed the former hierarchical SOE management system into a situation of anarchy (see table 3). This has created high moral hazard. Managerial freedom at the bottom has increased but the local agent's accountability is lost and the performance of SOEs has not improved accordingly. The lesson is clear: partial reforms will not suffice. As Ericson (1991, pp.25) has observed: in such a transition economy, freeing economic agents is an invitation to disaster, which can only result in the re-imposition of strict control.

The collapse of Barings Bank was a good example of how high the principal's risk can be when he pursues flexibility and entrepreneurship at the bottom level of the organisation but fails to ensure accountability which was one of the merits of hierarchy model. People may ask that how many "Barings" are there in China? Or is China another "Barings"?

In the earlier mentioned Hongta's case, there was about 100 million US \$ of offshore state asset unrecorded on the company's account, which was accessible only through the former CEO's signature. In 1996, the CEO of Kunming Cigarette factory disappeared in US after expropriating 1 billion Yuan (1US\$=8.3 Yuan) of state asset.¹⁵ In November 1998, a manager of a state financial institution in Shengzhen, Guangdong province disappeared with 200 million Yuan.¹⁶ The most striking case was the recent liquidation of GITIC (Guangdong international trust and investment corporation, the second largest ITIC in China). The negative asset was estimated as 32 billion Yuan.¹⁷ GITIC borrowed mainly from international capital market. The court in China ruled that

¹⁵ April 20th, 1999. <http://www.zaobao.com.sg>

¹⁶ April 22nd, 1999 <http://www.zaobao.com.sg>

only 5% of the debt can be recovered to foreign creditors (Singdao Daily, March 25th, 1999). Foreign banks are mourning that they have never been treated so badly and muttering that China had better not be counting on new foreign money coming in to help restructure the economy and fuel growth (Jan 15th, 1999 Wall Street Journal). It was said that five more "ITIC" will be liquidated. Since the money they borrowed from abroad have been usually regarded as sovereign debts, the string of high-profile loan defaults will make China's raising capital abroad tougher, if not impossible. More than thirty international bank syndicates have already stopped further lending money to China and require repayment ASAP, even the export loans previously available to China's enterprises have been cancelled.

In auditing GITIC, one ridiculous record was found that 400 million HK\$ was lent to a timber company in Malaysia with no receipt (Singdao Daily, March, 25th, 1999). Such kind of insane plundering state asset and free riding on the whole country's credit standing will cause serious problem comparable to the collapse of Barings bank.

Shocked by the wide spread activities of plundering state assets by SOE managers, Chinese government found it necessary to keep some SOEs under the central government's close watch. There will be two benefits from this action: on the one hand, the state as the principal will be more responsive to the manager's actions and opportunities; on another hand, the shorter the information channel between the agent and the principal, the less distorted the information and the more efficiently problems get solved. At least direct supervision can help to safeguard state assets. There were some moves made already. 500 largest SOEs' personnel rights have been centralised.¹⁸ It has

¹⁷ April 24th, 1999 <http://www.zaobao.com.sg>

¹⁸ <http://e-china.online.sh.cn/>

been recognised that choosing the right CEO is the key issue in the success of SOEs. This trend seems to lead to a matrix model (see table 3) of SOE management system.

The matrix model, however, is not likely to succeed. Laudon has observed following characteristics of matrix model (Laudon, 1998 pp199): Power struggles and turf battles lead to confusion, conflict and indecision; dual reporting and authority levels make accountability problematic; lack of tools for managing and communicating information hampers understanding of the business and created information overload; duplication of resources engenders excessive overhead and cost. Many large corporations in western countries have adopted the matrix model during 1970s only to abandon it in the 1980s.

(2) Information age State Owned System: The organizational solution to agency problem

China's reform has happened to be in the accelerating stage of knowledge explosion and globalisation, or the so-called post-industrial age. In such a stage, the amount and complexity of information have been growing at geometric rate (Huber, 1984 pp.931). The slower global economic growth and the shrinking global market has enhanced the degree of competition in China's market; improvement in R&D technology, advertising technology and distribution technology has enabled competitors to "steal" markets from each other even more quickly than they can before. Shorter event permits more events per unit of time so as to increase turbulence (Huber, 1984 pp.932). As a result, the long and narrow channel connecting agent (SOE manager) and principal (the state) was clogged with pseudo information, which is often intentionally distorted, with actual content being quite limited (Groves, 1994). No wonder the Chinese Premier Zhu has often complained that "they (local state agencies) cheat level by level up to the

central government.” This has caused enormous uncertainty and abnormally high agency cost.

Agency cost, in its nature, is an information cost. It is the asymmetric information between principal and agent that causes agency cost. As long as the timely free flow of information from agent to principal and the meaningful use of those information can be ensured, the agency cost will be significantly reduced. Costlessly monitoring SOEs by the state can significantly reduce agency cost by allowing centralising important decisions without damaging entrepreneurship, but it will incur high level of information processing and communication demand and it constituted the greatest challenge to the existing organisation’s capability. Due to the inappropriate organizational structure of SOE management system and the obsolete IT platform (paper based), efficiently monitoring SOE managers has proven to be a nightmare to Chinese government.

Fortunately, a major break through of IT (information technology) in the 1990’s offers a powerful tool to help solving this problem. According to Laudon (Laudon, 1998 pp.216), we have entered a world in which users could access and communicate information through a wide variety of powerful workstations and portable technologies (clients) linked to shared information and communication services (servers) through high performance local and global networks. The emergence of Internet, World Wide Web and browser technology in the mid 1990’s also fueled the transition.

The idea of “Networked IT Revolution” (Laudon, 1998 pp.176) provides an information processing and communication infrastructure that matches the demand of the proposed SOE management system. The system permits important decisions to be

centralised yet still reflect real-time understanding of the business environment (preserving entrepreneurship) and allow immediate feed back.

The information age organisational model of state owned system thus emerges (see table 3). From table 3 we can see that the middle layers of the former hierarchy chain are sharply cut out. Those layers are just relays for the faint and unfocused signals that pass for communication in the traditional organisation. Deletion of these layers can greatly reduce both the degree of information distortion and shorten hierarchy chain: the root of the collusion between state agencies.

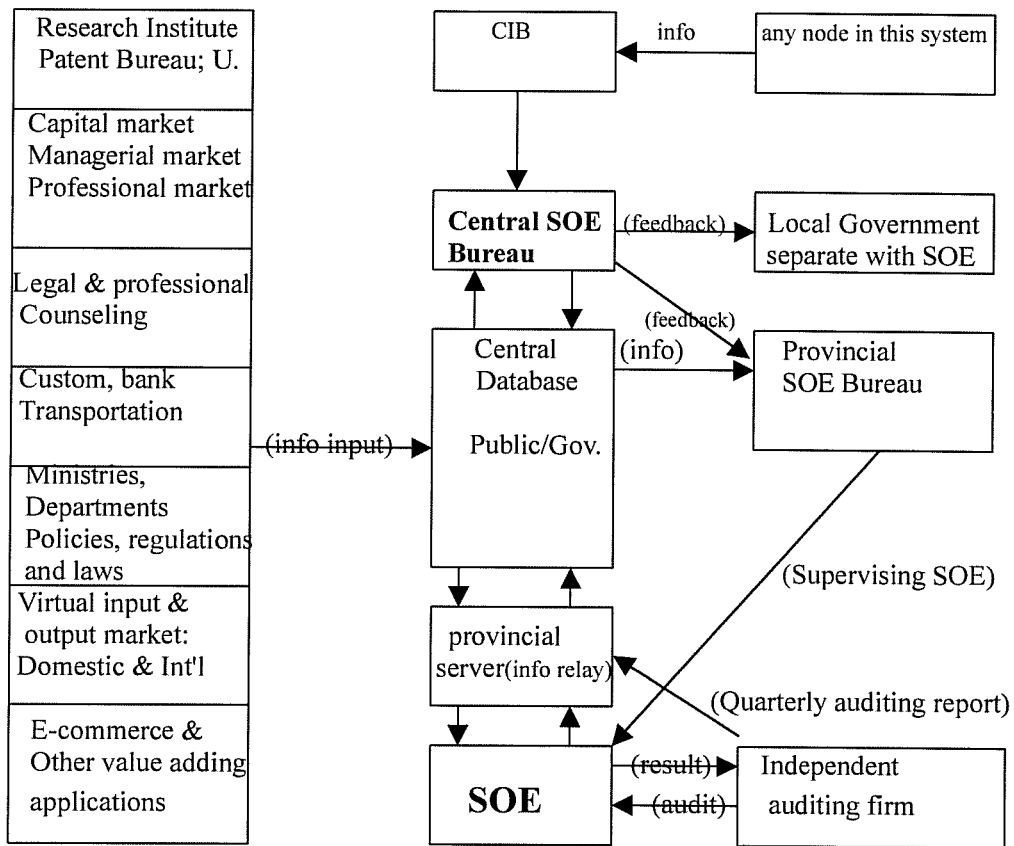
Table 4 provided a detailed configuration of the proposed SOE management information system. This model was inspired by Cash (1994, pp.91) and Laudon (1998, pp.188). We can see it works like an orchestra led by a conductor.

(3) Functions of the system:

1) The central database is the heart of the system. The central database connect several servers (databases) that include provincial servers, research institutions, ministries, customs, and other servers. All these servers and databases should be managed and kept updated by specialists from all the concerned fields. The provincial server functions as technical relay of information. There is no artificial information block between SOEs and central government.

2) In each province, the independent CPA firms audit SOEs quarterly and submit the auditing reports to the central database. SOEs operate under one goal: profit maximisation. The state builds a social safety net in case of layoff. SOEs do not produce political goods any more. Profit is the sole criterion of SOE manager's competency. Strict

Table 4 Information Age Organizational model



documentation of every transaction in SOEs must be implemented. CPA firms bear unlimited liability for any fraud behaviour by auditors.

3) The SOEs get feedback timely from provincial SOE bureau which is responsible for monitoring SOEs' performance and promoting or sacking SOE managers according to the SOEs' profit. Managers have total freedom in routine operation and the power to initiate removal in his company. Important investment decision will be subject to provincial SOE bureau's approval. The SOE bureau will be evaluated according to the speed of feedback. Local official has no say on SOEs' personnel and management. The central government can sack local official timely in case of corruption complaint from SOE managers.

4) The central database should be developed toward a powerful and user-friendly DSS (decision support system) and KS (knowledge system). Huber has observed that "while to some extent DSS and KS will update their knowledge by "reading" inventories and newspapers, and will be self-teaching, the turbulence and changing complexity of the post-industrial environment will require that experts frequently be called in to update and to upgrade the information and intelligence systems." This depends on the unreserved support from the state on input of capital and human resources, but in the long run we can expect less specialists because the informal contacts with a set of readily available advisors would tend to result in a net of formalisation of the decision process (or routinization) (Huber, 1984 pp.936).

5) Through the network, a highly efficient central intelligence bureau is accessible to SOE managers and all the other concerned parties. The bureau monitors the deviation behaviour of state agencies.

(4) Informational advantages of this system

1) The information between the principal (the state) and the agent (the SOE manager) will be more symmetric. Almost timely and free flow of information will greatly reduce uncertainty.

2) There will be no information distortion that existed in previous hierarchical chain. The basis of collusion between agencies: the local officials, was eliminated. There will be less scope for collusion. Or if any, it will be easily detected because of enhanced transparency of SOEs' management performance and simplified criterion (profit) for evaluation.

3) Through the system, the state also screens signals from all the SOEs so that it is possible to determine an acceptable level of profitability of a SOE within a specific industry, district and market. The actions and opportunities facing a SOE manager can be more accurately observed using adverse selection. There will be less scope for SOE managers' opportunistic behaviour. Managers with low capability or poor performance will be easily spotted and replaced.

4) Through the system, nation wide co-ordination among provincial SOE bureau will be possible and duplication of investment or too risky project can be avoided.

5) Should the database develop into a powerful and user-friendly DSS (decision support system) and KS (knowledge system), the management decision process will be more objective and greatly facilitated. The SOE managers will have access to high quality and abundant information which was previous unavailable or very costly to get, risky project will be rejected through low cost professional consulting through the network.

(5) Advantages of backwardness in developing this system:

1) Mature Information Technology

For the past 30 years, each decade has seen computing power increase by a factor of 100 while costs have dropped by a factor of 10. The most powerful microprocessors, such as Intel's Pentium Pro or DEC's Alpha, have mainframe and even supercomputer-like computing power, but only at a fraction of their costs. Advances in science, technology and manufacturing will enable this momentum to continue (Laudon, 1998 pp.154).

2) No serious problems of "legacy systems" and "insulated island of automation"

Legacy problem refers to those transaction processing systems that were designed to perform a specific task. Over time, these systems may not accurately reflect business needs. In addition, as hardware and software improvements occur in the information systems marketplace, older information systems solutions will tie an organisation to an out-of-date platform that is unable to deliver value creating applications and is costly to operate and maintain (Laudon, 1998 pp.221). "Insulated island of automation" refers to the incompatible systems between organisations. For an instance, currently, most of the banks in China are still using IBM mainframe MIS system that allows only one way flow of information and make further development of E-commerce (requiring on-line credit confirmation and transaction) impossible. Future innovation should aim at the client-server system.

3) No serious Y2K problem need to be fixed.

(6) Key factors preventing the system from success

1) Lack of talents

The IT platform provides a powerful instrument but it does not guarantee any result. The new system is a knowledge-based system. The user must be IT literate. This requires training of users. The databases and servers should be managed by specialists. Drucker (1988, pp.46) has perceived that “information is data endowed with relevance and purpose.” Converting data into information thus requires knowledge. And “knowledge, by definition, is specialised”. IT networked infrastructure can provide important tools, but it can define neither the information that needs to be in the system nor the meaning of the information and how to use it to co-ordinate and manage the SOEs (Laudon, 1998 pp.177). It is up to the users and specialists to co-operate to make the system a smart and leaning one. Only 24.6% of enterprise managers in China have had formal degree education.¹⁹ The state also lacks sufficient talents to supervise such a huge number of SOEs (114 thousand)²⁰.

As many as politically possible SOEs should be privatised, especially those small and media sized SOEs. As many as possible of SOEs should be transformed to be run under one objective (profit maximisation). The government is no longer able to shield SOEs from the more and more intensive market competition from both domestic and abroad. Either in tariff or in subsidy, the protection cost is becoming prohibitive. Profitable SOEs should be privatised first because they will have better results of restructuring. SOEs must compete in the market with no guaranteed support from the state (either in credit or in product marketing).

2) Culture and environment

¹⁹ http://www.ceis.gov.cn/wscd/98/98_dc12.asp

²⁰ <http://www.cei.gov.cn/sicnet/a/db/97yearbook/1997-12-1.htm>

The system will not release its full potential without some core values shared among all the participants in this system. Strict auditing and evaluation procedure must be ensured. The contract law and bankruptcy law should be strictly implemented since they are the prerequisites of an efficient market economy. Bank credit should not be determined by government order but by the SOE's own financial well being. Stringent penalties should be imposed on any deviant behaviour given the establishment of efficient incentive scheme.

3) Moral hazard problem on the top of the system

Who will watch those guys on the top of the system? I assumed the integrity of the central government officials in designing the system. But this assumption may be too strong to hold in a country in which the president is not elected by the people and there is no free publication (part of the monitoring system). As a result, the proposed system could be up to nothing more than a better tool for centralised corruption. It was said that the very persons in charge of purchase in the Three Gorges Project (valued at 600 billion Yuan) are the former Premier Li's son and son in law. After finishing of this huge project (if it is possible), I doubt I would dare to live in downstream of the Yangze River on which the Three Gorges stands.

4) Security issues

There are two security issues needed to be concerned. The first is the security of data transmitted on the net. Compared to sending letters through the post office, sending email over the internet can be blazingly fast but is highly susceptible to the electronic eavesdroppers. Authentication problem also bothers the receiver of email. Well-designed cryptography systems can ensure the security of such transmissions (Zimmermann, 1998

pp.110). Another issue is system security. As long as systems connect to the internet for transferring files, sending email, downloading programs and so on, there will always be the chance that the system will be broke in by malicious hackers and attacked by virus designed by computer perverts around the world. "Firewall" and powerful defensive software could block unauthorised intruders to some extent (Cheswick, 1998 pp.106).

6. Summary

China's SOEs are in a deep crisis. The reason is high agency cost caused by both the obsolete state owned system and the discouraging managerial incentive scheme, which are legacies of the old planned economy. Crisis usually leads to one of two outcomes: a disaster or a new system. Considering the second outcome, crisis is not necessarily a bad thing. If out of the crisis we can build up a new SOE management system and a fair managerial incentive scheme that are compatible with China's industrial strategy and the dynamic market, then the renaissance or reinvigoration of SOEs is not too far away.

Bibliography :

- Alchian, Armen A; Demsetz, Harold:** "Production, Information Costs, and Economic Organization." *American Economic Review*. Vol. 62 (5). p.777-95. Dec.1972.
- Akhmetshina, Elvira:** "Shock Therapy for the Russian Federation: Privatization and Criminalisation of the Economy", Major Paper, Department of Economics, University of Ottawa, 1998
- Aram, John D and Wang Xiaoli :** "Lessons from Chinese State Economic Reform", *China Economic Review*. Vol. 2. p.29-46. Spring 1991.
- Arrow, Kenneth J:** "Insurance, Risk, and Resource Allocation. " Collected Papers of Kenneth J. Arrow. Volume 4. The Economics of Information. Arrow, Kenneth J., Cambridge, Mass.: Harvard University Press, Belknap Press. p.77-86. 1984.
- Arrow, Kenneth J.:** "The Economics of Agency", Principals and Agents: The Structure of Business. Pratt, John W., ed. Zeckhauser, Richard J., ed., Harvard Business School Research Colloquium series Boston: Harvard Business School Press. p 37-51. 1985.
- Boycko, Maxim; Shleifer, Andrei; Vishny, Robert W :** "A Theory of Privatisation". *Economic Journal*. Vol. 106 (435). p 309-19. March 1996.
- Byrd, William :** "Enterprise-Level Reforms in Chinese State-Owned Industry", *American Economic Review*. Vol. 73 (2). p 329-32. May 1983.
- Cash, James I; Eccles, Robert G; Nohria, Nitin; Nolan, Richard L :** Building the Information Age Organisation : Structure, Control and Information Technologies, Richard D. Irwin, 1994
- Cauley, Jon and Sandler, Todd :** "Agency Theory and the Chinese Enterprise Under Reform", *China Economic Review*. Vol. 3 (1). p 39-56. Spring 1992. Vol 3,

No.1, 1992

Coughlan, Anne T and Schmidt, Ronald M : "Executive Compensation, Management Turnover, and Firm Performance", *Journal of Accounting & Economics*. Vol. 7 (1-3). p 43-66. April 1985.

Cheswick, William: "How Computer Security Works?" *Scientific American*, Oct 1998

Chow, Gregory C : "Challenges of Chinas Economic System for Economic Theory", *American Economic Review*. Vol. 87 (2). p 321-27. May 1997.

Drucker, Peter F : "The Coming of The New Organisation", *Harvard Business Review*, January-February 1998

Ericson, Richard E: "The Classical Soviet-Type Economy: Nature of the System and Implications for Reform", *Journal of Economic Perspectives*. Vol. 5 (4). p 11-27. Fall 1991.

Fama, Eugene F : "Agency Problems and the Theory of the Firm", *Journal of Political Economy*. Vol. 88 (2). p288-307. April 1980.

Garner, Maurice R : "The Theory of Public Enterprise Reconsidered", *Annals of Public & Cooperative Economics*. Vol. 67 (1). p 85-115. March 1996.

Giersch, Herbert, ed: "Privatization at the end of the century". *Egon-Sohmen-Foundation series*. Heidelberg and New York: Springer. p x, 367. 1997.

Grossman, Sanford J; Hart, Oliver D: "An Analysis of the Principal-agent Problem", *Econometrica*. Vol. 51 (1). p 7-45. January 1983.

Groves, Theodore; Hong, Yongmiao; Mcmillan, John; Naughton, Barry :

"Autonomy and Incentives in Chinese State Enterprises". *The Quarterly Journal of Economics*. Vol. 109 (1). p 183-209. February 1994.

Groves, Theodore; Hong, Yongmiao; Macmillan, John; Naughton, Barry : “China’s Evolving Managerial Labor market”, *Journal of Political Economy*. Vol. 103 (4). p 873-92. August 1995.

Harris, Milton; Raviv, Artur: “Optimal Incentive Contracts with Imperfect Information”, *Journal of Economic Theory*. Vol. 20 (2). p 231-59. April 1979.

Hart, Oliver and Moore, John : “Property Rights and the Nature of the Firm”. *Journal of Political Economy*. Vol. 98 (6). p 1119-58. December 1990.

Holmstrom, Bengt and Milgrom, Paul : “Aggregation and Linearity in the Provision of Intertemporal Incentives”, *Econometrica*. Vol. 55 (2). p 303-28. March 1987.

Huber, George P : “The Nature and Design of Post-Industrial Organizations”, *Management Science*, Vol.30, No.8, August 1984

Jaques, Elliott : “In Praise of Hierarchy”, *Harvard Business Review*, January-February 1990

Jefferson, Gary H and Rawski, Thomas G : “Enterprise Reform in Chinese Industry”, *Journal of Economic Perspectives*. Vol. 8 (2). p 47-70. Spring 1994.

Jensen, Michael C and Meckling, William H : “Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure”, *Journal of Financial Economics*. Vol. 3 (4). p 305-60. Oct. 1976.

Laffont, Jean-Jacques and Torole, Jean: A Theory of Incentives in Procurement and Regulation, The MIT Press, 1993

Laudon, Kenneth C and Laudon, Jane Price : Management Information Systems- New Approaches to Organisational and Technology, 5th edition, Prentic Hall, 1998

Lee, Keun : “Property Rights and the Agency Problem in China’s Enterprise Reform”,

Cambridge Journal of Economics. Vol. 17 (2). p 179-94. June 1993.

Leibenstein, Harvey: "Allocative Efficiency vs. 'X-inefficiency'", *American Economic Review*, 56, 1966

Li, David D : "A Theory of Ambiguous Property Rights in Transition Economies : The Case of the Chinese Non-State Sector", *Journal of Comparative Economics*. Vol. 23 (1). p 1-19. August 1996.

Lin, Justin Yifu; Cai, Fan; Li, Zhou : "Competition, Policy Burdens, and State-Owned Enterprise Reform", *American Economic Review*. Vol. 88 (2). p 422-27. May 1998.

Machlup, Fritz: "Theories of the Firm: Marginalist, Behavioral, Managerial", *American Economic Review*, 57, 1967

Mas-Colell, Andreu; Whinston, Michael D; Green, Jerry R : *Microeconomic Theory* , Oxford University Press, 1995

Mirrlees, James A: *The Theory of Moral hazard and Unobservable Behavior*, Nuffield College, Oxford, 1975

Muller, Holger M: "The First-best Sharing Rule in the Continuous-time Principal-agent Problem with Exponential Utility", *Journal of Economic Theory*. Vol. 79 (2). p 276-80. April 1998.

Murrell, Peter: "Can Neoclassical Economics Underpin the Reform of Centrally Planned Economies?" *Journal of Economic Perspectives*. Vol. 5 (4). p 59-76. Fall 1991.

Naughton, Barry : "Chinese Institutional Innovation and Privatization from Below". *American Economic Review*. Vol. 84 (2). p 266-70. May 1994.

Qian, Yingyi : "Enterprise reform in China : Agency Problems and Political Control",

Economics of Transition. Vol. 4 (2). p 427-47. October 1996.

Rawski, Thomas G : “Chinese Industrial reform : Accomplishments, Prospects, and Implications”. *American Economic Review*. Vol. 84 (2). p 271-75. May 1994.

Ross, Stephen A. : “The Economic Theory of Agency : The Principal’s Problem”, *American Economic Review*. Vol. 63 (2). p 134-39. May 1973.

Schankerman, Mark : “Review of: Privatizing Russia”, *Journal of Economic Literature*. Vol. 35 (2). p 818-820. June 1997.

Schmidt, Klaus M: “Managerial Incentives and Product Market Competition”, *The Review of Economic Studies*. Vol. 64 (2). p 191-213. April 1997.

Shleifer, Andrei and Vishny, Robert W: “Politicians and Firms”, *The Quarterly Journal of Economics*. Vol. 109 (4). p 995-1025. November 1994.

Shavell, Steven: “Risk Sharing and Incentives in the Principal and Agent Relationship”, *The Bell Journal of Economics*. Vol. 10 (1). p 55-73. Spr. 1979.

Spence, A Michael ; Zeckhauser, Richards: “Incurance, Information and Individual Action”, *American Economic Review*. Vol. 61 (2). p 380-87. May 1971.

Stiglitz, Joseph E : “Incentives, Risk, and Information : Notes toward a Theory of Hierarchy”, *The Bell Journal of Economics*. Vol. 6 (2). p 552-79. Autumn. 1975.

Sung, Jaeyoung; Schattler, Heinz: "The First-order Approach to the Continuous-time Principal-agent Problem with Exponential Utility", *Journal of Economic Theory*. Vol. 61 (2). p 331-71. December 1993. 1993

Sung, Jaeyoung; Schattler, Heinz: “On Optimal Sharing Rules in Discrete and Continuous-time Principal-agent Problems with Exponential Utility”, *Journal of Economic Dynamics & Control*. Vol. 21 (2-3). p 551-74. Feb.-March 1997.

Varian, Hal R : Microeconomy Analysis, 3rd edition, W. W. Norton&Company, 1992

Williams, Edward E : “The New Economics of the People's Republic of China: The Overcentralized Command Economy Failed, Now the Management System Must Be Reformed”, *American Journal of Economics & Sociology*. Vol. 49 (3). p 351-73. July 1990.

Williamson, O : Economic Organization: Firms, Market and Policy Control, Wheatsheaf Books, London, 1986

Wilson, R. B: “On the Theory of syndicates”, *Econometrica* 36, 1968

Wong, Yue-Chim Richard : “China's Economic Reform: The Next Step”. *Contemporary Economic Policy*. Vol. 13 (1). p 18-27. January 1995.

Zhang, Weiyong : “Decision Rights, Residual Claim and Performance : A Theory of How the Chinese State Enterprise Reform Works ”. *China Economic Review*. Vol. 8 (1). p 67-82. Spring 1997.

Zimmermann, Philip R: "Cryptography for the Internet", *Scientific American*, Oct 1998